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**Overview of Groundwater and
Surface Water Standards
Pertinent to the Idaho National
Engineering Laboratory**

**Anne L. Lundahl
Sandy Williams
Betty J. Grizzle**

Lockheed
Idaho Technologies Company

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Sandy Williams
Betty J. Grizzle**

Published September 1995

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ABSTRACT

This document presents an overview of groundwater- and surface water-related laws, regulations, agreements, guidance documents, Executive Orders, and DOE orders pertinent to the Idaho National Engineering Laboratory. This document is a summary and is intended to help readers understand which regulatory requirements may apply to their particular circumstances. However, the document is not intended to be used in lieu of applicable regulations. Unless otherwise noted, the information in this report reflects a summary and evaluation completed July 1, 1995. This document is considered a **Living Document**, and updates on changing laws and regulations will be provided.

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ACRONYMS

ACL	alternate concentration limit
AEA	Atomic Energy Act
ALARA	as low as reasonably achievable
ALR	action leakage rates
ARAR	applicable or relevant and appropriate requirement
BAT	best available technology
BMP	best management practices
BNA	Bureau of National Affairs
BRC	below regulatory concern
CAMUs	corrective action management units
CAP	corrective action plan
CCM	contingent corrective measure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFCs	chlorofluorocarbons
CFR	Code of Federal Regulations
CMI	corrective measure implementation
CMS	corrective measures study
COCA	Consent Order and Compliance Agreement
CWA	Clean Water Act
DCG	derived concentration guide
D&D	decontamination and decommissioning
DEQ	Department of Environmental Quality

DMR	Discharge Monitoring Report
DOE	Department of Energy
DOE-HQ	Department of Energy-Headquarters
DOE-ID	Department of Energy Idaho Operations Office
DOT	Department of Transportation
DQOs	Data Quality Objectives
EA	environmental assessment
EDE	effective dose equivalent
EIS	environmental impact statement
EMP	environmental monitoring program
EMR	environmental monitoring report
EO	Executive Order
EOC	Emergency Operations Center
EPA	Environmental Protection Agency
EPIP	environmental protection implementation plan
ERPP	Environmental Radiological Protection Program
ES	environmental survey
ESR	environmental survey report
ESRPA	Eastern Snake River Plain Aquifer
FEMA	Federal Emergency Management Agency
FFA	Federal facility agreement
FFA/CO	Federal facility agreement/consent order
FHBMs	Flood Hazard Boundary Maps
FIA	Federal Insurance Administration

FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FIRMs	Flood Insurance Rate Maps
FONSI	Finding of No Significant Impact
FR	Federal Register
FS	feasibility study
FWPCA	Federal Water Pollution Control Act
FY	Fiscal Year
GAO	General Accounting Office
GIS	Geographic Information System
GMP	groundwater monitoring plan
GPMP	groundwater protection management plan/program
GW	groundwater
GWMS	groundwater monitoring system
H&S	health and safety plans
HLW	high-level waste
HRS	Hazard Ranking System
HSWA	Hazardous and Solid Waste Amendments
HWMA	Hazardous Waste Management Act
IA	Interim Action
IAG	interagency agreement
ICPP	Idaho Chemical Processing Plant
IDAPA	Idaho Administrative Procedures Act
IDHW	Idaho Department of Health and Welfare
IDWR	Idaho Department of Water Resources

INEL	Idaho National Engineering Laboratory
ISFSI	independent spent fuel storage installation
IWA	Industrial Waste Acceptance
LDR	land disposal restrictions
LDU	land disposal unit
LITCO	Lockheed Idaho Technologies Company
LLW	low-level waste
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
MRS	monitored retrievable storage
MTR	minimum technology requirement
NARM	naturally occurring or accelerator-produced radioactive material
NCP	National Contingency Plan
NEPA	National Environmental Policy Act
NGVD	National Geodetic Vertical Datum
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPDWR	National Primary Drinking Water Regulations
NPRM	Notice of Proposed Rulemaking
NPL	National Priorities List
NRC	Nuclear Regulatory Commission
NRDA	Natural Resource Damage Assessments
NRDC	Natural Resources Defense Council
NWPA	Nuclear Waste Policy Act

OMB	Office of Management and Budget
OU	operable units
PCB	polychlorinated biphenyl
POTW	publicly owned treatment works
ppm	parts per million
PSO	program senior officials
PTI	Protection Technology Idaho, Inc.
QA	quality assurance
QA/QC	quality assurance/quality control
QAPP	quality assurance project plan
QC	quality control
RA	Regional Administrator
RCRA	Resource Conservation and Recovery Act
RD/RA	remedial decision/remedial action
RFI	RCRA facility investigation
RI	remedial investigation
RI/FS	remedial investigation/feasibility study
ROD	Record of Decision
RQ	reportable quantity
RWMC	Radioactive Waste Management Complex
SAP	sampling and analysis plan
SAIC	Science Applications International Corporation
SARA	Superfund Amendments and Reauthorization Act

SDP	site development plan
SDWA	Safe Drinking Water Act
SGWPP	state groundwater protection program
SIU	significant industrial user
SMCL	secondary maximum contaminant level
SOW	Scope of Work
SUO	Sewer Use Ordinance
SPCC	Spill Prevention, Control, and Countermeasures
SWMU	solid waste management unit
SWPPP	Storm Water Pollution Prevention Plan
TDS	total dissolved solids
TEGD	Technical Enforcement Guidance Document
TRU	transuranic
TSCA	Toxic Substances Control Act
TSD	treatment, storage, and disposal
TU	temporary unit
TWTDS	treatment works treating domestic sewage
UIC	underground injection control
USC	United States Code
USDW	underground source of drinking water
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
UST	underground storage tank
WAGs	waste area groups

WHP	Wellhead Protection Program
WIPP	Waste Isolation Pilot Plant
WQA	Water Quality Act

Overview of Groundwater and Surface Water Standards Pertinent to the Idaho National Engineering Laboratory

1. INTRODUCTION

Facilities that generate, treat, store, transport, or dispose of hazardous, sanitary/industrial, radioactive, and/or mixed wastes or substances are subject to strict environmental laws and regulations. These laws and regulations are designed to prevent releases of such wastes or substances into the environment and to require some measure of isolation or cleanup if contamination should occur. Many of these laws and regulations are designed in part to protect groundwater and surface water from contamination.

1.1 Purpose and Scope

This document provides an overview of the laws, regulations, rules, orders, strategies, agreements, and guidance documents, collectively designated herein as Standards, that are potentially applicable to groundwater and surface water protection at the Idaho National Engineering Laboratory (INEL). It is primarily a summary and is not intended to be used in lieu of the applicable regulations. Regulatory interpretations should be made from the actual Standards in consultation with qualified environmental professionals.

The Federal Government has not adopted comprehensive groundwater or surface water protection legislation. Instead, groundwater and/or surface water protection is addressed as a part of various statutes and Executive Orders (EOs), including the following:

- Safe Drinking Water Act (SDWA)
- Resource Conservation and Recovery Act (RCRA) as amended by the Hazardous and Solid Waste Amendments (HSWA)
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA)
- Clean Water Act (CWA)
- Toxic Substances Control Act (TSCA)
- Atomic Energy Act (AEA)
- Nuclear Waste Policy Act (NWPA)
- Low-Level Radioactive Waste Policy Act

- EO No. 11990 (Protection of Wetlands)
- EO No. 11988 (Floodplain Management).

Of these statutes and EOs, RCRA is the most detailed with regard to groundwater protection and the CWA is the most detailed with regard to surface water protection. These statutes and the regulations under which they were promulgated are evaluated in this report. Also evaluated in this report are the following State of Idaho regulations and statutes: the Idaho Hazardous and Solid Waste Management Regulations, Water Quality Standards and Wastewater Treatment Requirements, Drinking Water Regulations, Well Construction, Underground Injection Control, Wastewater Land Application Permit Regulations, Idaho Hazardous Waste Management Act, and the Environmental Protection and Health Act.

This report also summarizes pertinent U.S. Department of Energy (DOE) orders, and the groundwater protection strategy documents of both the U.S. Environmental Protection Agency (EPA) and DOE. Most of the DOE order requirements addressing groundwater and surface water are in DOE Order 5400.1, "General Environmental Protection Program." This order requires the development of a program for groundwater and surface water protection by each DOE operations office.

This report identifies the types of facilities, wastes, and activities that can trigger groundwater/surface water assessment, protection, management, or monitoring requirements. The technical requirements are then discussed that are potentially applicable to the INEL and its activities.

The update of this report was prepared by Ekova L.L.C., for Lockheed Idaho Technologies Company (LITCO), in support of the Environmental Protection Group. The report includes a summary and evaluation of applicable Standards that have been promulgated through July 1, 1995.

Environmental regulations have been evolving rapidly in their scope and technical requirements. Because of the frequent changes in these requirements, the reader is cautioned to consult the actual standards in consultation with environmental professionals.

1.2 Report Organization

This document is organized as follows. Sections 2 and 3 discuss the groundwater protection strategies established by the EPA and DOE, respectively. Section 4 provides an overview and historical perspective of potentially applicable groundwater and surface water laws and regulations. Sections 5 through 11 address the pertinent laws and regulations identified in Section 4 in more detail. Section 12 discusses potentially relevant Idaho State Regulations. Section 13 discusses the radioactive and mixed waste statutes and regulations pertaining to groundwater and surface water. Section 14 reviews relevant DOE orders. Section 15 reviews the INEL Federal Facility Agreement and Consent Order (FFA/CO). Section 16 presents the first two steps in a three-step strategy for determining which technical requirements associated with groundwater and surface water monitoring, protection, and remediation must be met at a given site to achieve regulatory compliance. Section 17 presents the third step, which is to identify the technical requirements related to groundwater and surface water monitoring, protection, management, and remediation found in various Standards. Section 18 lists references. Section 19 is a glossary of key terms used in this report. A list of acronyms is provided at the beginning of the report.

2. EPA GROUNDWATER PROTECTION STRATEGY

The U.S. Environmental Protection Agency (EPA) published its first groundwater protection strategy in 1984. The 1984 EPA Strategy discussed the current state of groundwater contamination problems and articulated the EPA's role in a national groundwater protection program. The 1984 EPA Strategy had four major objectives: (a) build state capacity (to develop and implement groundwater programs), (b) address sources of contamination, (c) establish groundwater policy direction and program consistency, and (d) coordinate EPA programs.

The 1984 Strategy presented the EPA Groundwater Classification System, which defined protection policies for three classes of groundwater. In this system, groundwater was classified according to the value of the groundwater and its vulnerability to contamination. These classes applied to all groundwater sources having significant value as water resources. The three classes were defined as follows: (a) Class I, or special groundwater, (b) Class II, which referred to current and potential sources of drinking water and water having other beneficial uses, and (c) Class III, which was groundwater that was not a potential source of drinking water and that had limited beneficial use.

Several years after the publication of the 1984 Strategy, the EPA recognized that there were still gaps in the protection efforts being established across the country. The latest EPA groundwater protection strategy, *Protecting the Nation's Ground Water: EPA's Strategy for the 1990s; The Final Report of the EPA Groundwater Task Force* (EPA 1991), is a result of efforts by a task force established in 1989 to review the Agency's groundwater protection program and "to develop concrete principles and objectives to ensure effective and consistent decision-making in all Agency decisions affecting the resource" (EPA 1991).

One change in the new 1990s EPA Strategy that may affect the Idaho National Engineering Laboratory (INEL) is the fact that the EPA has abandoned its Groundwater Classification System. The Strategy instead suggests that groundwater remediation activities be prioritized. The Strategy says prioritization should be based on the risk of adverse effects to human health first, and then on restoring "currently used and reasonably expected sources of drinking water." When designating groundwater for protection as a reasonably expected source of drinking water the Strategy recommends that the State should examine factors such as remoteness, quality, cost of protection, future growth and population patterns, and the availability and cost of alternative water supplies, according to the Strategy. This recommendation may affect the INEL since the U.S. Department of Energy (DOE) has in part adopted the EPA classification system (see Section 3), and DOE has not determined whether it will retain its classification system.

2.1 Goals and Major Approaches of EPA Groundwater Protection Strategy for the 1990s

The 1990s EPA Strategy is to set forth an "aggressive" approach to protecting the nation's groundwater resources and direct the EPA's efforts over the coming years. Its overall goal is to prevent damage to human health and the environment while protecting the environmental integrity of the nation's groundwater resources. The EPA has developed new approaches in order to meet its updated groundwater protection goals:

- **Focus on Comprehensive Resource Management:** This policy builds on current State activities by providing financial incentives for filling in gaps in protection efforts and building comprehensive protection programs on the State level.
- **Emphasis on Prevention of Groundwater Contamination:** The EPA will seek to achieve greater balance between prevention and remediation activities.
- **Clear definition of Federal and State Roles:** The EPA will provide assistance on the State level for the integration of Federal and State groundwater actions.
- **Adequacy of State Programs:** The EPA will refine the definition of elements for a State groundwater protection program and establish how each element must be addressed to develop an adequate program.
- **EPA Oversight:** The EPA will shift from a program-specific approach to a cross-program, resource-based approach.
- **Coordinated Funding:** The EPA will shift from the typical grant funding method to coordinated management of current grants and an incentive program.

These approaches are designed to provide consistency in EPA programs at all levels, to provide greater program coordination within the EPA, and to strengthen state capabilities to protect groundwater resources.

2.1.1 Part A

Part A of the 1990s Strategy, "EPA's Ground-Water Protection Principles," presents the overall goal of the EPA's groundwater policy (1991). The Strategy was written to ensure that drinking water supplies currently used and those reasonably expected to be used in the future, both public and private, are protected. This may be accomplished through source controls, siting controls, designation of wellhead protection areas and future public water supply areas, and protection of aquifer recharge areas.

2.1.2 Part B

Part B of the 1990s Strategy, "The Federal/State Relationship in Ground-Water Protection (1991)," states that the primary responsibility for coordinating and implementing groundwater protection programs "has always been and should continue to be vested with the States." However, the Strategy says also that Federal, State, and local activities should be coordinated to have an effective program. The EPA provides "technical and financial assistance under the Clean Water Act (CWA) to build State capacity to protect groundwater" (EPA 1991). The Strategy stresses the need for regulatory consistency. This involves better coordination between Federal agencies, including DOE.

According to the Strategy, the EPA will continue its role in controlling major sources of pollution. The States retain primary responsibility for management and protection of groundwater, and addressing nonpoint, commercial, and residential sources of pollution. This requires State decisions regarding groundwater allocation and land use.

Part B says that States and the EPA should take a resource-based approach in which all sources of contamination as well as unique hydrogeologic features are taken into account. States should not only consider current water supplies, but should also designate groundwater for protection that is reasonably expected to become drinking water. The 1990s Strategy takes into account protection of aquatic ecosystems as well as human health.

A major goal of the Strategy is to assist states in development and implementation of State Groundwater Protection Programs (SGWPPs) designed to provide comprehensive protection of the resource. The EPA will assess current State programs. This review will take into account the unique needs and circumstances of each State. The intent is to build State programs to the point where each State is capable of comprehensively protecting its groundwater. Federal funding will initially be equally available to all States. However, States showing greater progress towards achieving a comprehensive program will receive an increasing share of the grants.

The EPA is assisting the states in determining the "key elements" of a "mature" SGWPP. The Strategy provides a list of elements suggested for SGWPPs although the States will be granted flexibility in addressing these elements due to unique hydrogeological conditions. Each SGWPP should

- Set goals and document progress
- Characterize the resource and set priorities for action
- Develop and implement (pollution) prevention and control programs
- Define roles within the State and the relationship to Federal programs.

Although the EPA has abandoned its Groundwater Classification System, it still recommends that the SGWPP include a process used for setting priorities such as a "use designation/classification scheme."

The direction the EPA is taking in the State of Idaho is to provide technical and financial support to the State to help with implementation of the State Groundwater Quality Plan which is consistent with the EPA Strategy. Idaho has received grant funds to: 1) help in coordination of all State groundwater protection programs; 2) support groundwater education and outreach programs; 3) identify nonpoint source contamination, with emphasis on agricultural sources; and 4) develop State groundwater quality rules.^a

The EPA intends to defer to State standards, priorities, and programs to the extent authorized by Federal statutes. As with other programs, "EPA statutes generally provide that Federally promulgated standards or regulations serve as minimum levels of protection." States may adopt more-stringent standards. The EPA is committed to "exploring opportunities for providing for deference to State regulations, standards or policies as authorized by the EPA statutes (EPA 1991)."

a. Personal communication between Drew Keenan (EPA Region 10) and Sandy Williams (Williams Consulting), September 28, 1995.

2.1.3 Part C

Part C of the 1990s Strategy, "EPA's Approach to Implementation," discusses overall implementation of the EPA Ground-Water Protection Principles and the SGWPPs. Committees and work groups have been formed at EPA Headquarters and regional offices to

- Help provide consistency in the development of EPA regulations required under Federal statutes
- Determine the appropriateness of deferring to a comprehensive SGWPP under each regulation
- Define the criteria for evaluating SGWPPs
- Define the EPA's continuing oversight role.

Part C also defines the responsibilities of the Regional EPA Offices. The key responsibilities include assuring States are actively involved in EPA regional activities associated with implementing the 1990s Strategy, and working together with States to establish priorities, milestones, and commitments. The Regional Offices will also conduct annual reviews of State, Regional, and Headquarters progress in implementing SGWPPs.

According to the 1990s Strategy, three elements of State protection programs are of special importance in State implementation of existing EPA requirements:

1. Establishing a formal mechanism for coordinating authorities and programs under various EPA statutes
2. Identifying the most valuable, vulnerable aquifers
3. Evaluating or ranking the highest-priority sources of contamination.

Although the EPA has abandoned its Groundwater Classification System, criteria must be established for determining which aquifers are of concern under the first two elements above.

2.1.4 Part D

Part D of the 1990s Strategy is "Agency Policy on EPA's Use of Quality Standards in Ground-Water Prevention and Remediation Activities." When carrying out its programs under the Strategy, the EPA will use the maximum contaminant levels (MCLs) set forth in the Safe Drinking Water Act (SDWA) as "reference points" in order to protect groundwater resources that are potential sources of drinking water. Water quality standards established under the CWA will be used when the groundwater resource is hydrologically connected to surface water ecological systems. Reference points will be applied differently for prevention and cleanup purposes.

The Strategy states that prevention of groundwater contamination should be accomplished through use of best technologies and management practices. Detection of a percentage of the reference point may trigger additional action, such as additional monitoring, or restricting or banning the use of a particular pesticide.

For cleanup purposes, when restoring contaminated groundwater resources, the EPA will accept a cancer risk level range of 10^{-4} to 10^{-6} . Exposures to noncarcinogens must be below appropriate reference doses. Factors such as the cumulative effect of multiple contaminants should be taken into account; in cases of multiple contaminants, more-stringent measures than the reference point may be appropriate. Conversely, less-stringent measures may be used where authorized by law, dependent on technical practicality, adverse environmental impacts of remediation, cost, and low likelihood of potential use.

2.1.5 Part E

Part E of the 1990s Strategy, "Ground-Water Data Management Summary and Recommendations," discusses groundwater data management. This Part consists mainly of a Ground-Water Task Force Subcommittee Report, *Ground-Water Data Collection, Accessibility, and Utilization*. The EPA recognizes the growing volume of groundwater data being collected and the problems involved with cross-program integration. The Ground-Water Task Force report makes recommendations with respect to groundwater data consistency, quality, automation, accessibility, and utilization including geographic information systems (GISs). The Strategy suggests that each Region develop a groundwater management policy addressing these elements. Regional policy should consider the needs of State and local governments and the regulated community. According to the 1990s Strategy, Region X has already implemented this policy. Each Region needs to develop a Directory for use by the EPA, State and local governments, other Federal agencies, and the groundwater community. This Directory would identify the EPA, State, and other Federal groundwater data bases in existence. Each Region should incorporate regional GIS capabilities. GISs are particularly useful in risk-based prioritization of program commitments.

The Ground-Water Task Force Report discusses groundwater monitoring requirements contained in other regulations and acts such as the Resource Conservation and Recovery Act (RCRA), CERCLA, Toxic Substances Control Act (TSCA), SDWA, and the CWA. The report does not contain requirements of its own. The regulations and acts addressed in that report are discussed in other sections of this document and are therefore not discussed in detail here.

The Ground-Water Task Force Report discusses types of data collected under the different regulations and acts, and the data format and availability requirements. The Report also discusses State and Federal implementation and enforcement responsibilities. It discusses decisions to be made using groundwater data such as risk assessments, the inconsistencies in methods and quality assurance (QA) regarding data collection and improvements in data collection that are underway.

The Report specifically discusses the EPA Region X "Data Management Order." This order establishes consistent procedures for organizing, reporting, transmitting, storing, and retrieving groundwater data in Region X. The order applies to all groundwater data collection activities directly carried out by EPA staff or EPA contractors, including research and development, enforcement, and permit issuance.

2.1.6 Part F

Part F of the 1990s Strategy, "Office of Research and Development Ground-Water Research Plan: Strategy for FY 1991 and Beyond," is the Office of Research and Development's strategy for conducting subsurface and related research in support of EPA's programs.

Part F discusses the need for the EPA to perform continuing research on subsurface processes, monitoring, and remediation methods, to evaluate and refine research results, and to assure coordination with other research agencies. This Part promotes the use of technology transfer.

Part F also discusses recent technological advances, further groundwater research, and groundwater research legislation that would give the EPA the authority and direction to perform groundwater research.

While Part F does not directly affect groundwater requirements at the INEL, professionals in the groundwater community may use it to learn of the latest EPA technological advances (as of July 1991, the date of publication of the 1990s Strategy). As technological advances are made, technical groundwater monitoring requirements may change.

2.2 Effects of 1990s EPA Strategy on INEL Groundwater Management

Groundwater management at the INEL may be primarily affected by two aspects of the 1990s EPA Strategy. First, as mentioned previously, the EPA has abandoned its Groundwater Classification System. Secondly, the EPA is committed to helping the States develop their own groundwater protection programs.

The EPA 1990s Strategy requires State groundwater protection programs to identify their most valuable and vulnerable aquifers. The 1990s Strategy also suggests a use designation/classification scheme for setting priorities for actions to be taken to protect or remediate groundwater resources. To accomplish this, States will develop some sort of classification scheme. The Idaho Groundwater Quality Plan calls for the development of a groundwater classification scheme. Idaho has decided to identify and implement its classification scheme in rule form.

The second aspect of the 1990s EPA Strategy that may affect the INEL is the possibility that the State of Idaho may become more involved in INEL groundwater regulation. It is unknown exactly what effect this would have on the INEL, but State regulations must be at least as strict as Federal standards and may be more strict. On the other hand, State programs may take into account the unique hydrogeologic aspects of State groundwater systems to make groundwater monitoring requirements more realistic.

3. DOE DRAFT GROUNDWATER PROTECTION STRATEGY

U.S. Department of Energy (DOE) has been preparing a groundwater protection strategy since 1986. Due to numerous changes both within and outside the DOE, however, the final strategy was never issued. According to the DOE Headquarters Office of Groundwater, they have determined a Strategy is not necessary, instead they will publish a policy statement. The actual requirements are being incorporated into DOE orders, guidance documents and the Code of Federal regulations. Most water monitoring and protection requirements associated with radionuclides will be in 10 CFR 834 when it is finalized. This CFR will replace DOE Order 5400.5.^b Additional guidance on specific issues and problems raised by field or operations offices will be provided on an ongoing basis.

3.1 Overview of the DOE Draft Groundwater Protection Strategy

The DOE prepared its initial draft Groundwater Protection Strategy in response to a September, 1986, General Accounting Office (GAO) recommendation. In the recommendation, GAO suggested that the DOE establish a groundwater and soil protection strategy and that the strategy include "specific guidelines, to extent practical, to protect groundwater and soil around DOE facilities" (GAO 1986).

3.1.1 Objectives and Goals

On January 8, 1986, the Secretary of Energy issued a statement that summarized the Department's official environmental policy. The Secretary said, "It is the policy of DOE to conduct its operations in an environmentally safe and sound manner...DOE is committed to good environmental management in all of its programs and at all of its facilities in order 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." The objectives of the DOE Strategy coincide with the intent of that statement. The Strategy's objectives are to prevent groundwater degradation and to clean up existing contaminated groundwater commensurate with its highest current or potential usefulness (DOE Notice 5400.AA).

The primary goals of the DOE Strategy are as follows:

- Provide guidance only in broad terms on selected issues to allow flexibility due to site diversity
- Focus on those areas not under Federal or State jurisdiction where the DOE has discretion
- Identify areas where there are no applicable requirements, but where DOE policy will be to go beyond the existing requirements
- Amend DOE orders as necessary to make them consistent with the Strategy's framework and turn the suggestions in the Strategy into mandatory requirements

b. Personal communication between Jim Bauchmeyer (Department of Energy-Headquarters) and Sandy Williams (Williams Consulting), September 7, 1995.

- Demonstrate a strong preference for physical controls to protect groundwater and prevent further contamination, rather than the use of institutional controls
- Provide guidance on a continuing basis on groundwater-related issues.

3.1.2 Application

The DOE Strategy addresses management and disposal of hazardous, radioactive, and mixed wastes and provides guidance on preferred waste management and groundwater management practices for both DOE "elements" and DOE contractors. As specified by the Strategy, some of the requirements in this document have already been incorporated into various DOE orders, primarily 5400.1, but also 5400.3, 5400.4, and 5820.2A. Additional requirements from the Strategy are also found in the draft proposed rule 10 Code of Federal Regulations (CFR) 834 and the DOE document *Environmental Regulatory Guidance on Radiological Effluent Monitoring and Environmental Surveillance*, released January 1991. (These are discussed in Sections 12 and 13 of this report.) DOE Order 5400.1 was designed to implement the environmental protection and the groundwater protection policies.

3.1.3 Implementation

The DOE Strategy is to be followed to the extent that site-specific circumstances will allow. The Assistant Secretary of Environment and Health (EH-1) is to ensure consistent application of the Strategy throughout the DOE in accordance with requirements of applicable groundwater quality protection laws, regulations, and related DOE directives. The heads of DOE field organizations are to implement the Strategy in concert with applicable laws, regulations, and DOE orders. EH-1 is to lead in implementing this Strategy through changes and additions to DOE orders and by issuing guidance where appropriate. The office of EH-1 is to amend DOE orders as necessary to make them consistent with this Strategy and to give mandatory stature to those features of the Strategy meant to become requirements (DOE Notice 5400.AA).

The Strategy imposes requirements on the DOE and its contractors in addition to the requirements found in existing laws. It also addresses subjects not covered by legally applicable requirements. Where legally applicable requirements conflict with this Strategy, the Strategy states that the legal requirements take precedence.

In addition to the Strategy, the DOE presents policy statements regarding groundwater protection in various DOE orders. These statements are discussed in Section 3.2.

3.2 General Policy Statements

The DOE Groundwater Protection Strategy reflects DOE's overall environmental policy. This policy includes the following elements:

- General environmental approach
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) response policy

- Radioactive and mixed waste management policy
- Hazardous waste management policy.

3.2.1 General Environmental Approach

The following is the DOE environmental policy statement, found in DOE Order 5400.1: "Protection of the environment and the public are responsibilities of paramount concern and importance to this Department. All activities of the DOE should recognize and reflect this concern and public trust." Accordingly, it is DOE policy to

- "Conduct operations in an environmentally safe and sound manner ... that is in compliance with the letter and spirit of applicable environmental statutes, regulations, and standards"
- "Ensure incorporation of national environmental protection goals in the formation and implementation of DOE programs"
- "Use good environmental management in all of its programs and at all of 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"
- "Meet environmental obligations ... consistently across all operations and among all field organizations and programs"
- "Advance the goals of restoring and enhancing environmental quality and ensuring public health."

A general policy statement is also found in DOE Order 5480.1B, "Environment, Safety, and Health Program for the Department of Energy Operations," which states that DOE policy is to "assure compliance with applicable statutory requirements affecting Federal facilities and operations and where possible, consistent with the Department mission and supported by appropriate cost/benefit analysis, reduce identified environment, safety, and health risks, even though not mandated by specific requirements."

3.2.2 CERCLA Response Policy

For CERCLA response, DOE Order 5400.4 states that

It is the policy of DOE to respond to releases and potentially imminent releases of hazardous substances where such releases are on...any facility...under DOE jurisdiction, custody or control... This response shall be in accordance with the provisions of CERCLA, as amended, as well as those of the National Contingency Plan (NCP) and Executive Order 12580. DOE responses shall include both removal and/or remedial actions, as appropriate, to reduce adverse impacts on public health and the environment from releases regardless of whether the facility is listed on the National Priorities List (NPL).

Releases of certain radioactive materials are excluded from CERCLA requirements. Releases of source, special nuclear, or byproduct material are exempt because they are "federally permitted releases," if

they meet the derived concentration guide (DCG) regulations of DOE Order 5400.5. Federally permitted releases are defined in DOE Order 5000.3A as follows:

'Release' excludes...release of source, byproduct, or special nuclear material from a nuclear incident, as those terms are defined in the Atomic Energy Act (AEA) of 1954, if such release is subject to requirements with respect to financial protection established by the Nuclear Regulatory Commission under Section 170 of such Act, or for the purposes of Section 104 of the CERCLA or any other response, action, [and] any release of source, byproduct, or special nuclear material from any processing site designated under Section 102(a)(1) or 302(a) of the Uranium Mill Tailings Radiation Control Act of 1978.

CERCLA defines "federally permitted release" to include "any release of source, special nuclear, or byproduct material, as those terms are defined by the AEA of 1954, in compliance with a legally enforceable license, permit, regulations, or order issued pursuant to the AEA of 1954" [CERCLA, Section 101(10)]. Thus, if the release is not in compliance with the legally enforceable instruments listed above and with DOE orders, it may not be a Federally permitted release.

Radionuclides are listed among the substances for which reportable quantities are specified in 40 CFR 302.4 (CERCLA regulations). These include radionuclides of both known and unknown composition, alone and in mixtures with other radionuclides or hazardous substances. Recent changes in the reportable quantities of radionuclides are discussed in Section 6.

In addition to the requirements for reporting releases of radionuclides under certain circumstances, DOE facilities may be subject to the requirements of CERCLA through the application of applicable or relevant and appropriate requirement (ARARs) during remedial investigation and feasibility studies (RI/FSs). ARARs are to be incorporated as key factors throughout the CERCLA RI/FS process. This process, as it is related to the INEL, is discussed in Section 6 of this report.

3.2.3 Radioactive and Mixed Waste Management Policy

DOE Order 5820.2A defines mixed waste as waste containing both radioactive and hazardous components as defined by the AEA and the Resource Conservation and Recovery Act (RCRA), respectively. With regard to radioactive and mixed wastes, DOE Order 5820.2A, "Radioactive Waste Management," states the following:

Radioactive and mixed wastes shall be managed in a manner that assures protection of the health and safety of the public, DOE, and contractor employees, and the environment. The generation, treatment, storage, transportation, and/or disposal of radioactive wastes, and other pollutants or hazardous substances they contain, shall be accomplished in a manner that...complies with all applicable Federal, State, and local environmental...laws, regulations and DOE requirements.

One of the requirements of this order is to protect groundwater resources consistent with Federal, State, and local requirements. Under this order, low-level waste sites are to be designed and operated to "preserve the environment of the waste management facilities [to] ensure that no legacy requiring remedial action remains after operations are terminated." Thus, compliance with this order requires prevention of future groundwater contamination problems at these sites. Additionally, under certain circumstances DOE

Order 5820.2A requires groundwater (environmental) monitoring around high-level, transuranic, and low-level radioactive and mixed waste treatment, storage, and disposal facilities.

DOE emphasizes its stand on radioactive and mixed wastes in DOE Draft Proposed Rule 10 CFR 834, "Radiation Protection of the Public and the Environment."

3.2.4 Hazardous and Mixed Waste Management Policy

Specific guidance is given regarding hazardous waste in DOE Order 5400.3, "Hazardous and Radioactive Mixed Waste Program." This order states, "It is the policy of DOE to manage all Departmental hazardous and radioactive mixed wastes according to the requirements of Subtitle C of the RCRA, and the AEA, respectively. RCRA applies to the extent it is not inconsistent [incompatible] with the AEA. The radioactive component of radioactive mixed waste is subject to the requirements of DOE Order 5820.2A." For DOE treatment, storage, and/or disposal (TSD) facilities to comply with RCRA, as required in this order, they must take extensive groundwater protection measures and implement a consistent and effective groundwater monitoring program.

3.3 Requirements of the DOE Draft Groundwater Protection Strategy

The goals and objectives of the DOE Groundwater Protection Strategy are carried out through a series of requirements, many of which have already been incorporated into DOE orders, guidance documents, and draft regulations. These requirements can be summarized as follows:

- Comply with applicable regulations
- Get approval from EH-1 when variances are needed
- Write and implement site-specific groundwater protection plans
- Establish compliance points within 100 m of a contaminant source
- Institute groundwater cleanup standards
- Identify contaminant sources and affected areas
- Classify site groundwater using the U.S. Environmental Protection Agency (EPA) groundwater classification techniques, with slight but significant modifications
- Manage groundwater cleanups
- Rank contaminated areas by the degree of risk, using a hazard ranking system
- Limit the use of institutional controls as the sole control method
- Use long-term physical control methods whenever possible

- Conduct performance assessments
- Perform remedial actions where needed
- Site new facilities to avoid potential groundwater contamination
- Manage wastes to prevent soil contamination
- Manage wastes to minimize waste generation and release.

Each of these requirements is discussed in greater detail in the following sections.

3.3.1 Compliance With Applicable Regulations

The DOE Strategy states that DOE is committed to complying with the letter and spirit of applicable environmental protection requirements and that DOE should comply with all legally applicable waste management and groundwater protection requirements (DOE Notice 5400.AA).

3.3.2 Approval for Variances

A variance may be required by DOE if, after consideration of all circumstances, it is determined that the variance either provides equal or better protection or that there is no reasonable alternative. An example is the disposal of tritium-containing wastewater to seepage basins because no effective treatment method is available. This is an acceptable alternative because releases to groundwater are preferable to releases to air or surface water due to the relatively rapid degradation of tritium. To apply for variances from State, DOE or (non-DOE) Federal requirements, the applications must first be approved by EH-1. In both cases, EH-1 approval is based on assurances that the public health and the environment will be protected and that contaminant releases to the soil and groundwater will be "as low as reasonably achievable" (DOE Notice 5400.AA). Variances from requirements can be applied for only if there is a mechanism within the applicable law that allows for variance. Additionally, DOE (EH-1) may only grant variances for areas over which they have sole jurisdiction.

3.3.3 Site-Specific Groundwater Protection Plans

Under the Strategy, DOE is to develop and (periodically) revise groundwater protection programs and plans for DOE facilities that may affect groundwater quality. The Strategy requires that DOE develop groundwater protection practices on a site-specific basis. The need to conform to specific regulatory requirements may be a limiting factor in terms of alternatives.

Performance assessments are also required to be conducted under the Strategy. Comprehensive knowledge of the hydrogeologic environment that can be derived through extensive hydrogeological investigations, monitoring, and modeling is required to complete the performance assessments. The planning and implementation for these investigations is documented in the groundwater protection plans (DOE Notice 5400.AA).

3.3.4 Compliance Points Within 100 m of Contaminant Sources

Regulatory agencies have established different compliance point conventions in different rulemakings. Compliance points are the locations at which compliance with groundwater contamination limits is demonstrated. Monitoring is conducted at the compliance point to determine compliance and to help provide early warning of any groundwater contamination. The DOE Strategy requires DOE facilities to determine compliance points within 100 m of the contaminant source except where established conventions for similar situations or regulatory requirements differ. Compliance points are to be as close to the contaminant source as is possible. The variance provisions of Section 4.3 of the Strategy provide exceptions to this limitation. DOE will not establish compliance points outside of the specific area for which it controls access unless required by a remedial action.

3.3.5 Groundwater Cleanup Standards

The DOE Strategy requires DOE facilities to establish DOE groundwater protection standards for new facilities as well as standards for remedial measures in situations where there are no legally applicable standards. Cleanup standards will be either State or Federal drinking water standards, background levels of contaminants, or alternate concentration limits (ACLs), depending on the class of groundwater. Prior approval from EH-1 is required before the use of ACLs is allowed (DOE 1989). Additional details on the cleanup standards and how they apply to various classes of groundwater are found in Section 3.3.8.

3.3.6 Identification of Contaminant Sources and Affected Areas

The DOE Strategy requires that DOE facilities identify all existing sources of groundwater contamination for which DOE has responsibility. The facilities are to document past and present practices at DOE facilities where operations may affect groundwater quality, determine and document the effects of DOE operations on groundwater quality and quantity, and identify contaminant sources. Both detailed review of existing data and completion of new investigations may be necessary to fulfill this requirement (DOE Notice 5400.AA).

3.3.7 Classification of Site Groundwater

DOE facilities are to voluntarily conform to EPA's Groundwater Protection Strategy and implementation guidance and classify groundwater units whose quality may have been affected by DOE operations (see Section 2). This classification must be completed early in the planning stage of any new facility or operation that has the potential for affecting groundwater quality. While DOE performs groundwater classifications for its facilities, decisions used in a regulatory context are subject to review by the regulatory authority (DOE 1989).

Classification of site groundwater is to be based on EPA guidance on groundwater classification (limited definitions of classes are in Section 2). However, there is one key difference between EPA and DOE concerning the classification review area. The DOE Strategy defines "classification review areas" as the area within at least 2 mi of the boundary of each potential contaminant source. This includes the outer edge of a contaminant plume as a contaminant source. The use of the edge of a contaminant plume as the edge of a potential contaminant source is a departure from the EPA methodology, and this can have large implications for DOE's management of groundwater. For example, where a classification review area consists of a facility

and a 5-mi-long plume, the overall groundwater quality of that classification area may be degraded, which affects the classification of the groundwater and thus the required cleanup levels.

The identification of groundwater classification review areas is affected by additional factors. For example, unusually high groundwater flow velocity warrants expanding the classification review area. The entire site plus a 2-mi perimeter around it can also be used for sites with multiple contaminant sources (DOE Notice 5400.AA).

As discussed above, the DOE Strategy is under revision. The 1990s EPA Groundwater Protection Strategy, published after the DOE Strategy, has deleted the Groundwater Classification System. This development may affect the revision of the DOE Strategy. See Section 2 for more details.

3.3.8 Management of Required Groundwater Cleanups

Cleanup standards for groundwater under the DOE Strategy will depend on the class of groundwater affected. For example, standards for cleanup of Class I groundwaters will be either background contaminant levels or State or Federal drinking water standards, whichever is more stringent. For cleanup of Class II groundwater, the use of ACLs is permissible, with prior approval from EH-1 and the relevant State and/or Federal entities. Class III groundwater will be cleaned up only if it is necessary to protect human health or the environment, and the cleanup levels will be consistent with background levels (DOE Notice 5400.AA).

As stated in Section 2, the EPA has dropped its Class I, II, and III groundwater classification scheme. The DOE adopted the EPA classification system in its Draft Groundwater Quality Protection Strategy. It has not been determined whether the DOE will retain this classification system in the final version of its Strategy. Regardless of DOE's decision on this issue, there may be priorities dictated by an upcoming Federal Facility Agreement/Consent Order (FFA/CO) that override the above-mentioned cleanup standards.

In all cases, the practices that caused the contamination initially must be discontinued or modified. The types of changes depend again on the class of groundwater affected. For Class I groundwater, the discharges must be discontinued as soon as practicable. For Class II groundwater, modification or elimination of the discharges must occur as soon as reasonably achievable. For Class III groundwater, contaminant discharges will be as low as reasonably achievable (ALARA) (DOE Notice 5400.AA).

3.3.9 Ranking of Sites by Relative Risk

The DOE Strategy requires DOE facilities to use a risk-based hazard ranking system to determine the areas at highest risk of groundwater contamination and to allocate resources to the highest-priority sites. Other factors, such as protecting worker health and compliance with negotiated agreements, must also be considered when ranking and prioritizing the sites.

3.3.10 Limitation of Use of Institutional Controls

Under the DOE Strategy, institution controls can be relied upon only to limit public exposure to radionuclides and other contaminants for a period of 100 years, and only under certain conditions. Institutional methods for primary protection for up to 100 years may be employed by DOE, as long as these methods are likely to be successful for that time period. In some cases, the preferred method of protecting the public from

contamination at DOE sites is the use of such institutional controls as access restriction; in such situations, prior approval from EH-1 is required.

3.3.11 Use of Long-Term Physical Controls

According to the Strategy, DOE will rely primarily on physical rather than institutional control methods to provide adequate long-term groundwater protection. It may be necessary to supplement physical long-term control methods with both passive and active institutional controls for as long as they are useful in minimizing the chance that people will disrupt the control system, or in mitigating the effects of unintended control system failures. DOE will not rely on short-term containment methods for pollutants from current operations nor temporary remedies for existing contamination.

3.3.12 Long-Term Performance Assessments

To assess the adequacy of the control methods under consideration, the DOE Strategy requires facilities to conduct long-term performance assessments in terms of long-term health and environmental effects. The period of assessment is to be a minimum of 1,000 years, and the performance assessments will be based on current societal characteristics. When conducting performance assessments, DOE should not credit the effectiveness of institutional controls beyond 100 years (DOE Notice 5400.AA).

3.3.13 Performance of Prompt Remedial Actions

Once the required investigations and assessments have been completed, the DOE Strategy requires sites to implement the necessary remedial measures to clean up existing groundwater commensurate with appropriate standards. During this process, DOE is to cooperate with Federal and State authorities, through the use of interagency agreements and other appropriate means, to assist in the implementation of RCRA and CERCLA/Superfund Amendments and Reauthorization Act (SARA) requirements (DOE Notice 5400.AA).

The Strategy gives DOE a period of 25 years in which to complete the required remedial actions, necessary source controls, and cleanups. In extreme cases, groundwater cleanup within this period may not be feasible.

3.3.14 Siting of New Facilities to Avoid Future Groundwater Contamination

Siting restrictions related to groundwater are intended to prevent further degradation of aquifers, particularly those that are valuable or vulnerable. Where Class I groundwater exists within the groundwater classification review area, new disposal facilities for hazardous and/or radioactive wastes are not to be established. This applies even if the Class I groundwater is not directly beneath the proposed new facility. For protection of Class II and Class III groundwaters, DOE proposes to use combinations of siting and technology necessary to prevent deterioration of groundwater quality.

3.3.15 Management of Wastes to Prevent Soil Contamination

To prevent soil contamination by liquid hazardous and untreated radioactive wastes, the DOE Strategy prohibits further discharges of untreated liquid effluents to unlined impoundments and similar disposal facilities. This practice is prohibited from new areas and is to be discontinued at established locations at the earliest practicable time. Consistent with the recommendations in GAO (1986), DOE's Strategy includes consideration of soil protection. Use of the Strategy is intended largely to replace waste releases to soil with waste reduction, treatment, and containment methods.

The level of soil protection is also tied to the groundwater class in the area. In Class I groundwater areas, no new hazardous or radioactive waste disposal facilities will be sited. For Class II groundwater areas, technologies for preventing soil contamination will be considered and implemented to the extent practicable. No such provisions are listed for Class III groundwaters.

3.3.16 Management of Wastes to Minimize Waste Generation and Release

The Strategy requires DOE facilities to implement source control and waste reduction programs on a systematic basis to minimize contaminant releases impacting groundwater quality. As part of groundwater protection plans, the facilities must also conduct auditable programs to prevent or reduce the discharge of hazardous and radioactive waste or reduce the degree of hazard of the waste through treatment (DOE Notice 5400.AA).

4. OVERVIEW OF STANDARDS

This section presents a brief overview of the Standards that have shaped and driven groundwater and surface water compliance issues affecting the U.S. Department of Energy (DOE). The Standards are explained in detail in subsequent sections.

4.1 Historical Perspective

Many of the facilities for which DOE is responsible started operations years before environmental regulations became commonplace. Between 1954 and 1984, the wastes generated at these facilities were considered to be under the authority of the Atomic Energy Act (AEA) only. However, a series of legal actions, including the *LEAF vs. Hodel* decision in 1984, led to changes in the DOE position concerning its wastes. The DOE revised position was published in a May 1987 *Federal Register (FR)* notice that stated that "all DOE radioactive waste which is also hazardous under Resource Conservation and Recovery Act (RCRA) will be subject to regulation under both RCRA and the AEA." The radionuclides or "byproducts" in the waste remain subject to DOE oversight under Section 11(e)(2) of the AEA. This new position became effective on June 1, 1987 (52 FR 84, pp. 16022-16029).

Since 1987, DOE has produced its Draft Groundwater Quality Protection Strategy (described in Section 3) and a number of new and revised orders (addressed in Section 14) that clarify DOE waste handling policies and groundwater and surface water protection and remediation responsibilities under various regulations. While DOE was modifying its stance toward groundwater and surface water regulation, the U.S. Environmental Protection Agency (EPA) and the U.S. Nuclear Regulatory Commission (NRC) were producing new regulations to govern management and disposal of radioactive wastes. Table 4-1 summarizes the history from 1954 to 1991 of laws, Federal regulations, orders, court decisions, agreements, and reports pertaining to groundwater and/or surface water protection.

Table 4-1 indicates two major trends in environmental compliance. First, waste generators have become subject to an ever-increasing list of Standards. Second, regulations governing the disposal of specific types of radioactive wastes have either been promulgated or proposed. These two trends have closed many loopholes in the earliest regulations for disposal of hazardous and radioactive wastes. In addition, the DOE system of orders is changing in response to these legislative and regulatory trends. Many requirements and guidance contained in DOE orders are being promulgated. In the current regulatory climate, it is expected that Standards for groundwater and surface water protection, waste management, and site remediation will become more stringent and that the system of DOE orders will continue to evolve correspondingly.

4.2 Hazardous Waste/Substance Standards

Hazardous waste/substance Standards pertaining to groundwater and surface water, and to selection and/or implementation of remediation efforts for such wastes/substances are briefly explained in the following sections.

Table 4-1. History of Groundwater-related federal laws, regulations, orders, court decisions, agreements, and reports.

Year	Law, regulation, order, court decision, agreement, or report
1954	Atomic Energy Act
1960	"Standards for Protection Against Radiation" (10 CFR 20)
1969	National Environmental Policy Act
1972	Federal Insecticide, Fungicide, and Rodenticide Act
1972	Federal Water Pollution Control Act
1974	Energy Reorganization Act
1974	Safe Drinking Water Act
1976	Resource Conservation and Recovery Act
1976	Solid Waste Disposal Act
1976	Toxic Substances Control Act
1977	Clean Water Act
1977	Executive Order 11888, "Floodplain Management"
1977	Executive Order 11890, "Protection of Wetlands"
1978	Executive Order 12088, "Federal Compliance with Pollution Control Standards"
1978	Uranium Mill Tailing Radiation Control Act
1980	Comprehensive Environmental Response, Compensation, and Liability Act
1980	Resource Conservation and Recovery Act
1981	DOE Order 5484.1, "Environmental Protection, Safety, and Health Information Reporting Requirements"
1981	"Disposal of High-Level Wastes in Geologic Repositories" (10 CFR 60)
1982	Nuclear Waste Policy Act
1983	"Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings" (40 CFR 192)
1983	"Environmental Radiation Protection Standards for Low-Level Radioactive Waste Disposal" (48 FR 170, ANPRM 40 CFR 193)
1984	<i>LEAF vs. Hodel</i> ruling
1984	Hazardous and Solid Waste Amendments to RCRA
1985	"Environmental Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Wastes" (40 CFR 191)

Table 4-1. (continued).

Year	Law, regulation, order, court decision, agreement, or report
1985	Low-Level Radioactive Waste Policy Amendments Act
1985	DOE Order 5440.1E, "National Environmental Policy Act"
1986	Superfund Amendments and Reauthorization Act (SARA)
1986	EPA Ground-Water Protection Strategy, First Draft (see 1991 below)
1987	Executive Order 12088, "Federal Compliance with Pollution Control Standards"
1987	Executive Order 12570, "Superfund Implementation"
1987	"Radioactive Wastes: Byproduct Material" (10 CFR 962)
1987	Hazardous portion of mixed wastes becomes subject to RCRA (52 FR 84)
1987	INEL/EPA Consent Order and Compliance Agreement (COCA) (Replaced by the FFA/CO)
1988	DOE Order 5820.2A, "Radioactive Waste Management"
1988	"Environmental Standards for the Management, Storage, and Land Disposal of Low-Level Radioactive Wastes and Naturally Occurring and Accelerator-Produced Radioactive Waste" (Draft Proposed Rule 40 CFR 193, 40 CFR 764)
1989	"DOE Draft Groundwater Protection Strategy" (DOE Notice 5400.AA)
1989	DOE Order 5400.2A, "Environmental Compliance Issue Coordination"
1989	DOE Order 5400.1, "General Environmental Protection Program"
1989	"Radiation Protection Criteria for Cleanup of Land and Facilities Contaminated with Residual Radioactive Materials" (40 CFR 194)
1989	DOE Order 5400.4, "Comprehensive Environmental Response, Compensation, and Liability Act Requirements"
1990	Oil Pollutant Act
1990	DOE Order 5400.5, "Radiation Protection of the Public and the Environment"
1991	DOE Guidance Document EH/0173T, <i>Environmental Regulatory Guidance for Radiological Effluent Monitoring and Environmental Surveillance</i>
1991	INEL/EPA/Idaho Federal Facility Agreement and Consent Order (FFA/CO) (Replaced the COCA)
1991	<i>Protecting the Nation's Ground Water; EPA's Strategy for the 1990s, The Final Report of the EPA Ground-Water Task Force</i>

4.2.1 Resource Conservation and Recovery Act

Although many of the Standards listed in Table 4-1 address hazardous wastes and substances, RCRA has the most significant and comprehensive impact on groundwater and surface water protection. This legislation created the framework for the regulation of hazardous wastes "from cradle to grave," including the generation, storage, transport, treatment, and disposal of wastes. RCRA describes the characteristics of hazardous wastes and lists substances considered hazardous. RCRA requires permits for waste management facilities and corrective actions at sites that are found to be causing contamination. It also contains penalties for noncompliance. Groundwater monitoring programs are specifically required for certain types of RCRA-regulated waste management units. The requirements for surface water monitoring are not as specific, except where corrective action is necessary. RCRA affects groundwater and surface water monitoring and compliance on many fronts, as detailed in Section 5 of this report.

4.2.2 Comprehensive Environmental Response, Compensation, and Liability Act

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) facilitates response to dangerous environmental conditions and provides funding for environmental cleanup. Many of the cleanup requirements in CERCLA are analogous to the corrective action requirements of RCRA. A site becomes a candidate for remediation under CERCLA if an assessment of its potential health and environmental hazards exceeds a designated score on the EPA Hazard Ranking System. On November 21, 1989, the Idaho National Engineering Laboratory (INEL) site was proposed for inclusion on the CERCLA National Priorities List (NPL) for Federal facilities. The inclusion of INEL on the Federal facilities NPL became effective on December 21, 1989. Therefore, CERCLA cleanup requirements will apply to certain waste management units at the INEL. CERCLA is explained in more detail in Section 6 of this report. The INEL Federal Facility Agreement and Consent Order (FFA/CO), involving the EPA Region X, the Idaho Department of Health and Welfare (IDHW) and the DOE Idaho Operations Office (DOE-ID), contains requirements for CERCLA compliance. The FFA/CO is discussed in Section 15.

4.2.3 Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) prompted the promulgation of regulations to protect human health from contaminants in drinking water. The regulations established acceptable levels of contaminants, including certain radionuclides, in drinking water. These levels are often used as the measure of cleanup required in groundwater remediation efforts. The SDWA also controls the use of underground injection wells for the disposal of hazardous wastes and delineates a well head protection program. Section 8 provides more detail on the SDWA. The Underground Injection Control (UIC) program is explained in Section 8.1.2, and the issues of sole-source aquifer designation and wellhead protection programs are addressed in Sections 8.1.3 and 8.1.4, respectively.

4.2.4 Clean Water Act

The Federal Water Pollution Control Act (FWPCA) of 1972, as amended, established a framework to control water pollution. The FWPCA was amended by the Clean Water Act (CWA) in 1977. The CWA directed the EPA to establish comprehensive programs for preventing, reducing, or eliminating the pollution of navigable waters and groundwater. Although the intent of the CWA is to restore and maintain both surface water and groundwater, the regulations enacted under the CWA deal specifically with surface water. Four major programs have been developed to implement cleanup and control of pollutant discharges to surface water: (1) the National

Pollutant Discharge Elimination System (NPDES), (2) the National Pretreatment Program, (3) the Sludge Management Program, and (4) the Spill Prevention Program. The CWA is explained in more detail in Section 9 of this report.

4.2.5 National Environmental Policy Act

Another environmental law with potentially far-reaching effects is National Environmental Policy Act (NEPA). The regulations promulgated by the President's Council on Environmental Quality (40 CFR 1500-1508) provide the framework within which each Federal Agency must comply with NEPA. These regulations require the preparation of an environmental assessment (EA) or an environmental impact statement (EIS) if a proposed major Federal action or an action funded by the Federal government is expected to have the potential for adverse environmental impacts on the quality of the human environment. Because groundwater and surface water are integral elements of the human environment, major Federal actions and projects that can affect the groundwater and surface water, including wetlands (as well as other aspects of the human environment), can trigger NEPA and the subsequent preparation of an EA or EIS (or other DOE-specific forms of NEPA documentation, such as a categorical exclusion or a memorandum-to-file). Sole-source aquifer designation must be addressed in NEPA documentation.

DOE guidelines for implementation of NEPA were amended in 1987 (52 FR 240, pp. 47662-47670). The procedures for implementation are outlined in DOE Order 5440.1E. For example, NEPA compliance may become applicable when RCRA corrective actions or CERCLA remedial investigation/feasibility study (RI/FSs) are conducted leading to the selection of a remedial action. DOE Order 5400.4 states that the preparation of RI/FS EAs or RI/FS EISs is recommended in such situations. This report does not contain a detailed assessment of NEPA due to its limited relation to groundwater and surface water management; however, DOE Order 5440.1E (NEPA) is discussed in Section 14.

4.2.6 Federal Insecticide, Fungicide, and Rodenticide Act

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), implemented by 40 CFR 162-171, comes into effect when pesticides are produced, stored, transported, used, or disposed of. FIFRA and its amendments are designed to provide premarket clearance of pesticides and post-market surveillance of pesticides and pesticidal devices to ensure prevention of unreasonable adverse effects upon human health and the environment. The Act prohibits any individual from producing, storing, transporting, delivering, receiving, selling, or offering for sale any pesticide product that has not been registered with the Administrator of EPA. Implementation of the requirements of FIFRA can reduce the quantity of pesticides that reach groundwater under sites where they are used or stored. In a proposed rule published in the *Federal Register* (56 FR 92), EPA has established criteria for classifying pesticides for restricted use due to groundwater concerns. These proposed criteria would require that a pesticide be considered for restricted use if ingredients of the pesticide product are detected in the groundwater of at least three different counties or in 25 or more wells in four or more States. In this proposed rule, EPA takes measures to reduce the risks involved with the restricted use classification by proposing "a recertification requirement for certified applicators, and a requirement that some or all candidates for certification or recertification be trained in, or demonstrate competence in, techniques used to minimize the potential for ground water contamination." This report does not contain a detailed assessment of FIFRA due to its limited relation to groundwater or surface water management.

4.2.7 Toxic Substances Control Act

The Toxic Substances Control Act (TSCA) regulates toxic substances including polychlorinated biphenyls (PCBs). TSCA requires the reporting of spills and groundwater monitoring when PCBs or PCB-containing items are intended for disposal or are disposed of in a designated hazardous waste landfill. In addition to the PCB regulations under TSCA, EPA may use the authority under TSCA to propose regulations aimed at controlling disposal of certain low-level radioactive wastes (LLWs). Section 7 of this report provides more detail on TSCA.

4.2.8 Protection of Floodplains and Wetlands

Executive Orders 11988, "Floodplain Management," and 11990, "Protection of Wetlands," establish a national criterion for Federal agencies for the management and protection of floodplains and wetlands in the United States. DOE has established regulatory and compliance requirements for these two executive orders in 10 CFR 1022. These requirements are fulfilled through existing procedures such as those established for implementing NEPA [10 CFR 1021], which provides a method of environmental review for evaluating the potential effects of any action that may take place in a floodplain or wetland. Executive Order 11988 directs Federal agencies to consider floodplain management when formulating and evaluating water or land use plans and to avoid adverse impacts associated with the occupancy and modification of floodplains. Executive Order 11990 directs Federal agencies to take action to minimize the destruction, loss, or degradation of wetlands. Additional regulations and laws that address requirements for wetland and floodplain management include 40 CFR 264, 40 CFR 270, and the CWA.

4.3 Radioactive Waste Regulations

Numerous regulations have been developed to govern the disposal of radioactive wastes. Some of these, particularly the licensing requirements that are administered by the NRC, are under the authority of the AEA, as amended. In recent years, EPA has also begun regulating the management and disposal of certain radioactive wastes.

Currently, three main agencies have jurisdiction over radioactive wastes: the EPA, NRC, and DOE. EPA sets environmental radiation protection standards for the management, storage, and disposal of spent nuclear fuel, high-level waste (HLW) and transuranic (TRU) waste (40 CFR 191). NRC licenses commercial nuclear facilities and regulates commercial radioactive waste management and disposal, in cooperation with EPA limits. DOE is responsible for defense nuclear waste except under certain circumstances. DOE and EPA are responsible for HLW (including mixed HLW) and mixed TRU waste managed at sites. DOE, EPA, and NRC would regulate HLW (including mixed HLW) and TRU waste if disposed of in geologic waste repositories. DOE has been charged with the development of geologic repository(s) for permanent disposal of radioactive waste. Development of the first repository is being regulated by both EPA and NRC through two sets of regulations: (a) the NRC's "Disposal of High-Level Radioactive Wastes in Geologic Repositories" (10 CFR 60) and (b) EPA's "Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level, and Transuranic Radioactive Wastes" (40 CFR 191). Both sets of regulations contain provisions for groundwater monitoring. NRC's regulation requires groundwater monitoring as part of its siting criteria in 10 CFR 60.122 and as part of its confirmation of geotechnical and design parameters in 10 CFR 60.141.67. The EPA regulation requires groundwater monitoring under 40 CFR 191.16.

The role of DOE regarding commercial radioactive waste is to conduct research and develop methodologies to treat and dispose of these wastes, and to operate any geologic repository(s) licensed by NRC. DOE is also responsible for complying with EPA environmental protection requirements in management of DOE-generated wastes. The only DOE facilities that must be licensed by the NRC are the geologic repository(s). Although NRC licensing requirements are not binding on DOE's defense nuclear wastes, these requirements provide workable guidelines for design and operation of DOE radioactive waste disposal sites.

Two other agencies, the Federal Emergency Management Agency (FEMA) and the U.S. Department of Transportation (DOT), also have responsibilities relative to radioactive waste disposal issues. FEMA is responsible for nuclear emergency planning and implementation. DOT regulates shipment of radioactive wastes and materials.

4.3.1 High-Level Radioactive Wastes

According to the Nuclear Waste Policy Act, as amended, high-level radioactive waste, transuranics, and spent nuclear fuel must be disposed of in a solid rock vault deep underground, called a geologic repository. The regulations that specify the design, performance, and operating requirements for geologic repositories are found in the "Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-level and Transuranic Radioactive Wastes" (40 CFR 191), and in the "Disposal of High-level Radioactive Wastes in Geologic Repositories" (10 CFR 60), which incorporates 40 CFR 191. Dose limits for exposure of the public to radiation are set in 10 CFR 834. This regulation is applicable to all DOE elements that treat, store, transport, package, or dispose of HLW, LLW, TRU waste, spent nuclear fuel as well as residual radioactive materials, and naturally occurring or accelerator-produced radioactive materials (NARMs). Because the INEL is not a geologic repository, 10 CFR 60 is not discussed further in Section 13. Standards pertaining to the management of HLW that may be applicable to the INEL are discussed in the Section 13 subsection concerning 40 CFR 191 and 10 CFR 834.

4.3.2 Low-Level Radioactive Wastes

Disposal of LLW is governed by the Low-level Radioactive Waste Policy Act and its amendments. Disposal sites for LLW and NARMs will also have to comply with the proposed "Environmental Standards for the Management, Storage, and Land Disposal of Low-Level Radioactive Waste and Naturally-Occurring and Accelerator-Produced Radioactive Waste" (40 CFR 193 and 40 CFR 764) once the rules are promulgated. These two proposed rules are currently the topic of interagency discussion and their final form and scope have yet to be determined. Once the rules are adopted, however, disposal sites for LLW and NARMs will have to comply with their requirements.

4.3.3 Uranium Mill Tailings

Tailings from uranium and thorium mines and mills must be disposed of according to the requirements of "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings" (40 CFR 192), as authorized by the Uranium Mill Tailings Radiation Control Act, and the proposed 40 CFR 193.

4.3.4 Byproduct Materials

The definition of "byproduct material" varies among the regulations. For example, in 10 CFR 20 ("Standards for Protection Against Radiation") and 10 CFR 30 ("Rules of General Applicability to Domestic

Licensing of Byproduct Material"), it is defined by the NRC as "any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material." This is also the definition provided in the AEA.

However, in 10 CFR 40 ("Domestic Licensing of Source Material"), byproduct material is defined by the NRC as "the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes. Underground ore bodies depleted by such solution extraction operations do not constitute 'byproduct material' within this definition."

In the "Radioactive Waste: Byproduct Material" rule (10 CFR 962), the definition is the same as the AEA definition, with the following clarification: the term "any radioactive material" refers only to the radionuclides in a mixed (radioactive and hazardous) waste. In mixed wastes, the hazardous portion is regulated under RCRA, and the radionuclides in the waste are regulated under AEA authority. These distinctions are presented in the "Radioactive Waste: Byproduct Material" rule (10 CFR 962). DOE abides by this definition.

4.3.5 Naturally Occurring and Accelerator-Produced Radioactive Materials

The regulations proposed in 40 CFR 764 define NARMs and establish uniform standards for disposal of high-concentration NARMs. If this proposed rule is promulgated, NARMs must be disposed of in regulated low-level radioactive waste disposal facilities that comply with 40 CFR 193.

4.3.6 Residual Radioactivity

Residual radioactivity from decommissioning and remedial activities is regulated under the proposed EPA rule, "Radiation Protection Criteria for Cleanup of Land and Facilities Contaminated With Residual Radioactive Materials" (40 CFR 194). DOE Order 5820.2A, Chapter 4, requires that byproduct materials, NARMs, "and similar contaminated residues derived from DOE remedial actions" be managed, stored, or disposed of in accordance with 40 CFR 192, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings." These wastes must be disposed of in "specially-designed DOE sites" or tailings disposal sites established under 40 CFR 192. Small volumes of these wastes can be disposed of as LLW.

4.4 Federal Facility Agreement and Consent Order

An FFA/CO was negotiated at the INEL by DOE-ID, IDHW, and EPA Region X for the purpose of achieving and maintaining compliance with CERCLA corrective action requirements. The FFA/CO includes an Action Plan that specifies a number of groundwater compliance and monitoring requirements. Section 15 discusses the FFA/CO in more detail.

5. RESOURCE CONSERVATION AND RECOVERY ACT

The Resource Conservation and Recovery Act (RCRA) is the principal statute governing the management, recycling, recovery, transport, treatment, storage, and disposal of solid wastes, both nonhazardous and hazardous. RCRA (Public Law 94-580) was passed through Congress in October 1976 as an amendment to the 1965 Solid Waste Disposal Act because of the need to address the problem of how to safely dispose of the huge volumes of solid and hazardous waste generated nationwide each year. On November 8, 1984, Congress passed the Hazardous and Solid Waste Amendments (HSWA) to RCRA, which included more stringent design standards for RCRA-regulated waste management units and expanded the activities subject to RCRA to include investigation/cleanup requirements for hazardous constituents released from solid waste management units (SWMUs).

The goals of RCRA, as set forth by Congress, are as follows:

- To protect human health, welfare, and the environment
- To reduce waste and conserve energy and natural resources
- To reduce or eliminate the generation of hazardous waste as expeditiously as possible.

To achieve these goals, three programs were established. The first program, termed Subtitle C, establishes a program to control hazardous waste from the time it is generated until its ultimate disposal, the so-called "cradle-to-grave" concept. The second program, Subtitle D, encourages states to formulate comprehensive solid waste management plans, primarily for nonhazardous waste. The third program, Subtitle I, regulates certain underground storage systems. This section discusses the regulations applicable to groundwater and surface water, and associated monitoring requirements found in Subtitles C and D, the *RCRA Ground-Water Technical Enforcement Guidance Document (TEGD)* (EPA 1986), and the *RCRA Facility Investigation Guidance Manual* (EPA 1989a). Information regarding Subtitle I is in Section 10 of this report.

RCRA includes provisions to delegate program, permitting, and enforcement authority to the states. On February 4, 1991, the State of Idaho received final authorization from the U.S. Environmental Protection Agency (EPA) to administer many portions of the hazardous waste management program (55 FR 235, pp. 50327-50329) through the State of Idaho Hazardous Waste Management Act (Title 1, Chapter 5). The Idaho program is codified under the Idaho Administrative Procedures Act (IDAPA). Idaho has essentially adopted the EPA regulations. Therefore, discussions of the RCRA requirements in this Section also represent Idaho requirements, and references to both EPA and State authorities are included.

RCRA regulations and guidance materials often use the term "waste management unit" when discussing monitoring requirements for RCRA-regulated treatment, storage, and disposal (TSD) units at a facility. Compliance point monitoring is based on the waste management unit boundary. The entire Idaho National Engineering Laboratory (INEL) is the RCRA-regulated TSD facility. The INEL refers to its RCRA-regulated units as TSD units, which for purposes of determining regulatory requirements corresponds to RCRA waste management units. This report uses the term "RCRA-regulated waste management unit" throughout for consistency with available regulatory agency guidance.

5.1 Major Aspects of RCRA

Subtitles C and D of RCRA regulate the management of hazardous and solid wastes, respectively, and apply to groundwater and surface water issues. Subtitle C, the backbone of RCRA, defines the types of facilities that fall under these regulations and regulates hazardous waste management from the time it is generated until its ultimate disposal.

The majority of the regulations governing the handling of hazardous wastes under RCRA, Subtitle C, are codified in 40 CFR 260 through 268, and 270 through 272. These regulations address the generation, transportation, treatment, storage, and disposal of hazardous wastes and require environmental monitoring to detect releases of hazardous constituents that may injure human health/welfare or the environment. Groundwater monitoring programs are specifically required for certain types of RCRA-regulated facilities, and Subtitle C states how compliance with these requirements must be demonstrated. The general requirements relating to surface water are discussed in the regulations as part of the design and operation standards for RCRA-regulated waste management units (see Section 5.7). The design and operation standards must be sufficient to protect groundwater and surface water. Owners/operators of these units must ensure that hazardous constituents are not migrating from the unit to adjacent surface water and groundwater. Though the regulations do not specifically state how compliance will be demonstrated, monitoring and inspection is necessary to demonstrate compliance. The requirements for surface water monitoring are not as specific. Therefore, the discussions of groundwater monitoring requirements are in greater detail than surface water monitoring requirements. However, groundwater and surface water monitoring is specifically required during corrective action where applicable, since such activities are multi-media environmental investigations (see Section 5.9).

Regulations found in Subtitle C containing requirements for environmental monitoring include the following:

- 40 CFR 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities"
- 40 CFR 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities"
- 40 CFR 267, "Interim Standards for Owners and Operators of New Hazardous Waste Land Disposal Facilities"
- 40 CFR 270, "EPA Administered Permit Programs: The Hazardous Waste Permit Program."

Underground injection of hazardous wastes is regulated under the Safe Drinking Water Act (SDWA) (40 CFR 149.8). The SDWA and its underground injection control program are discussed in Section 8 of this report. Underground injection of hazardous waste is also regulated under 40 CFR 265, Subpart R. Under those regulations, disposal of hazardous waste by underground injection is excluded from closure and post-closure requirements under 40 CFR 265, Subparts G and H. The Idaho hazardous waste management program is authorized to address disposal of hazardous waste by underground injection.

Subtitle D establishes a program that addresses the control and management of nonhazardous solid waste. Minimum Federal standards for State and local (usually municipal) landfills are mandated in Subtitle D. Subtitle D also establishes an overall regulatory framework for nonhazardous solid waste management, and authorizes EPA to provide technical assistance to states. Planning and implementation of Subtitle D solid waste programs are the responsibility of the State and local governments. Solid wastes generated at the INEL are subject to the State of Idaho regulations found in Title 1, Chapter 6, of the Solid Waste Management Regulations. Groundwater and surface water programs administered by the State of Idaho regarding the handling and disposal of nonhazardous solid wastes are briefly discussed in Section 12 of this report.

Sections 3004(u) and 3004(v) of RCRA establish a corrective action program for the investigation and cleanup of SWMUs located at facilities seeking a RCRA operating permit. These activities will be regulated under 40 CFR 264, Subpart S. The corrective action program addresses SWMUs suspected of receiving solid waste contaminated with RCRA hazardous constituents. SWMUs are evaluated as part of the RCRA permitting process to determine the presence of hazardous constituents and the potential for any releases into the environment (past, present, future). Special permit conditions are then established for investigation and cleanup of those SWMUs that have released, are releasing, or will potentially release, hazardous constituents into the environment. Regulations have been promulgated in draft form as 40 CFR 264, Subpart S, but are not yet final (see Section 5.10).

5.2 Facility Operating Status Under RCRA

RCRA Subtitle C establishes a program where all TSD units operate under either interim status (40 CFR 265) or permitted status (40 CFR 264). Individual RCRA-regulated waste management units can close under interim status or under permitted status. Once a RCRA-regulated waste management unit ceases operation, it undergoes closure, during which groundwater and surface water monitoring may or may not be required. Monitoring requirements at a facility are determined by the operating status, closure requirements, and nature of each RCRA-regulated waste management unit.

Interim status is available for certain facilities that meet specific requirements at the time the regulations become effective. Interim status RCRA-regulated waste management units must either close under interim status or seek an operating permit under RCRA. If the RCRA-regulated waste management units continue operating, a permit must be obtained by submitting an acceptable permit application to the regional EPA office or authorized State Agency.

As of 1993, the RCRA-regulated waste management units at the INEL with interim status are container storage units, tank storage units, tank treatment systems, incinerators, surface impoundments, a containment building, and miscellaneous treatment units. None of these units are anticipated at this time to require groundwater monitoring. However, the information provided throughout Section 5.3 summarizes the pertinent requirements of RCRA groundwater monitoring systems (GWMSs).

For the purposes of this section, the term "hazardous waste" also refers to mixed waste.

5.2.1 Operating Under Interim Status

RCRA requires that owner/operators of facilities that have interim status comply with requirements for interim status operations as set forth in 40 CFR 265. Interim status TSD units may continue to operate

until final administrative disposition of the Part B permit application required under 40 CFR 264 and 270 is made (i.e., the permit application is denied, or it is approved and the permit is issued). Interim status is terminated at that time. Interim status can also be terminated if the owner/operator of the TSD unit fails to submit the permit application on time, if the information required in the permit application is incomplete, or if operational deficiencies are found. Interim status TSD units that do not seek an operating permit must close under interim status.

Operation under interim status requires groundwater monitoring for "land-based" RCRA-regulated waste management units (surface impoundments, landfills, waste piles, land treatment, and certain miscellaneous units). Tank systems whose secondary containment systems do not comply with the applicable design and operation requirements may also be required to have groundwater monitoring programs. The results of this monitoring are used in the preparation of the Part B permit application, which is required before the facility can receive an operating permit.

The interim status groundwater monitoring program is required to detect, characterize, and respond to releases of hazardous constituents to the uppermost aquifer. Detection of statistically significant increases in hazardous constituent concentrations above background values will trigger more comprehensive monitoring or a corrective action program to clean up the contamination.

Consistent with EPA's implementation of the loss of interim status requirement for land disposal facilities in 1985 (50 FR 186, pp. 38946-38949), land disposal facilities newly subject to groundwater monitoring requirements had until September 25, 1991, to complete a site characterization, and design and install groundwater monitoring systems capable of determining the facility's impact on groundwater quality. To certify compliance with these requirements, facilities had to submit a groundwater monitoring system certification, certifications of financial responsibility, and Part B permit applications by September 25, 1991. Newly regulated units or facilities had a one-year timeframe from the effective date of new listings or characteristics rules for the implementation of a complete groundwater monitoring program. Facilities operated by the United States Government were not required to submit the certifications of financial responsibility since they are exempt from those requirements.

5.2.2 Operating Under Permitted Status

Operating standards for permitted status facilities are codified in 40 CFR 264. The types of RCRA-regulated waste management units that require groundwater monitoring are identified in Section 5.2.1. Certain types of "miscellaneous" units (e.g., units that do not fit any of the RCRA definitions of specific types of RCRA-regulated waste management units) may also be required, if categorized as "land-based" by EPA or the State, to have a groundwater monitoring program. As of 1993, none of the INEL RCRA-regulated waste management units to be permitted are considered land-based. The "land-based" units at the INEL are planned for closure under interim status. Upon obtaining a permit to operate the TSD unit, the owner/operator must comply with the standards and specific conditions set forth in the permit. The permit will specify the constituents in groundwater samples to be analyzed and the maximum allowable levels of the constituents in groundwater samples collected at the point of compliance.

When a RCRA-regulated waste management unit operates under permitted status, the owner/operator is required to monitor groundwater to detect, characterize, and respond to releases of hazardous constituents into the uppermost aquifer. Response to releases of hazardous constituents includes instituting a corrective action program when the concentrations of hazardous constituents in the groundwater exceed an established

groundwater protection standard at a specified point of compliance. The corrective action program may extend to cleanup of groundwater outside the facility boundary in order to protect human health or the environment.

5.2.3 Closure and Post-Closure Under Interim Status

Subpart G of 40 CFR 265 applies to the closure and post-closure of a RCRA-regulated waste management unit under interim status. This subpart requires owners and operators of hazardous waste management units to close units in a manner that is protective of human health and the environment and that minimizes post-closure release of hazardous constituents to the environment. The owner/operator must submit a closure plan detailing (a) a closure strategy that minimizes the need for further maintenance; and (b) provisions for controlling post-closure escape of hazardous constituents at concentrations harmful to human health or the environment. Closure can follow either of the following options: (a) "clean closure" where wastes and waste residuals are removed and contaminated structures, soils, and groundwater are decontaminated or removed, or (b) "landfill closure" where wastes and other contaminated materials are left in place. If the latter option is followed, the closure plan must include a cap to cover the wastes and the cap must meet RCRA design requirements. The "landfill closure" option must also address post-closure care in a written post-closure plan that provides for maintenance, inspection, and groundwater monitoring throughout a 30-year post-closure period.

5.2.4 Closure and Post-Closure Under Permitted Status

Subpart G of 40 CFR 264 applies to the closure of a RCRA-regulated waste management unit under permitted status. Closure under permitted status requires a written closure plan and, in certain instances, a post-closure plan as described in Section 5.2.3.

5.3 RCRA Groundwater Monitoring Programs

Owners/operators of facilities with land-based RCRA-regulated waste management units are required under RCRA to have a RCRA-compliant monitoring program for the area beneath the units to assess their impact on the groundwater. Land-based RCRA-regulated waste management units include surface impoundments, landfills, land treatment units, waste piles, some miscellaneous units (40 CFR 264, Subpart X), open burn/open detonation units, and some tank systems. The INEL has surface impoundments, tank systems, open burn/open detonation, and miscellaneous treatment units that may require RCRA groundwater monitoring. Groundwater monitoring requirements are found in Subpart F of 40 CFR 264 and Subpart F of 40 CFR 265. Requirements for interim status and permitted RCRA facilities are very similar. Table 5-1 compares the groundwater monitoring requirements of 40 CFR 264 and 265. Descriptions of the requirements are provided in the following sections.

According to 40 CFR 265, Subpart F, a GWMS for an interim status RCRA-regulated waste management unit must consist of at least one background or hydraulically upgradient well and at least three hydraulically downgradient wells. The downgradient wells are to be located at the limit of the waste management area. The number, locations, and depths of the wells must be designed to ensure the earliest possible detection of a release of hazardous waste or hazardous waste constituents that may migrate from the waste management area to the uppermost aquifer. However, recently 40 CFR 265.91(a)(3) was amended to allow alternate hydraulically downgradient monitoring well locations at interim status facilities where existing physical obstacles prevent installations at the limit of the waste management area (56 FR 246, pp. 66365-66369).

Table 5-1. Comparison of Part 264 and Part 265 groundwater monitoring requirements.

Program element	Program							
	Part 265				Part 264			
	Background monitoring	Detection monitoring	Assessment monitoring	Corrective action	Background monitoring	Detection monitoring	Compliance monitoring	Corrective action
Parameter/constituent	a, b, c	a, b	f		a, d	a, d	g,h	Constituents found to exceed protection standard
Frequency of sampling and analysis	Quarterly	Semiannually ^a Annually ^b	According to approved plan		Based on statistical method chosen	Semiannually	Annual ^a Determined by EPA ^b	Frequency necessary to demonstrate success of remediation
Duration of program	One year	Until contamination detected	Until permit issued, until closure, or until facility proves to regulatory agency that no hazardous waste or hazardous waste constituents have entered the groundwater	Corrective action may be required under §3004(u), 3004(v), 3006, or 7003 of RCRA or §106 of CERCLA or under the permitting authority	Ongoing	Until footnote d or g exceed predetermined standards, then other monitoring methods must be used	Active life of facility and post-closure period	As long as necessary; may be established in special conditions in the permit

Table 5-1. (continued).

Program element	Program							
	Part 265				Part 264			
	Background monitoring	Detection monitoring	Assessment monitoring	Corrective action	Background monitoring	Detection monitoring	Compliance monitoring	Corrective action
Number of wells required	Minimum of one upgradient and three downgradient	Minimum of one upgradient and three downgradient	Number needed to characterize extent of contamination		Number needed to establish background levels	Number needed to determine water quality at compliance point	Number needed to determine if contamination exceeds standard	Number needed to demonstrate success of remediation
Statistical analysis required	mean and* variance from upgradient wells	a, c	According to approved plan		Choice of four methods or Owner's proposal	Same as background	Same as detection	Same as compliance
Sampling and analysis plan	Required	Required	Required		Required	Required	Required	Required
a. Indicator parameters								
b. Water quality parameters								
c. Drinking water standards								
d. Waste constituents and reaction byproducts								
e. CABF = Cochran's Approximation to Behren's - Fisher Student's t-test								
f. Hazardous constituents detected in groundwater and managed at facility								
g. Constituents in Appendix IX to 40 CFR 264								
h. Constituents identified under detection monitoring								
Note: Part 265 assessment monitoring is analogous to Part 264 compliance monitoring.								

In order to site monitoring wells at alternate locations, several criteria must be met by the existing facility. A demonstration must be made by the facility to establish the following: (1) an existing physical obstacle prevents monitoring well installation at the hydraulically downgradient limit of the waste management area, (2) the selected alternate downgradient location is as close to the waste management area as possible, and (3) the alternate location must ensure the detection of any statistically significant amounts of hazardous waste or hazardous constituents from the waste management area as early as possible, given the alternate location. Buildings, highways, railroads, and geologic features may all qualify as "physical obstacles." In addition, factors affecting the safety of personnel may qualify (e.g., overhead or underground electrical cables). This demonstration must be prepared in writing, maintained at the facility, and certified by a "qualified groundwater scientist." The regulations specifically define what constitutes a qualified groundwater scientist.

The minimum number of upgradient and downgradient wells is not specified for a GWMS at a permitted RCRA-regulated waste management unit. Rather, 40 CFR 264, Subpart F, states that the GWMS must consist of a sufficient number of monitoring wells to properly characterize background water quality and detect any contamination. Both interim status and permitted RCRA-regulated waste management unit GWMSs must yield representative samples from the uppermost aquifer. The "uppermost aquifer" is defined in 40 CFR 260.10 as the geologic formation nearest the natural land surface that is an aquifer, as well as lower aquifers that are hydraulically connected with this aquifer within the RCRA-regulated waste management unit boundary.

For RCRA-regulated waste management units undergoing evaluation, investigation, or remediation under RCRA 3004(u) and 3004(v) corrective action provisions, groundwater monitoring may be required in order to determine the nature and extent of contamination in the environment from the unit in question. Typically, these programs utilize existing RCRA guidance and regulatory requirements as the basis for conducting the investigations, establishing the GWMS, conducting sampling and analysis, and evaluating the collected data for significance. The length of time the GWMS must be in place to collect information and to monitor any cleanup activities is generally determined as part of the corrective action process and is formally established in either a consent order or in special conditions to an operating permit. If releases to the groundwater have occurred, groundwater monitoring, closure, and post-closure requirements for RCRA-regulated waste management units may be imposed.

5.4 Groundwater Monitoring Requirements

Regardless of a RCRA-regulated waste management unit's operating or closure status, certain groundwater monitoring requirements may apply. Requirements are most stringent for those facilities most likely to contaminate groundwater (i.e., land-based units and some tank systems). These requirements are presented in Subpart F of both 40 CFR 264 and 265. Applying to each facility in permitted status, 40 CFR 264 involves a three-phased approach to groundwater monitoring programs. The approach includes detection, compliance, and corrective action monitoring. Applying to each facility in interim status, 40 CFR 265 implies the necessity of a phased groundwater monitoring program. The scope of these groundwater monitoring programs depends on the facility's ability to demonstrate comparative concentration levels of contamination. Such demonstration requires installation of a GWMS. As documented in the *Final RCRA Ground-Water Monitoring Compliance Order Guidance* (EPA 1985), the initial GWMS is considered a detection program. Depending upon the groundwater quality, a GWMS suitable for an assessment program may be required. The

groundwater monitoring requirements under each operating or closure status are described in the following sections.

5.4.1 Detection Monitoring Under Interim Status

Owners/operators of interim status land-based RCRA-regulated waste management units are required (40 CFR 265.91 and 265.92) to design, construct, operate, and maintain a GWMS capable of determining the facility's impact on groundwater in the uppermost aquifer beneath the facility. The program under which the GWMS is operated must be implemented throughout the active life of the RCRA-regulated waste management unit and, in the case of disposal units, during the post-closure care period.

The groundwater monitoring requirements under 40 CFR 265 may be waived by EPA if the owner/operator can demonstrate that there is low potential for leakage of hazardous constituents from the RCRA-regulated waste management unit to the uppermost aquifer and water supply wells. The demonstration must be in writing and must be certified by a qualified geologist or geotechnical engineer. It should be noted, however, that obtaining the necessary data for such a demonstration is very costly.

A GWMS for an interim status RCRA-regulated waste management unit must consist of at least one monitoring well that is located hydraulically upgradient of the unit (or waste management area) and at least three monitoring wells located hydraulically downgradient from and at the boundary of the unit or waste management area. Alternate monitoring well locations may be selected where physical obstacles exist at the boundary of the unit. However, several criteria must be met that justify selection of the alternate location, as discussed in Section 5.3. In the case of a single RCRA-regulated waste management unit, the waste management area is described by the waste boundary. Examples of waste boundaries are berms, pads, and walls within which waste is placed or located. Where multiple RCRA-regulated waste management units are located in close proximity, the waste management area is described by an imaginary boundary line that circumscribes the units.

The interim status regulations further require that the upgradient monitoring well be located so as to be unaffected by facility operations and be capable of yielding samples representative of background water quality near the waste management area. All downgradient monitoring wells must be able to immediately detect statistically significant amounts of hazardous constituents released from the waste management area to the uppermost aquifer.

EPA has developed specific technical design criteria for monitoring wells and GWMSs. Guidance for these specific criteria is available in the *TEGD* (EPA 1986a) and has been codified only in general terms in 40 CFR 264.97(c) and 265.91. The current regulations under 40 CFR 265.91 require the following:

- Monitoring wells be cased in a manner which maintains the integrity of the borehole
- The casing be screened and packed with sand or gravel, where necessary, to enable sample collection in appropriate flow zones
- The annular space above the screened interval be sealed to prevent contamination of samples and groundwater.

Following the installation of monitoring wells, the owner/operator must collect and analyze samples according to procedures detailed in an approved sampling and analysis plan (SAP). The plan must be approved by EPA or the State and must address, at a minimum, procedures for sample collection, sample preservation and shipment, analytical procedures, and sample chain-of-custody. The plan must be kept at the facility.

The owner/operator is required to establish initial background concentrations under a detection monitoring program for the following constituents and parameters by sampling all monitoring wells on a quarterly basis for the first year of GWMS operation:

- Constituents listed in Appendix III to 40 CFR 265 (EPA Interim Primary Drinking Water Standards; arsenic, barium, cadmium, chromium, fluoride, lead, mercury, nitrate, selenium, silver, endrin, lindane, methoxychlor, 2,4-D, 2,4,5-TP, silvex, radium, gross alpha, gross beta, and coliform bacteria)
- Groundwater quality parameters (chlorine, iron, manganese, phenols, sodium, and sulfate)
- Groundwater contamination indicator parameters (pH, specific conductance, total organic halogens, and total organic carbons).

For the indicator parameters, at least four replicate measurements must be made on each sample collected for the upgradient well during the first year. The arithmetic mean and variance of this sample population must be determined by combining the respective measurements. In subsequent years, all monitoring wells must be sampled for groundwater quality parameters on an annual basis, and all monitoring wells must be sampled for indicator parameters on a semi-annual basis.

The elevation of the static water level must be determined and recorded for each monitoring well each time the monitoring well is sampled. This information will be used in determining changes in the hydraulic gradient.

5.4.2 Assessment Monitoring Under Interim Status

The owner/operator must prepare an outline of a groundwater quality assessment program that describes the approach to be taken in the event that statistically significant contamination is detected in downgradient wells. The outline must reflect that the owner/operator will respond to this situation by immediately determining the extent of contamination, its rate of migration, and the concentrations of the hazardous constituents in the groundwater.

The owner/operator must collect samples and perform the statistical analyses required under 40 CFR 265.93 for each well in the GWMS at the frequency specified in 40 CFR 265.92. If the statistical comparisons reveal a significant increase in the concentrations of the detection parameters in downgradient monitoring wells, the owner/operator must immediately resample to confirm the results. If the results are confirmed, the owner/operator must notify EPA or the State in writing within seven days. Within 15 days, the owner/operator must develop and submit a comprehensive and detailed plan, based on the outline discussed above, for assessing the groundwater contamination.

The assessment plan must include proposals for the following:

- The numbers, locations, and depths of assessment wells
- A SAP
- Procedures to be used in evaluating the groundwater contamination
- A schedule for implementation.

Upon approval of the assessment plan, the owner/operator must implement and complete the program according to the schedule.

If it is determined that the groundwater requires remediation, the owner/operator is responsible for accomplishing the cleanup. Even though interim status regulations include no such requirements, EPA or the State is authorized to enforce such a cleanup under Section 3008, 3013, or 7003 of RCRA. If EPA determines that there is an imminent threat to human health, it can require an immediate response action under Section 106 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

The owner/operator must evaluate the data on the potentiometric surface at least annually to determine if the hydraulic gradient has changed. If it has changed, the owner/operator must submit a proposal for modifying the GWMS so that it will continue to detect contamination.

5.4.3 Groundwater Monitoring During Closure and Post-Closure Under Interim Status

Owner/operators who close RCRA-regulated waste management units under interim status must comply with the applicable standards set forth in 40 CFR 265, Subparts G and H, and where appropriate J, K, L, M, N, or P. This can include a requirement for groundwater monitoring during the closure period and, if applicable, during the post-closure care period. The owner/operator must submit as a part of the closure and post-closure plans a detailed description of the groundwater monitoring programs for the closure and post-closure periods.

Post-closure care for each RCRA-regulated waste management unit begins after completion of closure and continues for 30 years. The post-closure care period may be shortened if the owner/operator demonstrates through monitoring results, waste characteristics, application of advanced technology, decontamination, stabilization, or removal techniques that the unit is secure and that there is little potential for release of hazardous constituents to the environment. In addition, EPA or the State may extend the post-closure care period if it finds that the unit is not secure and that a potential for release of hazardous constituents exists.

If the owner/operator performs clean closure by removal of the wastes and all waste residuals, post-closure care and therefore groundwater monitoring is not required. However, the owner/operator must demonstrate that all wastes have been removed in accordance with the approved closure plan. In some cases, even though the owner/operator has elected to clean-close the unit, EPA or the State may require the owner/operator to demonstrate, through a groundwater quality inspection, that the RCRA-regulated waste management unit has not contaminated the groundwater. Clean closure is not an option under RCRA for landfills.

If the owner/operator closes a RCRA-regulated waste management unit with the wastes remaining in place (i.e., as a landfill), the wastes must be covered with a RCRA-compliant cap and post-closure groundwater monitoring must be conducted to ensure that the unit is not releasing hazardous constituents to the groundwater.

As part of the closure and post-closure process, the owner/operator must submit a certification that all closure and post-closure requirements have been met, including groundwater monitoring requirements. This certification must be signed by an independent, registered professional engineer, as well as by the owner/operator.

5.4.4 Detection Monitoring Under Permitted Status

If the owner/operator has not established background levels for hazardous constituents and indicator parameters under interim status monitoring, the owner/operator must comply with 40 CFR 264.97(g) and (h) in establishing background levels for constituents identified in the permit application and subsequently the permit. The owner/operator must install, operate, and maintain a GWMS at the compliance point that complies with 40 CFR 264.97 and that considers other technical criteria presented by EPA in the *TEGD* (EPA 1986a). The compliance point is defined as a vertical surface located at the hydraulically downgradient limit of the waste management area that extends down into the uppermost aquifer underlying the regulated units.

The owner/operator must sample and analyze for indicator parameters (pH, specific conductance, total organic halogen, and total organic carbon), and other constituents specified by EPA or the State as reliable indicators of groundwater contamination based on the waste types managed at the RCRA-regulated waste management unit and in the vicinity. These parameters and their concentration limits will be specified in the permit. The samples must be analyzed statistically as described in 40 CFR 264.97 to determine if significant contamination exists in the uppermost aquifer. The owner/operator must collect and analyze at least four samples from each monitoring well in the GWMS at least semiannually (or as established in the permit) and must determine the groundwater flow rate and flow direction at least annually (or as established in the permit).

The owner/operator must evaluate the analytical results using one of four statistical methods listed in 40 CFR 264.97(h) or an alternative method approved by EPA or the State. In performing the statistical analyses, the owner/operator must compare data from each compliance point well to the background levels established under interim status monitoring or under permitted status. The owner/operator must complete the statistical analysis, and determine whether statistically significant contamination is present, within a reasonable time period following sample collection. EPA or the State will specify this period in the permit.

While in a detection monitoring program under 40 CFR 264, if the owner/operator determines that there is statistically significant contamination (e.g., any concentration limit set in the permit is being exceeded) at any compliance point well, EPA or the State must be notified in writing within seven days of the determination and the notification must identify what chemical parameters or hazardous constituents exceeded the concentration limits. The amount of time allowed to make the determination will be specified in the permit. The owner/operator must also immediately sample all the monitoring wells and analyze for constituents in Appendix IX of 40 CFR 264. The owner/operator may then resample within one month and repeat the analyses for any Appendix IX constituent found. Positive analyses in the second Appendix IX analysis that confirm the first Appendix IX analysis form the basis for a compliance monitoring program. Should the owner/operator choose not to conduct the second sampling for Appendix IX constituents, the constituents found in the first Appendix IX sampling will form the basis for compliance monitoring.

The owner/operator is required under 40 CFR 270.42 to submit an application for a permit modification to EPA or the State within 90 days of the determination of significant contamination (i.e., concentration limit exceeded) to establish a compliance monitoring program. The application must include the concentrations of all Appendix IX constituents detected at the compliance point, the proposed changes to the GWMS program to comply with 40 CFR 264.99 (changes including sampling frequency, sampling and analytical procedures, or statistical methods), and a proposed concentration limit or a notice of intent to seek an alternate concentration limit (ACL) for any constituent detected at the compliance point. ACLs are concentration limits other than those established in the regulations. Within 180 days of the determination of significant contamination, the owner/operator must submit to EPA or the State, any proposed ACLs and an engineering feasibility plan for a corrective action program that addresses the contamination and satisfies 40 CFR 264.100.

The owner/operator has the option to demonstrate that the apparent contamination detected (as described above) is the result of an error in sampling, analysis, or statistical evaluation; a source other than the regulated unit; or natural variation in the groundwater. EPA or the State must be notified in writing within seven days of the determination of significant contamination of the intent to make this demonstration. A report that makes the demonstration and an application for a permit modification for required changes to the detection monitoring program must be submitted within 90 days. If the detection monitoring program no longer satisfies the requirements for detection monitoring, the owner/operator must submit an application for a permit modification for necessary changes within 90 days.

As noted above, the owner/operator may petition EPA or the State to consider establishing an ACL for a particular constituent. This petition must include evaluations of the potential adverse effects on groundwater quality and hydraulically connected surface water quality. The information supporting the evaluations for groundwater quality must include the following:

- Physical and chemical characteristics of the waste in the regulated unit
- Potential for migration of the waste and its constituents
- The hydrogeologic characteristics of the facility and surrounding area
- The quantity of groundwater and direction of groundwater flow
- The proximity and withdrawal rates of groundwater users in the area
- Current and future uses of groundwater in the area
- The existing quality of groundwater including other sources of contamination and their cumulative impact on groundwater quality
- The potential for health risks caused by human exposure to waste constituents
- The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents
- The persistence and permanence of the potential adverse effects.

The information supporting the evaluations for hydraulically connected surface water quality must include the following:

- The volume and physical and chemical characteristics of the waste in the regulated unit
- Hydrogeologic characteristics of the facility and surrounding land areas
- The quantity, quality, and flow direction of groundwater
- Rainfall patterns in the area
- The proximity of the regulated unit to surface waters
- The current and future uses of surface waters in the area and any water quality standards established for those surface waters
- The existing quality of surface water including other sources of contamination and the cumulative impact on surface water quality
- The potential for health risks caused by human exposure to waste constituents
- The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents
- The persistence and permanence of the potential adverse effects.

The EPA or State agency will evaluate all of the above factors and may grant the petition and establish the ACL as the governing concentration limit in lieu of the regulatory-required limit if it finds that the particular constituent will not pose a substantial present or potential future hazard to human health and the environment as long as the ACL is not exceeded.

5.4.5 Compliance Monitoring Program Under Permitted Status

If hazardous constituents from a RCRA-regulated waste management unit with a GWMS are detected above allowed concentration limits at compliance point wells during detection monitoring under permitted status, the owner/operator must implement a compliance monitoring program. "Detection" is defined as statistically significant evidence of increased contamination as described in 40 CFR 264.97.

An owner/operator required to establish a compliance monitoring program under 40 CFR 264.99 must monitor the groundwater to determine if the RCRA-regulated waste management unit is in compliance with the hazardous constituent concentration limits (also known as the groundwater protection standard) established in the permit. The owner/operator must install a GWMS in accordance with 40 CFR 264.97 at the compliance point. The sampling procedures and statistical methods to be used by the owner/operator must determine if the concentrations of constituents listed in the permit have exceeded the limits established under the permit in a statistically significant manner at each compliance point well. The statistical analysis must be performed within the time period specified in the permit. The owner/operator must collect and analyze at least four

samples from each well in the GWMS at least semiannually during the compliance period or as established in the permit.

The owner/operator must analyze samples from all compliance point wells for all constituents in 40 CFR 264, Appendix IX, on a timeframe established in the permit (at least annually). If constituents that do not already appear in the permit are detected, the owner/operator may resample and analyze within one month. If the presence of new constituents is confirmed, the owner/operator must notify EPA or the State in writing within seven days and add the new constituents to the list being monitored. The owner/operator may choose not to resample for confirmation, but must notify EPA or the State in writing within seven days and add the new constituents to the list in the permit.

If concentration limits exceed those defined in the permit at any compliance point well, a corrective action program must be implemented. The owner/operator must notify EPA or the State in writing within seven days. An application for a permit modification to establish a corrective action program in accordance with 40 CFR 264.100 must be submitted within 180 days or within 90 days if an engineering feasibility plan was already submitted under 40 CFR 264.98 (detection monitoring). The application must include both a detailed description of corrective actions that meet the groundwater protection standard in the permit and a plan for a groundwater monitoring program that demonstrates the effectiveness of the corrective action.

The owner/operator may demonstrate that the apparent contamination resulted from an error in sampling, analysis, or statistical evaluation or from natural variation in groundwater. In making this demonstration, the owner/operator must notify EPA or the State in writing within seven days of the determination of significant contamination of the intent to make this demonstration. The demonstration report, with an application for a permit modification to make necessary changes in the compliance monitoring program, must be submitted within 90 days; per 40 CFR 264.99(g)(6), the owner/operator is not relieved of the requirement to submit a permit modification application within the timeframes noted above unless the demonstration that a source other than the regulated unit caused the contamination is successful. If the owner/operator determines that the compliance monitoring program no longer satisfies 40 CFR 264.99, an application for a permit modification to make required changes must be submitted within 90 days.

5.4.6 Corrective Action Monitoring Under Permitted Status

A corrective action program is required if the groundwater protection standard established by EPA during compliance monitoring is exceeded. "Exceeded" is the same as the definition of "detected" in Section 5.4.5.

An owner/operator required to establish a corrective action program must remove or treat in-place the constituents that exceed the groundwater protection standard established in the permit. The owner/operator must implement the corrective action program within the time period specified by EPA and must establish and implement a groundwater monitoring program to demonstrate the effectiveness of the remediation. EPA will specify in the permit the measures that are required.

In addition, the owner/operator must implement a corrective action program to remove or treat in-place any constituents listed in the permit that exceed the groundwater protection standard. The corrective action program must address the area between the compliance point and the facility's downgradient property boundary and beyond, if necessary, to protect human health and the environment.

The owner/operator must continue the corrective action during and after the compliance period to the extent necessary to ensure that the groundwater protection standard is no longer exceeded. The owner/operator may terminate corrective action measures during the closure period if it can be demonstrated that the groundwater protection standard has not been exceeded for three consecutive years. This demonstration must be based on groundwater data collected in the corrective action monitoring program.

The owner/operator must report semiannually in writing to EPA the effectiveness of the remediation. If the owner/operator determines that the corrective action program no longer satisfies the requirements of 40 CFR 264.100, an application for a permit modification must be submitted within 90 days to make appropriate changes.

Table 5-2 summarizes the reporting/implementing requirements for permitted units and the allowable timeframes for the detection, compliance, and corrective action monitoring programs.

5.4.7 Groundwater Monitoring During Closure and Post-Closure Under Permitted Status

Owners/operators who close a RCRA-regulated waste management unit under permitted status must comply with the applicable requirements for groundwater monitoring given in 40 CFR 264 Subparts F, K, L, M, N, and X during closure, and, if applicable, during the post-closure period. The requirements for closure and post-closure groundwater monitoring for interim status and permitted facilities are the same (see Sections 5.2.3 and 5.4.3).

5.5 Additional Groundwater Monitoring Requirements for RCRA Part B Permits

Owners/operators of RCRA-regulated waste management units are required to file Part A and Part B permit applications to receive their operating permit. Part A permit applications serve to notify the Regional Administrator or the Director of the State Agency of the existence of the facility, the RCRA-regulated waste management units present, and the wastes managed at that facility. Part B permit applications provide detailed information about specific RCRA-regulated waste management units and activities at those units. In many Part B permit applications, information regarding the protection of groundwater may be necessary (40 CFR 270.14 and 270.97). The owner/operator must comply with general Part B permit application requirements regarding groundwater protection. 40 CFR 270.14(c) requires the owner/operator to provide the following information:

- A summary of the groundwater monitoring data collected during interim status under 40 CFR 265.90 through 265.94
- Findings of a detailed site hydrogeologic investigation that identifies the uppermost aquifer and any hydraulically connected aquifers
- A topographic map that delineates the waste management area, points of compliance, locations of all monitoring wells, the extent of any groundwater contamination from a regulated unit, and the concentrations of all Appendix IX constituents in the zone of contamination
- Plans and an engineering report for the GWMS required under 40 CFR 264.97

- Information sufficient to establish a detection monitoring program under 40 CFR 264.98, if no hazardous constituents have been detected at the time of permit application
- Information sufficient to establish a compliance monitoring program under 40 CFR 264.99, if hazardous constituents have been detected at the time of permit application
- Information sufficient to establish a corrective action program under 40 CFR 264.100, if the concentrations for the constituents in 40 CFR 264.94, Table 1, exceed the levels established in 40 CFR 264.94, Table 1 or if groundwater monitoring conducted under interim status indicates the presence of hazardous constituents from regulated units that exceed background concentrations.

The above information is provided in this report for the purpose of a complete discussion of RCRA requirements. As of 1993, none of the INEL RCRA-regulated waste management units to be permitted are required to have RCRA groundwater monitoring systems.

5.6 Surface Water Monitoring Requirements

Owners/operators of facilities with land-based RCRA-regulated waste management units are specifically required to have a RCRA-compliant monitoring program to assess their impact on groundwater, as discussed in Sections 5.3 and 5.4. These programs include detection, compliance, closure and post-closure, and corrective action monitoring for permitted facilities, and detection, assessment, and closure and post-closure monitoring for interim status facilities. Surface water monitoring is not specifically discussed as part of these monitoring programs, unless the surface waters are hydraulically connected to groundwater within the uppermost aquifer underlying the facility. The owner/operator must provide information supporting the evaluation of hydraulically connected surface water quality in order to petition to establish ACLs (see Section 5.4.4). The groundwater would serve as a pathway for migration of contaminants from the facility to water supply wells or to surface water. However, surface water monitoring is specifically required during corrective action, as applicable, since such activities are multimedia environmental investigations (see Sections 5.9 and 5.11).

Table 5-2. Timeframes for detection, compliance, and corrective action monitoring programs for permitted units.

Action	Timeframe
<i>40 CFR 264.98 Detection Monitoring Program</i>	
Collect samples and conduct statistical tests to determine evidence of contamination	Semiannually at a minimum; frequency determined by Regional Administrator or State Director
Determine groundwater flow rate and direction in the uppermost aquifer	At least annually
Determine whether there is statistically significant evidence of contamination	Semiannually at a minimum; time period specified by Regional Administrator or State Director
Notify Regional Administrator or State Director of finding of statistically significant contamination	7 days
Sample all monitoring wells for Appendix IX constituents	Immediately after finding of statistically significant contamination
(Optional) resample for detected Appendix IX constituents	1 month
Submit to the Regional Administrator or State Director a permit modification application to establish a compliance monitoring program	90 days
If necessary, submit to the Regional Administrator or State Director all data needed to justify an ACL and an engineering feasibility plan for a corrective action program	180 days
Notify the Regional Administrator or State Director of intent to demonstrate by written report that a source other than the regulated unit or an error in sampling/analysis caused the contamination	7 days
Submit demonstration report	90 days
Submit to the Regional Administrator or State Director a permit modification application to make any appropriate changes to detection monitoring program	90 days
Submit to the Regional Administrator or State Director a permit modification application to make any appropriate changes if detection monitoring program no longer satisfies requirements of 264.98	90 days

Table 5-2. (continued).

Action	Timeframe
<i>40 CFR 264.99 Compliance Monitoring Program</i>	
Compliance monitoring period and sampling frequency	Determined by Regional Administrator or State Director (at least semiannually)
Determine whether there is statistically significant evidence of increased contamination at each monitoring well at the compliance point	Determined by Regional Administrator or State Director
Determine groundwater flow rate and direction in the uppermost aquifer	At least annually
Analyze samples from all monitoring wells at the compliance point for Appendix IX constituents	At least annually
(Optional) Resample for detected Appendix IX constituents previously not identified on the permit	1 month
Report presence of new Appendix IX constituents and add to analysis list	7 Days after original analysis or after optional resampling
Report constituents that exceed concentration limits	7 days
Submit to the Regional Administrator or State Director a permit modification application to establish a corrective action program	180 days or 90 days*
Notify the Regional Administrator or State Director of intent to demonstrate that contamination is due to a source other than the regulated unit or from an error in sampling, analysis, or statistical methods:	7 days
(a) Submit report to the Regional Administrator or State Director	90 days
(b) Submit to the Regional Administrator or State Director a permit modification application for appropriate changes to compliance monitoring program	90 days
Submit to the Regional Administrator or State Director a permit modification application for appropriate changes to compliance monitoring program if it no longer satisfies 40 CFR 264.99 requirements	90 days

Table 5-2. (continued).

Action	Timeframe
<i>40 CFR 264.100 Corrective Action Plan</i>	
Begin corrective action program after the groundwater protection standard is exceeded.	Determined by Regional Administrator or State Director
Begin program to remove or treat in place any hazardous constituents that exceed concentration limits in groundwater	Determined by Regional Administrator or State Director
Report the effectiveness of the corrective action program	Semiannually
Apply for permit modification to make any appropriate changes to the program	Within 90 days of the determination
Terminate corrective action by demonstrating that the groundwater protection standard has not been exceeded for three consecutive years	After 3 consecutive years
a. Within 90 days if an engineering feasibility study has been previously submitted to the Regional Administrator or State Director.	

5.7 Groundwater and Surface Water Protection Requirements

The general requirements relating to groundwater and surface water protection for RCRA-regulated waste management units are included in design and operation standards for "land-based" waste management units. The RCRA regulations require design which prevents surface water run-on and the generation of run-off or leachate from the unit from migrating to adjacent groundwater and surface water. Monitoring and inspection of these systems is necessary to assure proper function and prevention of any release of hazardous constituents to the environment. Groundwater and surface water monitoring is also required during corrective action, as they are multimedia environmental investigations of existing or potential contamination of soil, groundwater, surface water, and air (see Section 5.9). Even though interim status regulations do not specifically include corrective action for cleanup of a facility, the EPA or the State Agency is authorized to enforce cleanup under Section 3008, 3013, or 7003 of RCRA.

Design and operation standards are specified for liner systems, leachate collection systems, and leak detection systems to prevent any releases of hazardous constituents to groundwater and surface water. Specific design standards for leak detection systems for new and replacement surface impoundments, waste pipes, and landfills, and any lateral expansions of these units are required for both interim and permitted status facilities. Double liner and leachate collection and removal system requirements were recently modified and new provisions were added to 40 CFR 264 and 40 CFR 265 (57 FR 19, pp. 3462-3497). Liner systems for surface impoundments and landfill units must consist of a top liner designed to prevent the migration of hazardous constituents into the liner and a composite bottom liner consisting of a geomembrane underlain by at least 3 ft of compacted soil material having a hydraulic conductivity of no more than 1×10^{-7} cm/sec. The EPA has also extended the revised landfill double liner and leachate collection and removal system requirements to new

and replacement waste pile units. Leak detection systems for new and replacement surface impoundments, waste piles, and landfills must meet minimum design criteria and ensure that leaks are detected at the earliest practicable time. Owners and operators must establish action leakage rates (ALRs) for each waste management unit affected. The ALR is a rate that requires implementation of a response action to prevent hazardous constituent migration from the unit, thereby protecting the groundwater and surface water. A response action plan is required to specify monitoring, inspection, and corrective measures to be implemented if the action leakage rate is exceeded. Routine monitoring, inspection, and maintenance is also specified for liners and cover systems, leachate collection and removal systems, and leak detection systems under 40 CFR 264 and 40 CFR 265.

A number of leak detection requirements exist for land treatment units, such as monitoring soil and soil-pore liquid in the unsaturated zone to determine if hazardous constituents migrate out of the treatment zone (see Section 5.10.3). The modified leak detection requirements are not extended to land treatment units, since the regulatory requirements for treatment zone monitoring are sufficient to ensure that leakage of hazardous constituents to the environment will be detected at the earliest practicable time.

General monitoring and inspection is required for both interim and permitted status facilities. Tank systems must be inspected every day when the system is operational. Inspection of surface impoundments, waste piles, land treatment units, and landfills must be performed weekly and after storm events while the units are in operation to detect evidence of the following:

- Deterioration, malfunction, or improper operation of run-off and run-on control systems
- Proper functioning of wind dispersion control systems
- The presence of leachate in and the proper functioning of leachate collection and removal systems, where present
- The amount of liquids removed from the leak detection systems must be recorded (during the active life and closure)
- Deterioration in dikes, berms, or other containment systems
- Sudden drops in the level of surface impoundment contents.

The owners/operators of RCRA-regulated waste management units under permitted and interim status must comply with the applicable monitoring requirements during closure, and if applicable, during post-closure (Subparts G, Sections 264.111 through 264.120 and 265.111 through 265.282). The owners/operators must assure closure in a manner that controls, minimizes, or eliminates the release of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products to the groundwater or surface water. In order to accomplish this standard, a closure plan must be prepared for permitted and interim status facilities which includes a detailed description of activities necessary during closure, including groundwater monitoring, leachate collection, and surface water run-on and run-off controls.

The following sections describe the general groundwater and surface water monitoring requirements for both interim status and permitted facilities.

5.7.1 Groundwater and Surface Water Protection Under Interim Status

Owners/operators with land-based RCRA-regulated waste management units at interim status facilities are required to include general design and operation standards to assure the protection of groundwater and surface water. Applicable requirements for containment systems, liner systems, run-off/run-on control systems, leachate collection and removal systems, and leak detection systems are presented in Part 265, Subparts J, K, L, M, and N. These design criteria are directed towards the protection of soil, groundwater, surface water, and air from migration of hazardous constituents from the waste management units. The design, operation, and maintenance requirements pertaining more specifically to groundwater and surface water protection are described in the following sections.

5.7.1.1 Tank Systems. Under Subpart J, owners/operators of facilities that use tank systems for storing or treating hazardous waste must provide secondary containment and leak detection systems. These systems require design, operation, and maintenance that prevents migration of hazardous wastes or accumulated liquids out of the system and into the groundwater or surface water. In order to meet this requirement, secondary containment system specifications are outlined in Part 265, Subpart J, Section 265.193. One of the requirements for secondary containment systems is an external liner system designed to prevent surface water run-on and precipitation from entering the system, unless sufficient additional capacity is provided within the system. The additional capacity must be capable of containing precipitation from a 25-year, 24-hour storm event.

The leak detection system should be capable of detecting any failure of either the primary or secondary containment system, and any release of hazardous constituents to the secondary containment system within 24 hours, or at the earliest possible time. Accumulated waste or precipitation must be removed from the system within 24 hours, or as soon as possible, to prevent potential impacts to human health or the environment. Additionally, it should be noted that if the collected material is discharged through a point source to waters of the United States, the release is subject to the regulations under Sections 301, 304, and 402 of the Clean Water Act (CWA), as amended (see Section 9).

A variance from the design and secondary containment requirements in Subpart J may be obtained for interim status facilities if an evaluation is performed to assure that alternative design and operating practices and location characteristics will prevent a release to groundwater or surface water at least as effectively as secondary containment. In the event a release should occur, the location characteristics must be such that no substantial hazard is posed to groundwater or surface water. The information required to support the evaluation for assuring the protection of groundwater and surface water includes the following:

- The potential adverse effects on groundwater and surface water
- The physical and chemical characteristics of the waste in the regulated unit
- The potential for migration of the waste and its constituents
- The hydrogeological characteristics of the facility and surrounding area
- The potential for health risks caused by human exposure to waste constituents

- The potential for damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents
- The persistence and permanence of the potential adverse effects
- The quantity and quality of groundwater and the direction of groundwater flow
- The proximity and withdrawal rates of groundwater users in the area
- The current and future uses of groundwater
- The existing quality of groundwater including other sources of contamination and their cumulative impact on groundwater quality
- The patterns of rainfall in the region
- The proximity of the tank system to surface waters
- The current and future uses of surface waters in the area and any water quality standards established for those surface waters
- The existing quality of surface water including other sources of contamination and the cumulative impact on surface water quality.

The EPA or State Agency will evaluate all of the above components and may grant a variance to allow alternative tank design and operating practices that will prevent potential adverse effects on groundwater and surface water quality.

5.7.1.2 Surface Impoundments. New and replacement surface impoundments must have a liner system, leachate collection and removal system, and a leak detection system that is designed, constructed, and installed to prevent any migration of wastes from the impoundment to adjacent subsurface soil, groundwater, and surface water (see Subpart K, Sec. 265.221). The owner/operator must install two or more liners with a leachate collection system located between the liners.

5.7.1.3 Waste Piles. The design and operation of new and replacement waste piles must prevent any migration of wastes out of the pile into the adjacent subsurface soil, groundwater, or surface water, as required in Subpart L, Section 265.253 and 265.254. These waste piles must have, at a minimum, a double liner system with a leak detection system that is designed, constructed, and installed to prevent any migration of wastes out of the pile into the adjacent groundwater and surface water at any time during the active life of the pile and during closure. Owners/operators must install two or more liners with a leachate collection and removal system above and between the liners. If leachate or run-off from a waste pile is hazardous, then one of the following two containment systems options must be implemented:

Option 1:

- An impermeable base must be placed under the pile

- A run-on control system capable of preventing flow onto the active portion of the pile during peak discharge from at least a 25-year storm event
- A run-off management system to collect and control at least a 24-hour, 25-year storm event
- The collection and holding systems for run-on/run-off control systems must be emptied to maintain optimum design capacity.

Option 2:

- The pile must be protected from precipitation and run-on by some other means
- No liquids or wastes containing free liquids may be placed in the pile.

If collected leachate or run-off is discharged through a point source to waters of the United States, the discharge is subject to regulations under Section 301, 304, and 402 or the CWA, as amended (see Section 9).

5.7.1.4 Land Treatment. The owner/operator must design, construct, operate, and maintain the land treatment facility to maximize the degradation, transformation, and immobilization of hazardous constituents within the treatment zone, as specified under Subpart M, Section 265.272. The treatment zone must be designed in a manner that minimizes run-on and run-off of hazardous constituents during the active life of the unit. A run-on control system must be designed to prevent flow onto the treatment zone during peak discharge from at least a 25-year storm event. The run-off management system must be designed to collect and control run-off from a 24-hour, 25-year storm event. Collecting and holding facilities associated with run-on and run-off control systems must be emptied after storm events to maintain the design capacity of the system.

5.7.1.5 Landfills. Landfills are required to have a double liner system with a leak detection system that is designed, constructed, and installed to prevent any migration of wastes from the landfill to adjacent subsurface soil, groundwater, and surface water at any future time, as specified under Subpart N, Section 265.301. The owner/operator of a new or replacement landfill unit must install two or more liners and a leachate collection and removal system above and between the liners. A run-on control system must be designed to prevent flow onto the treatment zone during peak discharge from at least a 25-year storm event. The run-off management system must be designed to collect and control run-off from a 24-hour, 25-year storm event. Collecting and holding facilities associated with run-on and run-off control systems must be emptied after storm events to maintain the design capacity of the system.

5.7.2 Groundwater and Surface Water Protection Under Permitted Status

Owners/operators with land-based RCRA-regulated waste management units at permitted facilities are also required to include general design and operation standards to assure the protection of groundwater and surface water. Applicable requirements for containment systems, liner systems, run-off/run-on control systems, leachate collection and removal systems, and leak detection systems are presented in Part 264, Subparts J, K, L, M, N, and X. These design and operation standards are directed towards the protection of soil, groundwater, surface water, and air from migration of hazardous constituents from the waste

management units. The design, operation, and maintenance requirements pertaining more specifically to groundwater and surface water protection are described in the following sections.

5.7.2.1 Tank Systems. Owners/operators of facilities that use tank systems for storing or treating hazardous waste must provide secondary containment and leak detection systems, as required under Subpart J, Section 264.193. These systems require design, operation, and maintenance that prevents migration of hazardous wastes or accumulated liquids out of the system and into the groundwater or surface water. The requirements for tank systems at both interim status and permitted facilities are the same (see Section 5.7.1.1).

5.7.2.2 Surface Impoundments. Owners/operators of new and replacement surface impoundments must have a liner system, leachate collection and removal system, and a leak detection system that is designed, constructed, and installed to prevent any migration of wastes from the impoundment to adjacent subsurface soil, groundwater, and surface water (see Subpart K, Sec. 264.211). The owner/operator must install two or more liners with a leachate collection system located between the liners.

The owner/operator of the waste management unit at a permitted facility may petition the EPA, or the State Agency to consider an alternate design and operating practices. This petition must include an evaluation of the proposed alternative design and operation, the nature and quantity of wastes, the hydrogeologic setting of the facility, and all other factors influencing the quality and mobility of the leachate produced by the unit. The evaluation would include analysis of the attenuative capacity and thickness of the liners and soils between the impoundment and groundwater or surface water in the vicinity. The potential adverse effects on groundwater and surface water quality must be evaluated, if migration of hazardous constituents should occur from the waste management unit.

5.7.2.3 Waste Piles. New and replacement waste piles must be designed and operated in a manner that prevents migration of wastes out of the pile into the adjacent subsurface soil, groundwater, or surface water, as required under Subpart L, Section 264.250 and 264.251. These waste piles must have a double liner system with a leak detection system that is designed, constructed, and installed to prevent the migration of wastes out of the pile at any time during the active life of the pile and during closure. The owner/operator must install two or more liners and a leachate collection and removal system above and between the liners.

These requirements do not apply, along with Subpart F, if the waste pile is located inside or under a structure that provides protection from precipitation. In addition, the following requirements must be met:

- Liquids or materials containing free liquids are not placed in the pile
- The pile is protected from surface water run-on
- The pile is designed and operated to control wind dispersion
- The pile will not generate leachate through decomposition or other reactions.

In addition, the owner/operator of the waste management unit at a permitted facility may petition the EPA, or the State Agency to consider an alternate design and operating practices. This petition must include an evaluation of the proposed alternative design and operation, the nature and quantity of wastes, the hydrogeologic setting of the facility, and all other factors influencing the quality and mobility of the leachate produced by the unit. The evaluation would include analysis of the attenuative capacity and thickness of the

liners and soils between the impoundment and groundwater or surface water in the vicinity. The potential adverse effects on groundwater and surface water quality must be evaluated, if migration of hazardous constituents should occur from the waste management unit.

5.7.2.4 Land Treatment. The owner/operator must design, construct, operate, and maintain the unit to maximize the degradation, transformation, and immobilization of hazardous constituents within the treatment zone, as specified under Subpart M, Section 264.273. The treatment zone must be designed to minimize run-off of hazardous constituents during the active life of the unit. The requirements for land treatment at both interim status and permitted status are the same (see Section 5.7.1.4).

5.7.2.5 Landfills. Landfills must have a double liner system with a leak detection system that is designed, constructed, and installed to prevent any migration of wastes from the landfill to adjacent subsurface soil, groundwater, and surface water at any future time, as specified under Subpart N, Section 264.301. The owner/operator of a new or replacement landfill unit must install two or more liners and a leachate collection and removal system above and between the liners. A run-on control system must be designed to prevent flow onto the treatment zone during peak discharge from at least a 25-year storm event. The run-off management system must be designed to collect and control run-off from a 24-hour, 25-year storm event. Collecting and holding facilities associated with run-on and run-off control systems must be emptied after storm events to maintain the design capacity of the system.

The owner/operator of the waste management unit may petition the EPA or the State Agency to consider an alternate design and operating practices. This petition must include an evaluation of the physical location characteristics, the proposed alternative design and operation, the nature and quantity of wastes, the hydrogeologic setting of the facility, and all other factors influencing the quality and mobility of the leachate produced by the unit. The evaluation would include analysis of the attenuative capacity and thickness of the liners and soils between the impoundment and groundwater or surface water in the vicinity. The potential adverse effects on groundwater and surface water quality must be evaluated, if migration of hazardous constituents should occur from the waste management unit.

5.7.2.6 Miscellaneous Units. An owner/operator must locate, design, construct, operate, maintain, and close miscellaneous units in a manner that ensures the protection of human health and the environment, specified under Subpart X, Section 264.601. Permits are required to detail, as appropriate, design and operating systems, detection and monitoring systems, and response plans in the event of a release of a hazardous constituent from the unit. These standards must be sufficient to prevent migration of hazardous constituents from impacting subsurface or surface soil, groundwater, surface water, or wetlands. The following factors must be evaluated in order to make this determination:

- The volume, physical, and chemical characteristics of the waste in the unit
- The effectiveness and reliability of containment, confinement, and collection systems and structures in preventing contaminant migration
- The hydrologic and geologic characteristics of the unit and the surrounding area, including surface topography
- The proximity of the unit to surface waters

- The current and potential uses of nearby surface waters and water quality standards
- The existing surface water quality and quality of surface soils
- The existing groundwater quality
- The quantity and direction of groundwater flow
- The proximity to and withdrawal rates of current and potential groundwater users
- The patterns of land use
- The patterns of precipitation in the region
- The potential for deposition or migration of waste constituents into subsurface physical structures and root zones of food-chain crops and other vegetation
- The potential human health risks, damage to domestic animals, wildlife, crops, vegetation, and physical structures caused by exposure to the waste constituents.

Monitoring and inspections, testing and maintenance, analytical data, inspections, response, corrective action, and reporting procedures and frequencies must be performed in accordance with Part 264 requirements.

5.7.3 Floodplain Location Standards Under RCRA

RCRA facilities located in a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout of any hazardous waste by a 100-year flood. If the facility can demonstrate that the location and containment of the waste management units are not vulnerable to flood waters, or have no adverse effects on human health or the environment from a washout, this requirement may be waived. One major consideration when making this determination is whether the concentrations released during a flood event would impact the current or potential uses of any affected surface waters and meet established water quality standards. Further details on siting restrictions in floodplains under RCRA are discussed in Section 11.2.3.

5.7.4 Contingency Planning Under RCRA

Contingency planning is required for interim status and permitted facilities. The contingency plans must establish timely response procedures for any unplanned sudden or non-sudden releases of hazardous constituents to air, soil, groundwater, or surface water. Specific items requiring inclusion in contingency plans are described in 40 CFR 264.52 and 265.52. If a Spill Prevention, Control, and Countermeasures (SPCC) Plan or another type of emergency or contingency plan has been prepared for the facility, that plan may be amended to include, at a minimum, the hazardous waste management provisions established in 40 CFR 264.52 and 265.52.

5.8 Additional Groundwater and Surface Water Protection Requirements for RCRA Part B Permits

As noted in Section 5.5, owners/operators of RCRA-regulated waste management units are required to file Part A and Part B permit applications to receive their operating permit. Part B permit applications provide detailed information about specific RCRA-regulated waste management units and activities at those units. In addition to more detailed information regarding groundwater monitoring in Part B permit applications, information regarding groundwater and surface water may be necessary (40 CFR 270.14). 40 CFR 270.14 through 270.29 requires the owner/operator to provide the following information regarding waste management units (i.e., surface impoundments, waste piles, land treatment facilities, landfills):

- Plans and engineering reports detailing the design, construction, and maintenance of run-on and run-off control systems
- Management of collection and holding facilities associated with run-on and run-off control systems
- Description of the monitoring and inspection program for liner systems, leachate collection and removal systems, leak detection systems, cover systems, and appurtenances for control of run-on and run-off, where applicable.

The above information is required by owners/operators in Part B Permit applications in order to demonstrate compliance with Part 264 standards.

5.9 RCRA Corrective Action for Solid Waste Management Units

The corrective action program for SWMUs is established by EPA under Sections 3004(u) and 3004(v) of RCRA as amended by the HSWA. The following discusses the corrective action program and associated groundwater and surface water monitoring requirements in current form as implemented by EPA under its statutory authority. Additional regulations (expanding 40 CFR 264, Subpart S) pertaining to corrective action have been promulgated in draft form but have not yet been issued as final rules. Section 5.12.2 summarizes the proposed regulations.

A SWMU is defined as any discernible unit at which solid wastes have been placed at any time, whether or not the unit was intended for the management of solid or hazardous waste. Such units include any area at a facility at which solid wastes have been routinely and systematically released.

As part of the permitting process, the EPA requires permit applicants to submit information on all SWMUs at the facility. This information must include the following for each SWMU:

- Location on a topographical map
- Designation of the type of unit

- General dimensions and structural/operational description of the unit including any available drawings
- Dates of unit operation
- Specification of all wastes that have been managed at the unit to the extent available, including specific constituents and concentrations.

The owner/operator must also submit all available information pertaining to any release of hazardous wastes or hazardous constituents from each SWMU to any environmental media (i.e., air, surface water, groundwater, soil).

This information will be evaluated by the regulatory agency to determine SWMUs of concern in terms of past, present, or potential future release of hazardous constituents to the environment. This determination is generally performed after the applicant's information is evaluated, EPA/State records are evaluated, and the regulatory agency conducts an onsite information collection/inspection visit. The outcome of these evaluations and determinations is the identification of special permit conditions requiring the owner/operator to conduct RCRA facility investigations (RFIs) to evaluate the need for further action and/or corrective measures studies (CMSs) to clean up any released hazardous constituents. Depending on the situation, the regulatory agency may issue a consent order in addition to or in lieu of applying special conditions to the facility's operating permit.

The RFIs are multimedia environmental investigations of existing or potential contamination in the soil, groundwater, surface water, and air. The groundwater investigations are generally conducted in conformance with the RCRA GWMS requirements in Subpart F of 40 CFR 264/265, the *TEGD* (EPA 1986a), and the *RFI Guidance Manual* (EPA 1989a). However, the number of upgradient and downgradient monitoring wells and surface water monitoring locations may be more or less stringently interpreted. The goal of the RFI is to determine the nature and extent of existing contamination, the potential for future releases of hazardous constituents, and the need for further action. The owner/operator must develop and implement an RFI Work Plan which includes the strategy to characterize the nature, extent, and rate of migration of a release or releases of hazardous constituents. This work plan consists of a number of components, including the site-specific RFI Strategy which must be submitted for approval by the EPA or State Agency. The RFI Strategy describes the specific procedures for monitoring and data collection, characterizing each contaminant source, and evaluating the environmental setting.

The need for further action triggers the implementation of a CMS and, subsequently, implementation of a corrective measure to remedy the contamination or prevent future releases of hazardous constituents. Following completion of the corrective action, the unit or area in question may be required to undergo RCRA closure and post-closure care including conformance with the monitoring requirements of closure and post-closure.

In February 1993, the EPA finalized requirements that provide for the use of corrective action management units (CAMUs) and temporary units (TUs) when cleaning up sites under RCRA and Superfund (58 FR 28, pp. 8658-8685). This final rule creates a Subpart S to 40 CFR 264. These provisions address the difficulties associated with managing remediation wastes. The purpose of both CAMUs and TUs is to manage wastes generated at a facility as a result of remedial actions. The rule defines a CAMU as "an area within a facility that is designated for the purpose of implementing corrective action requirements." CAMUs may be

used to manage wastes generated during the remediation process at either permitted or interim status facilities. Wastes generated during site investigations are also considered remediation wastes. Groundwater, surface water, soils, and sediments originating from outside of the facility boundary can only be managed within CAMUs if they are associated with a release from within the facility that has migrated beyond the facility boundary. CAMUs are intended to facilitate the implementation of reliable, effective, protective, and cost-effective remedies, and they shall not create unacceptable risks to humans or the environment resulting from exposure to hazardous wastes or constituents.

Before the CAMU rule was promulgated, all remediation wastes had to be managed under the full RCRA Subtitle C regulations. The EPA recognized that this approach for managing remediation wastes was impeding cost effectiveness and timely cleanup of wastes during remediation. Under this requirement, placement, or replacement, of hazardous wastes into a CAMU does not automatically trigger land disposal restrictions (LDRs) and/or minimum technology requirements (MTRs). The TU provisions allow EPA to modify Subtitle C design, operating, and closure standards for tanks and container storage used for remediation wastes for a period of one year.

5.10 Technical Specifications for Groundwater Monitoring Programs Under RCRA

EPA is currently considering amending 40 CFR 264 and 40 CFR 265 to provide specific language for technical aspects of RCRA groundwater monitoring programs, including system design, construction materials, and drilling techniques. In the past, the *TEGD* has been used by EPA, State agencies, and owner/operators of TSD facilities to develop groundwater monitoring programs in compliance with RCRA (EPA 1986a). The changes being considered in 40 CFR 264 and 40 CFR 265 would result in major portions of the *TEGD* becoming regulatory requirements.

The *TEGD* provides detailed information on site hydrogeologic characterization, design and construction of GWMSs, development and implementation of SAPs, and statistical analysis of interim status groundwater monitoring data. This guidance document should be utilized to develop groundwater monitoring programs for waste management units during operating or closure status at RCRA facilities, and during corrective action and required RFIs. Although the document was developed for interim status facilities, it is also relevant to permitted facilities and non-RCRA programs. Requirements pertinent to implementation of a GWMS are described in the following sections.

5.10.1 Hydrogeologic Site Characterization

The owner/operator of a RCRA-regulated waste management unit is required to conduct a hydrogeologic investigation to adequately characterize the groundwater quality, to delineate the groundwater contamination from a release of hazardous constituents from a hazardous/mixed waste or solid waste management unit, and to justify placement of wells in the GWMS. The hydrogeologic investigation should include an evaluation of the direction and rate of groundwater flow, delineation of all flow zones in the uppermost aquifer, and an assessment of the fate and transport of hazardous constituents in the subsurface. The GWMS design depends on the complexity of the site geology and hydrogeology. Therefore it is critical to analyze the subsurface in detail, using all available site-specific data and data collected during the hydrogeologic investigation.

Typically, the existing information on aquifers is developed from regional data that are averaged over a large area. However, the site-specific hydrogeology can vary dramatically from regional hydrogeology, depending on the local geology. The GWMS design, including placement and number of wells and well design and construction, must be adequate to detect small amounts of contaminants released from RCRA-regulated waste management units.

To properly design a GWMS, the waste management area and the point of compliance must be properly defined. "Waste management area" is currently defined as the limit projected in the horizontal plane of the area on which wastes will be placed during the active life of a regulated unit and is further described by an imaginary line circumscribing multiple regulated unit(s) in close proximity. The "point of compliance" is a vertical plane located at the hydraulically downgradient limit of the waste management area that extends down into the uppermost aquifer underlying the regulated unit(s) (40 CFR 264.95). The EPA has proposed (53 FR 143, pp. 28160-28168) to revise the definitions of waste management area and point of compliance by providing clear authority to require multiple monitoring programs (i.e., detection, compliance, and corrective action) to be conducted simultaneously at a facility. The need for this authority is based on situations encountered where one facility includes more than one RCRA-regulated waste management unit. In this case, EPA would decide whether the facility's regulated units constituted one waste management area or if the individual units each constitute separate waste management areas. The proposed change would modify this definition by allowing EPA to describe the waste management area with a line circumscribing an individual unit or a group of units where necessary.

5.10.2 Design of Groundwater Monitoring System

The objective in designing a GWMS is to obtain representative groundwater samples from the uppermost aquifer (including any hydraulically-connected aquifers) that will provide for early detection of contaminants migrating from the waste management area. Site-specific variables determine the design of the GWMS: size and geometric shape of a RCRA-regulated waste management unit, complexity of the geology and hydrogeology, background water quality, quality of water flowing beneath the RCRA-regulated waste management unit or area, and the extent of the contaminant plume.

5.10.2.1 Placement and Number of Monitoring Wells. The primary objective in designing a GWMS is the early detection of contamination in the groundwater. To meet this objective, the monitoring wells must be placed in a manner that allows determination of groundwater quality both upgradient and downgradient of the RCRA-regulated waste management unit(s) requiring groundwater monitoring.

The design criteria for a basic GWMS (40 CFR 264.97 and 265.91) require monitoring wells to be placed in the uppermost aquifer at locations hydraulically upgradient and hydraulically downgradient of the waste management area. The upgradient monitoring wells must be sited so that they are unaffected by facility operations and are capable of yielding representative background samples. Downgradient monitoring wells must be sited to detect statistically significant concentrations and increases in hazardous constituents that have been released from the RCRA-regulated waste management unit. The downgradient wells should be placed as close as physically possible to the edge of the unit. In the case of a facility consisting of more than one RCRA-regulated waste management unit, the downgradient wells must be placed as close as physically possible along the point of compliance that circumscribes the waste management area.

The horizontal placement of downgradient wells along the perimeter of a waste management area should be predicated on the interception of potential pathways for contaminant migration. Potential pathways for contaminant migration include zones with relatively high intrinsic (matrix) hydraulic conductivities, fractured/faulted zones, solution channels, and zones suspected to be incompatible with the waste(s) present. Waste management areas located in heterogeneous geologic settings can have numerous, discrete zones of potential migration. Each zone of potential migration must be identified and monitored.

EPA or the State determines the number and placement of wells based on the size and shape of the RCRA-regulated waste management units and on the information contained in the initial site hydrogeologic investigation (40 CFR 264.95). The number and placement of monitoring wells may be specified by EPA or the State in the facility operating or closure permit.

5.10.2.2 Monitoring Well Design and Construction. EPA has developed specific technical design criteria for monitoring wells and GWMSs. With the exception of general requirements in 40 CFR 264.97 and 265.97, these specific criteria have not been codified. EPA has proposed (53 FR 143, pp. 28160-28168) to amend the general regulatory requirements under 40 CFR 264.97(c) by requiring documentation of the operation and maintenance of GWMSs (53 FR 143, pp. 28160-28168). The proposal requires that the design, installation, and decommissioning of any monitoring wells be documented and that piezometers or any other measurement, sampling, and analytical devices, as well as quality assurance/quality control (QA/QC) procedures for sampling and analysis, be documented in the operating record.

A groundwater monitoring well for a RCRA GWMS must be designed and constructed so that the representative samples can be obtained. Under the general regulatory requirements, the monitoring wells must be cased to maintain the integrity of the borehole, the casing must be screened to isolate flow zones, the annular space must be sealed off from the flow zone, and, if necessary, the screened interval must be packed with sand or gravel to facilitate flow to the monitoring well. Figure 5-1 illustrates a typical RCRA monitoring well; however, the monitoring well design can vary depending on the site. The drilling method and choice of construction materials are based on the site-specific hydrogeologic investigation, current groundwater quality, and waste characteristics. The technical details of how to drill the boreholes, select materials of construction, design and develop the monitoring well, and document monitoring well completion are provided in the *TEGD. A Guide to the Selection of Materials for Monitoring Well Construction and Groundwater Sampling* (Barcelona et al. 1983) provides additional guidance for materials selection.

5.10.3 Vadose (Unsaturated) Zone Monitoring

Land treatment units are the only RCRA-regulated waste management units that require vadose monitoring. The owner/operator of such units is required to implement a vadose monitoring system according to 40 CFR 264, 265, 267, and 270. Specifically, under 40 CFR 264.278, 265.278, 267.43, and 270.20, an owner/operator of a land treatment unit must monitor the soil and soil-pore liquid in the unsaturated or vadose zone. The general elements of the vadose zone monitoring program are similar to those of groundwater monitoring under Subpart F of 40 CFR 264 and 265. As in a groundwater monitoring program, the vadose zone monitoring program is designed to determine whether the concentrations of hazardous constituents show statistically significant increases over background concentrations.

Figure 5-1. Diagram of a typical RCRA monitoring well (EPA 1986a).

Requirements include soil monitoring using soil cores and soil-pore liquid monitoring devices such as lysimeters. The samples must be representative of soil-pore liquid and of the soil chemistry both at and below the treatment zone to determine whether hazardous constituents migrate out of the treatment zone (40 CFR 264.278). The treatment zone is specified in the permit but is generally no more than 5 ft from the land surface and at least 3 ft above the seasonal high water table. The number of samples, frequency and timing of sampling, analytical parameters, and statistical procedures for data analysis will be specified in the permit.

Owner/operators of interim status (40 CFR 265) land treatment facilities are required to submit an unsaturated zone monitoring plan to detect vertical migration of hazardous waste constituents and to provide information on the background concentrations in similar but untreated soils nearby. Background monitoring must be conducted before or in conjunction with required monitoring under 40 CFR 265.278(a)(1).

The number of soil and soil-pore water samples to be taken at interim status facilities is based on the variability of the hazardous waste constituents (as identified in 40 CFR 265.273) and soil type(s). Also, the frequency and timing of sampling is based on the proximity to groundwater and the soil permeability [40 CFR 265.278(c)(2)].

As outlined by closure and post-closure guidelines (40 CFR 265.280), the owner/operator must also characterize geologic and soil profiles, subsurface hydrology of the site, and soil characterizations, including cation exchange capacity, total organic carbon, and pH.

Owners/operators that permitted a new hazardous waste land treatment unit prior to the effective date of 40 CFR 264 regulations (February 13, 1983) are subject to Interim Standards in 40 CFR 267. The owner/operator, in addition to the groundwater monitoring program required in Subpart F, must implement an unsaturated-zone monitoring program to determine soil characteristics, including pH, permeability, the level of microbial activity in the soil, and the potential for rapid migration of waste constituents through the soil (40 CFR 267.43).

The State or EPA may require unsaturated zone monitoring at RCRA-regulated waste management units other than land treatment units on a site-specific basis. Examples include land-based units that are underlain by perched water or any unit where a contaminant release has occurred but vertical migration to the uppermost aquifer is hampered by low-permeability layers. For perched water, a monitoring system comparable to a GWMS may be required by EPA or the State.

5.10.4 Groundwater Sampling

The owner/operator must implement the approved SAP required under 40 CFR 264 Subpart F or 40 CFR 265 Subpart F upon construction of a GWMS. The approved SAP must include detailed descriptions of procedures for sample collection, sample preservation and handling, sample chain-of-custody, sample analysis, and field and laboratory QA/QC. The *TEGD* and *Test Methods for Evaluating Solid Waste - Physical/Chemical Methods* (SW-846, EPA 1988a) provide the necessary guidance for developing and implementing the SAP.

5.10.4.1 Appendix VIII and Appendix IX Analyses. When a statistically significant increase in the concentration of a contaminant is first detected in a monitoring well at the compliance point, additional requirements are triggered. Samples of groundwater must be collected and analyzed for a list of potential contaminants presented in 40 CFR 264, Appendix IX. Appendix IX includes both common names of

constituents for which analyses must be conducted and suggested analytical methods from SW-846 for each constituent (52 FR 131, pp. 25942-25953).

Prior to September 28, 1987, the hazardous constituents for which analyses were required for groundwater samples were listed in 40 CFR 261, Appendix VIII. This appendix, the "Hazardous Constituents List," was intended to include a broad universe of constituents that may harm human health or the environment. A number of problems arose with the application of Appendix VIII to analyses of water quality (52 FR 131, pp. 25942-25953). For this reason, EPA developed a new list (Appendix IX, 40 CFR 264) and used the Appendix VIII list as a start, deleting some constituents and adding others. EPA deleted the constituents for which analytical screening methods were not available, deleted constituents that were deemed relatively nontoxic, added constituents from the Superfund analyte list, and added specific constituents in place of the former general chemical classes. After Appendix IX became effective, Appendix VIII of 40 CFR 261 was no longer used as the list of parameters for groundwater sample analysis. Appendix VIII is now used to identify chemicals of concern in wastes to determine if the wastes are classified as hazardous (52 FR 131, pp. 25942-25953) and therefore RCRA-regulated or to assess migration of hazardous wastes into soils from a regulated waste management unit.

The EPA Regional Administrator or Director of the Idaho Department of Health and Welfare (IDHW) may also require analysis for constituents not listed in Appendix IX. These constituents are identified on a site-specific basis. They may include contaminants that may pose health or environmental hazards, and may also include certain constituents that pose little or no danger to humans or the environment. This latter group consists of constituents that may occur naturally in groundwater; data on these constituents provide valuable insight on the groundwater chemistry at the site (52 FR 131, pp. 25942-25953).

The results of the groundwater sample analysis must be submitted within 90 days to the EPA Regional Administrator or Director of the IDHW, along with an application for a permit modification to convert from the detection monitoring program to the compliance monitoring program. The required data include the types and concentrations of contaminants found in the groundwater at the compliance point and any proposed changes to the groundwater monitoring system or its operation (such as changes in sampling frequency) [40 CFR 264.98(h)].

In addition to the initial groundwater characterization required when contamination is first detected at a particular site, analysis for Appendix IX constituents is required on an annual basis following the first analysis. This is in addition to the regular groundwater monitoring program, under which the samples are analyzed for the constituents listed in the permit. The owner/operator must also continue to sample groundwater from the site GWMS at least semiannually, as required under the detection monitoring program. Once the facility permit is modified to include a compliance monitoring program, sampling is done quarterly. If the annual analysis for Appendix IX constituents indicates a contaminant not listed on the permit, the Regional Administrator and State Director must be notified. Additional information on these requirements is found in 40 CFR 264.98(h) and 264.99(d) and (f).

5.10.4.2 Sample Collection. The SAP must describe in detail the procedures for measurement of static water levels, detection of immiscible layers of contaminants, monitoring well evacuation, sample withdrawal, and field analysis of samples.

The static water level must be measured in each monitoring well prior to monitoring well evacuation and sample withdrawal [40 CFR 264.97(f) and 265.92(e)]. The SAP must provide a detailed description of

the method of measuring the static water level and the measurement device used. The measurement should include both the depth to standing water and the total well depth. Measurements must be made from a permanent reference point established on the casing stick-up. The reference point should be established relative to a National Geodetic Vertical Datum (NGVD). The measuring device must be accurate to ± 0.01 ft.

If the waste management area being monitored manages or has managed wastes including immiscible constituents, the owner/operator must provide a detailed description of the procedures and devices used for detecting those constituents in the wells if they cannot normally be detected in an aqueous phase. These procedures must be conducted prior to monitoring well evacuation. A device such as an interface probe must be used to determine the thickness of any layer(s) of immiscibles. The layer must be sampled separately from the groundwater.

The owner/operator must also provide a detailed description of the procedures and devices used in evacuating or purging the standing water in each monitoring well prior to sample withdrawal. The volume of monitoring well water to be removed will vary from site to site, but usually three casing volumes are sufficient to ensure that fresh formation waters have replaced any stagnant water in the monitoring well. If the groundwater to be sampled is known to contain hazardous constituents, all water purged from the monitoring well(s) must be contained until the concentrations of the constituents can be determined. If the purged waters are determined to be hazardous, the water must be disposed of in accordance with applicable disposal requirements for liquid hazardous waste.

After the monitoring well has recovered to the measured static water level, but no longer than two hours following monitoring well evacuation, the owner/operator should begin sample collection. The procedures and equipment used in sample collection should be described in detail in the SAP. The techniques used in obtaining the samples should be selected only after considering the parameters and constituents to be analyzed. Equipment used in obtaining samples should be dedicated. If the use of dedicated equipment is not possible, the equipment used must be decontaminated thoroughly prior to use. All equipment that comes in contact with the samples must be inert relative to the constituents to be analyzed to prevent chemical interference. EPA recommends using only fluorocarbon resin or stainless-steel devices and materials. In addition to the *TEGD*, the owner/operator should refer to *A Guide to the Selection of Materials for Monitoring Well Construction and Groundwater Sampling* (Barcelona et al. 1983) for guidance in selecting sampling devices. The order in which samples are collected should be based on the potential for volatilization of the constituents to be analyzed and should proceed from the most volatile to the least volatile constituents. EPA recommends the following sampling order for the more commonly analyzed constituents and parameters:

- Volatile organics
- Purgeable organics
- Total organic halogens and carbon
- Extractable organics
- Total dissolved metals

- Phenols
- Cyanide
- Sulfate and chloride
- Radionuclides.

Measurements of pH, temperature, and redox potential should be made in the field before each sample is collected due to the relatively unstable nature of these parameters. Field measurements should be made in separately aliquoted containers to prevent samples from being contaminated by the field analytical device electrodes.

5.10.4.3 Sample Preservation and Handling. The SAP must also provide descriptions of field methods to be used in preserving and handling samples, preservatives to be used, and sample containers to be used. *SW-846* provides detailed discussions of these aspects of groundwater sampling and should be referred to by the owner/operator (EPA 1988a).

The owner/operator must describe in detail the procedures to be used in preserving samples and the preservatives to be used. Methods of sample preservation are primarily limited to pH control, addition of chemicals, refrigeration, and protection from light sources.

Containers used to hold samples prior to analysis are to be specified in the SAP. The methods and reagents used in cleaning the containers must also be described. Owners/operators must use containers that are appropriate for the analyte to be measured. *SW-846* provides approved procedures for container preparation. The containers may be purchased from commercial sources that adhere to EPA guidelines. Whether the owner/operator prepares the containers or purchases them precleaned, an analysis of the final rinsate from the cleaning procedures should be made and maintained with the analytical results of the samples. Table 5-3 summarizes acceptable containers and preservatives.

The owner/operator must also describe special procedures to be employed in transferring the collected samples into the sample containers. This may include the following: careful handling of samples for analysis of volatile constituents to prevent aeration; leaving no headspace in volatile samples; splitting metals samples and filtering the portion to be analyzed for dissolved metals through a 0.45-micron filter; and using an amber glass bottle for total organic halogens and carbon.

5.10.4.4 Chain-of-Custody Program. The owner/operator must track all samples collected and document the movement of the samples through a chain-of-custody program. The program must be described in full and must, at a minimum, include the following elements:

- Sample labels to prevent misidentification of samples. The labels must be waterproof and should include a sample number, name of collector, date and time of collection, and analysis requested.
- Custody seals to ensure that the samples have not been disturbed or altered. Seals can be placed on sample containers or shipping containers (e.g., coolers).

Table 5-3. Summary of acceptable sample containers and preservatives for groundwater monitoring.^a

Parameter	Recommended container ^b	Preservative	Maximum holding time	Minimum volume required for analysis
<u>Indicators of groundwater contamination^c</u>				
pH	T, P, G	None required Field determined	None	25 mL
Specific conductance	T, P, G	None required Field determined	None	100 mL
TOC	G-amber, T-lined cap ^e	Cool 4°C ^d , HCl or H ₂ SO ₄ to pH <2	28 days	4 x 15 mL
TOX	G-amber, T-lined septa or caps	Cool 4°C ^d , H ₂ SO ₄ to pH <2	7 days	4 x 15 mL
<u>Groundwater quality characteristics^c</u>				
Chloride	T, P, G	4°C	28 days	50 mL
Iron	P, G	HNO ₃ to pH <2	6 months	200 mL
Manganese	P, G	HNO ₃ to pH <2	6 months	200 mL
Sodium	P, G	HNO ₃ to pH <2	6 months	200 mL
Phenols	G, T	Cool 4°C, 0.008% Na ₂ S ₂ O ₃	28 days	500 mL
Sulfate	T, P, G	Cool, 4°C ^d	28 days	50 mL
<u>EPA interim drinking water characteristics^c</u>				
Chromium	T, P, G	Field acidified to pH <2 with HNO ₃	6 months	1,000 mL
Mercury	P, G	(1) Field filtration (0.45 micron); (2) HNO ₃ to pH <2	28 days	1,000 mL
Total metals	P, G	HNO ₃ to pH <2	6 months	1,000 mL
Dissolved metals	T, P	(1) Field filtration (0.45 micron); (2) Acidify to pH <2 with HNO ₃	6 months	1,000 mL
Fluoride	T, P, G	HNO ₃ to pH <2	28 days	300 mL
Nitrate/nitrite	T, P, G	4°C ^d , H ₂ SO ₄ to pH <2	14 days	1,000 mL
Endrin	T, G	Cool, 4°C ^d	7 days	2,000 mL
Lindane	T, G	Cool, 4°C	7 days	2,000 mL
Methoxychlor	T, G	Cool, 4°C	7 days	2,000 mL
Toxaphene	T, G	Cool, 4°C	7 days	2,000 mL

Table 5-3. (continued).

Parameter	Recommended container ^b	Preservative	Maximum holding time	Minimum volume required for analysis
2,4 D	T, G	Cool, 4°C	7 days	2,000 mL
2,4,5-TP silvex	T, G	Cool, 4°C	7 days	2,000 mL
Radium	P, G	HNO ₃ to pH <2	6 months	1 gal
Gross alpha	P, G		6 months	1 gal
Gross beta	P, G		6 months	1 gal
Coliform bacteria	PP, G (sterilized)	Cool, 4°C	6 hours	200 mL
<u>Other Groundwater Characteristics of Interest</u>				
Cyanide	P, G	Cool, 4°C ^d , NaOH to pH >12 0.6 g ascorbic acid ^f	14 days ^g	500 mL
Oil and grease	G only	Cool, 4°, H ₂ SO ₄ to pH <2	28 days	100 mL
Semivolatile, Nonvolatile organics	T, G	Cool, 4°C ^d	7 days	1,000 mL
Volatiles	G, T-lined	Cool, 4°C ^d	7 days	1,000 mL

a. References: *Test Methods for Evaluating Solid Waste - Physical/Chemical Methods*. SW-846 (3rd edition, 1986)
Methods for Chemical Analysis of Water and Wastes. EPA-600/4-79-020 (March, 1979)
Standard Methods for Examination of Water and Wastewater. 17th Edition (1989).

b. Container types: P = Plastic
G = Glass
T = Fluorocarbon resins (PTFE, Teflon®, FEP, PFA, etc.)
PP = Polypropylene.

c. Based on the requirements for detection monitoring (40 CFR 265.93), the owner/operator must collect a sufficient volume of groundwater to allow for the analysis of four separate replicates.

d. Shipping containers (cooling chest with ice or ice pack) should be certified at the 4°C temperature at time of sample placement into these containers. Preservation of samples requires that the temperature of collected samples be adjusted to the 4°C upon placement of sample and during shipment. Maximum-minimum thermometers are to be placed into the shipping chest to record temperature history. Chain-of-custody forms will have Shipping/Receiving and In-transit (max/min) temperature boxes for recording data and verification.

e. Do not allow any head space in the container.

f. Use ascorbic acid only in the presence of oxidizing agents.

g. Maximum holding time is 24 hours when sulfide is present. Optionally, all samples may be tested with lead acetate paper before the pH adjustment in order to determine if sulfide is present. If sulfide is present, it can be removed by addition of cadmium nitrate powder until a negative spot test is obtained. The sample is filtered and then NaOH is added to pH 12.

- Field logbooks to document field activities and record field measurements. The logbook should be bound and the pages should be waterproof. Examples of information that should be recorded include monitoring well identification numbers, static water levels, times for various sampling activities, types of containers used and lot numbers, and field observations.
- Chain-of-custody records to track sample whereabouts and document sample possession. The owner/operator should employ a standard form to accomplish this. Figure 5-2 is an example of the form EPA uses for this purpose. A copy of the completed form should be retained by the owner/operator and a copy should accompany the samples to the laboratory.
- Sample analysis request forms to identify samples and analyses required. A copy of the completed form should be retained by the owner/operator and a copy should accompany the samples to the laboratory. The laboratory will probably provide the owner/operator with these forms upon request.
- Laboratory logbooks maintained by the laboratory to document the steps in preparing the samples for analysis (e.g., extraction) and to include results of quality control analyses. The owner/operator should ensure that the laboratory uses this documentation method.

5.10.4.5 Analytical Procedures. The owner/operator must ensure that the laboratory performing the sample analyses uses only EPA-approved (or equivalent) procedures. *SW-846* provides detailed discussion of all acceptable procedures. The procedures should be fully described in the SAP or in the laboratory's Quality Assurance Project Plan (QAPP). A copy of the QAPP must be available for review by EPA or the State.

5.10.4.6 Field and Laboratory Quality Assurance/Quality Control. It is incumbent upon the owner/operator to ensure the reliability and validity of all field- and laboratory-generated data through field and laboratory QA/QC programs. The field program for QA/QC should provide for the routine collection and analysis of field blanks including trip blanks and equipment blanks, calibration of field analytical equipment, and sampling equipment decontamination.

Trip blanks are used to verify that analytical results are free of bias from the sample containers, the sample container cleaning procedures, and the handling of the samples. Each time a group of bottles is prepared for use in the field, one bottle of each type (e.g., glass, fluorocarbon resin, polyethylene) should be selected from the batch and prepared as a trip blank. This trip blank should accompany the samples in the field and should undergo the same analyses. Equipment blanks should be prepared each time sampling equipment is decontaminated. This type of blank is used to check the adequacy of the decontamination effort and is collected from the final deionized water rinsate. The equipment blank should undergo the same analyses as the samples.

All field analytical equipment must be calibrated in the field prior to use and the calibration should be checked prior to measuring each sample. Procedures for calibration should be consistent with manufacturers' specifications and *SW-846*.

CHAIN OF CUSTODY RECORD

[illegible]

All nondedicated sampling equipment must be decontaminated between monitoring wells. The procedures for decontamination should include disassembling the equipment, rinsing with tap water, cleansing with a soft bristle brush and a nonphosphate detergent such as Alconox, rinsing with water, and at least one thorough rinsing with deionized water. The cleaned equipment should then be wrapped in aluminum foil. Personnel performing the decontamination should wear nontalc latex gloves (or equivalent) to further ensure that no contaminants are introduced.

All procedures for preparation of field blanks, field equipment calibration, and sampling equipment decontamination must be described fully in the SAP.

The owner/operator must ensure that the laboratory performing sampling analyses has prepared a QAPP that governs the conduct of all analyses and adheres to EPA guidelines for such plans in *SW-846*. The QAPP must include the routine use of standards, laboratory blanks, duplicates, and sample spikes and must provide for monitoring and documenting performance. QA analytical data must be submitted to EPA or the State along with sample results. The QAPP should be available for EPA or State review.

5.10.4.7 Frequency and Number of Samples. The owner/operator must collect samples from the background (upgradient) and compliance point (downgradient) monitoring wells and analyze them for the constituents listed in 40 CFR 265.92 or the constituents specified in the permit under 40 CFR 264.93. The sampling procedures and sampling intervals will also be specified in the SAP. The number of samples to be collected from each monitoring well will be specified by EPA in the permit (40 CFR 264) or in 40 CFR 265, Subpart F, for interim status.

5.11 Technical Specifications for Surface Water Monitoring Under RCRA

RFIs are multimedia environmental investigations of existing or potential contamination of soil, groundwater, surface water, and air. The *RFI Guidance Manual* provides guidance for surface water and groundwater investigations (EPA 1989a). It should be noted that specific surface water monitoring requirements are primarily limited to corrective action aspects of RCRA. The EPA is currently promulgating in draft form specific language for technical aspects of RCRA corrective action programs under Subpart S of 40 CFR 264, and would also amend 40 CFR 265 and 270. The new regulation will stipulate technical and procedural requirements for conducting corrective action to clean up significant releases to air, surface water, groundwater, and soil at SWMUs at operating, closed, or closing RCRA facilities (see Section 5.12.2).

The owner/operator at a RCRA facility seeking a Part B permit must provide information for each SWMU, as required under 40 CFR 270.14(d). The owner and operator may be required to conduct sampling and provide analytical results for groundwater, surface and subsurface strata, surface water, and air where the EPA or the State agency specifies the need for a RCRA Facility Assessment to determine if a RFI is necessary to provide further information (see Section 5.9).

5.11.1 Surface Water Site Characterization

The owner/operator of a RCRA facility undergoing corrective action for SWMUs is required to conduct an investigation to adequately characterize the surface water and groundwater quality. The goal of the RFI is to evaluate the nature, extent, and rate of migration of existing or future releases of hazardous constituents

to all environmental media. The hydrologic investigation should include an evaluation of surface water and overland flow characteristics, fate and transport mechanisms of hazardous constituents, and identification of the impacts on water quality. Contamination may also be transported by mechanisms such as hydraulically connected surface water and groundwater, flow deposition in sediments, and airborne deposition. The investigation should include sampling of run-off from contaminated areas, leachate seeps, outfalls, and other migration pathways for surface water. Additionally, the design of the monitoring system depends on characteristics of the hazardous constituents in order to evaluate environmental fate and transport. To properly design the system, the SWMUs must be defined and the relationship between unit characteristics and migration pathways to surface waters.

5.11.2 Design of Surface Water Monitoring Systems

In order to characterize contaminant releases, the *RFI Guidance Manual* recommends a phased approach for surface water characterization. If necessary, subsequent or expanded monitoring and evaluation may be required to adequately characterize the contaminant sources and the environmental setting. The phased monitoring program allows for modifications to the design as deemed necessary to further and more effectively characterize the surface water. The following factors should be considering when designing a surface water monitoring program:

- Collect and review existing information on the contaminant source and environmental setting, including
 - Waste and unit characteristics (e.g., chemical and physical properties)
 - Hydrologic characteristics (e.g., stream discharge, flow rates and volume)
 - Soil, climatic, topographic, and geologic description
 - Actual or suspected release characteristics (e.g., release nature and extent, location, rate, and frequency)
 - Inter-media transport
 - Conceptual model of release
- Develop monitoring procedures and program, including
 - Monitoring program objectives
 - Monitoring constituents and indicator parameters
 - Monitoring locations and frequencies
 - Monitoring types (e.g., hydrologic, biologic, and sediment)

- Conduct monitoring phase, including
 - Sample collection and field analysis
 - Sample analysis for selected parameters and constituents
- Collect, evaluate, and report results, including
 - Analytical and field data
 - Data validation and QA/QC
 - Characterization of analytical and field data
 - Monitoring program objectives assessment
 - Monitoring location, constituents, and frequency adequate to characterize release.

The type and amount of information necessary to adequately characterize the surface water will be facility and site-specific in nature. Site-specific variables determine the design of the surface water monitoring system, including the size and shape of the SWMUs, complexity of the surface and subsurface geology and hydrology, background water quality, flow and transport characteristics, and the nature and extent of contamination.

5.11.2.1 Monitoring Locations and Frequencies. The design and selection of monitoring locations will affect the representativeness of samples taken during monitoring and ultimately allow the determination of surface water quality. As a result, samples must be taken at locations representative of the physical and chemical characteristics of the water body as well as represent any variability in water quality. A conceptual model may be developed to represent potential contaminant distribution within the receiving waters to assist in defining monitoring locations. Contaminant distribution depends on factors such as the physical and chemical characteristics of the receiving waters, the characteristics of the contaminants, and the nature of point source and non-point source discharges. In general, monitoring stations must be located in the three following areas relative to the discharges:

- Background monitoring station(s) located in an area not affected by the release or releases of concern (i.e., upstream of the release)
- Monitoring station(s) at the discharge point(s) or area, depending on the nature of the discharge (i.e., point source or non-point source)
- Monitoring station(s) in the receiving water body within the area of potential influence.

Monitoring efforts should be concentrated within the area of potential influence. The following factors must be considered when selecting the monitoring stations within the area of influence:

- The homogeneity or heterogeneity of the water body (i.e., temperature, flow, salinity, and other physical and chemical characteristics)

- The representativeness of the monitoring point
- The presence of contaminated areas
- The development of a defensible monitoring design, including adequate sample size determination, experimental designs, and monitoring schemes (e.g., random grid, stratified random grid, and systematic grid).

Monitoring frequency should be determined by the facility owner/operator on a site-specific basis. The frequency of sample collection depends on the type of release, variability in water quality, process design factors, and meteorological factors. All monitoring points should be sampled as close to simultaneously as possible, regardless of frequency. The homogeneity of the receiving waters has an effect on the fate of contaminants, such as flow and seasonal and diurnal stratification. Sampling frequency also depends on whether the release is continuous or event-associated, such as rainfall/run-off or process triggered.

5.11.3 Surface Water Sampling

The owner/operator must develop and implement an RFI Work Plan which includes the strategy to characterize the nature, extent, and rate of migration of a release or releases of hazardous constituents. This Work Plan consists of a number of components, including the site-specific RFI Strategy which must be submitted for approval by the EPA or State Agency. The RFI Strategy describes the specific procedures for monitoring and data collection, characterizing each contaminant source, and evaluating the environmental setting. Methods for collecting pre-existing data should be included as well. The RFI Strategy must have detailed descriptions of methods and monitoring procedures for sample collection and analysis, sample preservation and handling, chain-of-custody, and field and laboratory QA/QC. The *RFI Guidance Manual*, the *TEGD*, and *SW-846* provide the necessary guidance for developing and implementing the RFI Strategy. In addition, EPA's *A Compendium of Superfund Field Operations Methods* (EPA, 1987) may be used for guidance on project planning and management, field and sampling methods, sampling and monitoring system design, and QA/QC.

5.11.3.1 Appendix IX Analyses. The general strategy for selecting specific monitoring constituents starts with the list of potential contaminants presented in 40 CFR 264, Appendix IX. Appendix IX includes both common names of constituents for which analyses must be conducted and suggested analytical methods from *SW-846* for each constituent (52 FR 131, pp. 25942-25953). Surface water and samples must first be collected and analyzed for the Appendix IX listing of hazardous constituents, as appropriate. As the RFI monitoring program progresses, the Appendix IX list may be tailored to a more appropriate set of monitoring constituents. The monitoring list should be based on site-specific considerations such as industry-specific information, sampling and analysis of waste from the unit, and the contaminated media. The EPA or the State agency may also require analysis for constituents not listed in Appendix IX. These constituents are identified on a site-specific basis.

5.11.3.2 Sample Collection. The sampling and analysis program must describe in detail the procedures for measurement of flow rates, water surface elevations, field analysis of samples, and sampling techniques.

The methods for taking hydrologic measurements depend on the characteristics of the release and the environmental setting. Primarily, the types of measurements that may need to be taken depend on the flow conditions. Generally, four types of flow conditions exist: (1) overland flow, (2) open channel flow, (3) closed conduit flow, and (4) lakes and impoundments. An effective monitoring program requires that the physical attributes of the water body be characterized, and the appropriate hydrologic measurements be taken. For overland flow conditions, hydraulic measurements, rainfall/run-off measurements, infiltration measurements, and drainage basin characterization may be appropriate. Open channel flow conditions require measurement of flow stages (e.g., storm event, seasonal); velocity; channel and man-made controls discharge; width, depth, and cross-sectional area; and definition of flow pathways. Closed conduit flow conditions require measurement of discharge. Lakes and surface impoundments require measurement of flow pathways, temperature distributions, and morphometric and bathymetric mapping.

Special care should be taken to delineate differential flow velocities, and mixing zones within the stream channel or overland flow. The choice of flow-measurement devices will also depend on whether the flow is continuous or intermittent, if the channel is open or closed, channel geometry, hydraulic discontinuities, frequency of measurement, exposure to weather, and access restrictions. In addition, duration of measurement may determine the need for a permanent flow-measuring device. Examples of flow, depth, and surface water elevation measuring devices include the following:

- Current meter
- Water stage gauge
- Weirs
- Automatic recording devices
- Stilling wells.

The flow measurement techniques selected for field investigations must be specific to the surface water monitoring conditions. Accurate flow measurements are essential to adequately characterize the nature, rate, and extent of contaminant releases to surface water. The owner/operator must provide a detailed description of the procedures and devices used during the measurement of flow data.

Because each hazardous waste site may contain a variety of waste substances, a variety of sampling equipment and techniques may be necessary. Samples from shallow depths can be readily collected by submerging a sample container. A telescoping aluminum pole with an adjustable beaker clamp attached to the end extends the reach of the sampler. Sample collection methods from various depths may include weighted-bottle samplers, Teflon bailers, or peristaltic pumps with silicon or Teflon tubing. Pumping methods should be avoided, wherever possible, when sampling for volatile organics or oil and grease.

The sampling devices and decontamination procedures selected should minimize the potential for cross-contamination or chemical interference and not compromise sample integrity and analytical results. The procedures and equipment used in sample collection should be described in detail. The techniques used in obtaining the samples should be selected only after considering the parameters and constituents to be analyzed. Equipment used in obtaining samples should be dedicated to each sampling location. If the use of dedicated equipment is not possible, the equipment used must be thoroughly decontaminated prior to use. In general,

the use of sampling devices, either disposable or constructed of a nonreactive material such as glass, stainless steel, or Teflon, is recommended by the EPA. The order in which samples are collected should be based on the potential for volatilization of the constituents to be analyzed and should proceed from the most volatile to the least volatile constituents. A suggested sampling order recommended by EPA is discussed in Section 5.10.4.2.

Measurements of pH, temperature, and redox potential should be made in the field before each sample is collected due to the relatively unstable nature of these parameters. Field measurements should be made in separately aliquoted containers to prevent samples from being contaminated by the field analytical device electrodes.

A detailed, site-specific plan that covers all sampling objectives and strategies should be included in the RFI Strategy. The plan describes collection methods, protocols, and equipment used, locations, number and type of samples, field physical parameters, and analytical parameters. Surface water sampling methods and devices chosen are also dependent on specific site conditions. The primary objective of a sampling program is the acquisition of samples that are representative of the source(s) under investigation. These samples must be suitable for subsequent analysis to enable identification of the types and amounts of pollutants present. Information derived from sampling often forms the basis for litigation and development of corrective action. Therefore, all sampling programs must be conducted in a manner that will ensure the reliability and validity of the data.

5.11.3.3 Sample Preservation and Handling. A detailed description of field methods to be used in preserving and handling samples, preservatives to be used, and sample containers to be used must be provided in the sampling plan. *SW-846* provides detailed discussions of these aspects of sampling and should be referred to by the owner/operator (EPA 1988a). Methods of sample preservation are primarily limited to pH control, addition of chemicals, refrigeration, and protection from light sources. The requirements for sample preservation and handling are the same for groundwater and surface water sampling (see Section 5.10.4.3).

5.11.3.4 Chain-of-Custody. The QA/QC procedures must also include chain-of-custody procedures and documentation. Chain-of-custody allows the possession and handling of samples to be tracked from the time of collection through analysis and final disposition. This process helps to ensure the sample integrity from collection to data reporting. Chain-of-custody requirements are the same for groundwater and surface water sampling (see Section 5.10.4.4)

5.11.3.5 Analytical Procedures. The owner/operator must ensure that the laboratory performing the sample analyses uses only EPA-approved (or equivalent) procedures. *SW-846* provides detailed discussion of all acceptable procedures. The procedures should be fully described in the SAP or in the laboratory's QAPP. A copy of the QAPP must be available for review by EPA or the State.

5.11.3.6 Field and Laboratory Quality Assurance/Quality Control. It is incumbent upon the owner/operator to ensure the reliability and validity of all field- and laboratory-generated data through field and laboratory QA/QC programs. The field program for QA/QC should provide for the routine collection and analysis of field blanks including trip blanks and equipment blanks, calibration of field analytical equipment, and sampling equipment decontamination. QA/QC programs are required for both surface water and groundwater sampling programs (see Section 5.10.4.6).

5.11.3.7 Frequency and Number of Samples. Site-specific conditions determine the frequency and number of surface water samples required to adequately assess the water quality. In general, at least three monitoring stations should be established, as follows: (1) a background monitoring station located in an area not affected by the release or releases of concern, (2) a monitoring station at the discharge point(s) or area, depending on the nature of the discharge, and (3) a monitoring station at the receiving water body within the area of potential influence.

5.12 Proposed Changes to RCRA Monitoring Requirements

The EPA proposed requirements in July 1990 (55 FR 145, pp. 30798-30889) entitled, "Corrective Action for Solid Waste Management Units at Hazardous Waste Management Facilities" for corrective action for SWMUs at facilities seeking permits under Section 3005(c) of RCRA. The proposal would expand regulations under 40 CFR 264, Subpart S, and amend existing 40 CFR 265 and 270 by making conforming changes.

The proposed Subpart S would apply only to owners/operators of waste management units seeking RCRA permits and would establish specific technical and procedural requirements for conducting RFIs, evaluating potential remedies, and implementing remedies for releases of hazardous constituents from SWMUs. The proposed requirements would apply to all environmental media including groundwater, surface water, air, and soil. These proposed regulations would have no specific effect on routine groundwater monitoring requirements under 40 CFR 264 or 265, but would require similar programs for groundwater monitoring wells, sampling, and analysis as part of corrective action.

6. COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT

In addition to the detailed protection and cleanup requirements of the Resource Conservation and Recovery Act (RCRA), the U.S. Congress enacted the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), which facilitates response to dangerous environmental conditions and provides funding for environmental cleanups. CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA) of October 17, 1986, provides the statutory framework for cleaning up hazardous waste sites. The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) codifies the U.S. Environmental Protection Agency (EPA) implementation policy written under CERCLA in Section 105. CERCLA is commonly known as Superfund.

This section discusses important requirements and provisions of CERCLA and the policy directives that address its implementation. CERCLA itself lacks actual regulatory requirements for groundwater and surface water monitoring; however, it mandates that requirements of other environmental laws be applied when appropriate, and it requires cleanup of contaminated water resources if the contamination could pose a hazard to human health or the environment. Other environmental statutes and strategies that affect Superfund remediation include the following:

- EPA's Groundwater Protection Strategy (EPA 1991), discussed in Section 2 of this report
- RCRA, discussed in Section 5
- Toxic Substances Control Act (TSCA), discussed in Section 7
- Safe Drinking Water Act (SDWA), discussed in Section 8
- Clean Water Act (CWA), discussed in Section 9
- State of Idaho requirements, discussed in Section 12.

On December 21, 1989, the Idaho National Engineering Laboratory (INEL) was placed on the CERCLA National Priorities List (NPL) for Federal facilities (54 FR 223, pp. 48184-48200). Since the INEL was placed on the NPL, a Federal Facility Agreement/Consent Order (FFA/CO) requiring cleanup under CERCLA has been negotiated among the U.S. Department of Energy (DOE), EPA Region X, and the State of Idaho Department of Health and Welfare. Requirements applicable to Federal facilities under CERCLA are discussed below.

Once a site has been added to the NPL, negotiations take place between EPA and the responsible party(s) to establish a CERCLA FFA. This agreement identifies the work that needs to be performed at the site and establishes a schedule. The initial work usually involves a remedial investigation (RI) (site characterization), which includes field investigations to define the nature and extent of contamination, characterization of the waste types, and contaminant concentrations and distributions. Once the contaminants of concern have been identified, the applicable or relevant and appropriate requirements (ARARs) can be identified, and the initial cleanup goals can be determined. The remedial actions implemented under CERCLA

frequently involve cleanup of contaminated water resources. The appropriate level of cleanup is determined through the use of ARARs.

For the setting of cleanup levels under CERCLA, ARARs are described as follows in the *CERCLA Compliance with Other Laws Manual* (EPA 1988b):

- Applicable requirements are cleanup standards; standards of control; and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a Superfund site.
- Relevant and appropriate requirements, like applicable requirements, are cleanup standards, standards of control, or other substantive environmental protection requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting law. While not technically applicable to a hazardous substance, pollutant or contaminant, remedial action, location, or other circumstance at a CERCLA site, relevant and appropriate requirements address problems or situations sufficiently similar to those encountered at a CERCLA site so that their use is well-suited.

Because situations at CERCLA sites vary widely, EPA cannot categorically specify requirements that will be ARARs for every site. ARARs can be identified only on a site-specific basis (i.e., established in connection with the characteristics of the particular site, the chemicals present at the site, and the remedial action alternatives suggested by the circumstances of the site).

6.1 Purpose and Major Aspects of CERCLA

CERCLA was passed into law in December 1980. CERCLA's scope is far broader than any of the other Federal environmental statutes. CERCLA covers all environmental media, including air, surface water, groundwater, and soil. The law was established for the following purposes: (a) to identify sites from which releases of hazardous substances into the environment might occur or have occurred, (b) to evaluate damages to natural resources, (c) to ensure cleanup by responsible parties and/or the government, and (d) to create a claims procedure for parties who have cleaned up sites or have spent money to restore natural resources. Some of SARA's most important changes relating to cleanup of contaminated water resources include

- Codification of former EPA "policy" with respect to (a) CERCLA compliance with other environmental laws, (b) the offsite disposal policy, and (c) ARARs for site cleanup (Section 121)
- Establishment of stringent cleanup standards with a preference for permanent solutions, such as incineration, that significantly reduce waste volume, toxicity, or mobility, and encourage alternatives to land disposal (Section 121)
- Limitation of the use of alternate concentration limits for contaminated groundwater for any receptor beyond the facility boundary (Section 121)

- Requirements to review remedial action if any hazardous substances remain onsite to ensure continued protection of human health and the environment, with any necessary remedial actions reported to Congress (Section 121).

6.1.1 CERCLA Application

The CERCLA statute applies to any facility where a "hazardous substance has been deposited, stored, disposed of, placed, or otherwise come to be located" (CERCLA PL96-510 et seq.). The term "hazardous substance" includes the following:

- Hazardous substances as listed in the Federal Water Pollution Control Act (FWPCA), Section 311(b)(2)(A), and any toxic pollutant as described in FWPCA
- Any element, compound or mixture, solution, or substance designated pursuant to CERCLA, Section 102
- Any hazardous constituents listed or characterized in RCRA
- Any hazardous air pollutant under the Clean Air Act, Section 112
- Any imminently hazardous chemical substance or mixture regulated under TSCA, Section 7.

Certain hazardous substances are excluded from regulation under CERCLA, including consumer products, petroleum and natural gas, and some radioactive materials. Federally permitted releases of source, special nuclear, and byproduct materials, as defined by the Atomic Energy Act, are excluded if the release is subject to Nuclear Regulatory Commission (NRC) licensing requirements and is released under provisions of applicable laws, regulations, and orders, including DOE orders. Releases of source, special nuclear, and byproduct materials from uranium ore processing sites are also excluded if the sites are regulated under the Uranium Mill Tailings Radiation Control Act. These exclusions do not exempt all radioactive materials from CERCLA requirements. The hazardous substances (including certain radionuclides) regulated under CERCLA are listed in 40 CFR 302, Table 302.4. Reporting and notification requirements for continuous releases of hazardous substances are detailed in 40 CFR 302.

Under CERCLA, Section 103(a), a facility owner/operator must immediately report a release of a hazardous substance in a quantity that equals or exceeds its reportable quantity (RQ) (defined in 40 CFR 117, Table 117.3) to the National Response Center (1-800-424-8802). A release is reportable if an RQ or more is released within a 24-hour period. Section 104 of CERCLA states that the Federal government may respond to a release or substantial threat of release of a hazardous substance into the environment. Response activities are to be conducted, to the extent practicable, in accordance with the NCP (40 CFR 300), which was originally developed under the CWA and has been revised to reflect the responsibilities created by CERCLA and the Oil Pollution Act (PL 101-380). Section 304 of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA), also known as Title III of SARA, requires owners/operators of certain facilities to report certain releases of extremely hazardous substances to State and local authorities. EPCRA Section 304 notification must be given immediately after releases of hazardous substances in quantities equal to or greater than their RQs to the community emergency coordinator for any area likely to be affected by the release and to the State emergency response commission. Exceptions are specified in 40 CFR 117.11(a)-(j).

6.1.2 CERCLA Remediation

Events that may trigger CERCLA response or liability are defined as the release or "threat of" release into the environment, including water resources, of a hazardous substance, pollutant, or contaminant. CERCLA defines these terms quite broadly. The CERCLA process begins with a preliminary assessment, site inspection, and site ranking, leading to either the inclusion or rejection of the site on the NPL based on the Hazard Ranking System evaluation. When removal and/or response actions are taken, and facilities are listed on the NPL, a higher priority is given to facilities where the release of pollutants or contaminants has resulted in the closing of drinking water wells or the contamination of a principal drinking water supply. The NCP (40 CFR 300), which was established under Section 105 of CERCLA, defines responses to actual or threatened releases of oil or hazardous substances to the environment. It calls for remedial investigation/feasibility studies (RI/FSS) for each NPL site. This process determines the nature and extent of the threat presented by the release of a hazardous substance to the environment, and evaluates proposed remedies. Guidance for CERCLA actions is provided by the EPA in *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA 1988e).

The scope of the RI/FS process must specifically include the following:

- Collect and analyze existing data
- Identify initial operable units, likely response scenarios, and potentially applicable remedial action objectives
- Initiate Federal/State ARARs identification (see Section 6.2)
- Identify initial quality assurance/quality control (QA/QC) objectives
- Prepare project plans [i.e., RI/FS workplans, sampling and analysis plans (SAPs), QA/QC plans, health and safety plans].

The purpose of a remedial investigation is to collect data necessary to adequately characterize the site in order to develop and evaluate effective remedial alternatives. To accomplish site characterization, the following activities are conducted, as appropriate:

- Conduct a field investigation
- Define the nature and extent of contamination
- Identify chemical and location-specific ARARs
- Conduct a baseline risk assessment
- Perform treatability studies.

Field investigations are designed to assess the physical characterization of the site, such as physiography, geology, soils and the vadose zone, surface water hydrology, hydrogeology, meteorology, land use, and ecology; specific characterization of air, surface water, and groundwater resources; and waste

characterization, source characterization, exposure pathways through environmental media, and human exposure pathways. When these factors are evaluated, the extent to which the release poses a threat to health or the environment can be determined. This information is intended to support the analysis and design of potential response actions.

Field investigation methods used in RIs are selected to meet the data needs established in the scoping process and outlined in the work plan and SAP. A compilation of field methods used during remedial response actions at hazardous waste sites is contained in *A Compendium of Superfund Field Operations Methods* (EPA 1987). This guidance document focuses primarily on techniques and methods used during the fieldwork phase of a remedial investigation. Methods are described for (1) implementing field activities, (2) investigating site physical characteristics, (3) defining sources of contamination, and (4) evaluating the nature and extent of contamination.

The primary objective of the feasibility study is to ensure the development and analysis of the appropriate remedial alternatives. Potential treatment technologies are evaluated and assembled into alternative remedial actions. A principal element of the study is to develop a range of alternatives that reduce the toxicity, mobility, or volume of the hazardous substances, pollutants, or contaminants. Three criteria are used to guide the development and screening of remedial alternatives, as follows: (1) effectiveness, (2) implementability, and (3) cost. After the alternatives are established, they are each evaluated against nine criteria set forth in the NCP in Section 300.430.

Further activities under CERCLA include remedial action selection/design and remedial action implementation. The remedial design/remedial action stage includes the development of the actual design of the selected remedy and implementation of the remedy through construction. Once the RI/FS has presented EPA with several detailed cleanup options, the EPA must select the appropriate remedy by preparing and publishing a Record of Decision (ROD). Operation and maintenance measures are initiated after the remedy is determined to be operational and functional and has met remedial action objectives and remediation goals in the ROD. Site monitoring of water resources is an integral part of the operation and maintenance activities to verify the effectiveness of the remedy.

6.2 CERCLA Requirements Pertaining to Groundwater and Surface Water

Although it does not directly require monitoring of groundwater and surface water, CERCLA, as amended by SARA, provides the statutory framework for cleaning up CERCLA sites. The NCP (40 CFR 300) codifies the EPA implementation policy written under CERCLA.

The specific requirements for monitoring of groundwater and surface water are usually determined during the preparation of the RI/FS work plan. This work plan will also include a SAP, which identifies the sampling activities to be conducted and the analyses to be performed on the samples collected. The work plan usually outlines what will be done with the data. It also requires that appropriate levels of cleanup be attained at sites receiving remedial action. Since monitoring of groundwater and surface water is necessary to determine compliance with this requirement, monitoring of groundwater and surface water is required under CERCLA. No specific directions on how monitoring should be conducted are provided in CERCLA. However, several guidance documents are available which include field methods, sampling and flow measurement techniques, and characterization methods. *A Compendium of Superfund Field Operations*

Methods provides detailed guidance for remedial investigations that require characterization of groundwater and surface water conditions (EPA 1987). Further information on CERCLA requirements pertaining specifically to groundwater is available in *Guidance on Remedial Actions for Contaminated Ground-Water at Superfund Sites* (EPA 1988c).

6.3 Identification of ARARs

Section 121 of CERCLA specifies that response actions must be taken in compliance with ARARs established in Federal and State environmental laws. The NCP clearly states that compliance with ARARs is one of the statutory requirements for remedy selection. Prior to the SARA, EPA required compliance with all Federal ARARs but not with State requirements. The revised NCP incorporates the new statutory requirement that, in addition to Federal ARARs, remedies must comply with State environmental requirements and facility siting laws when they are more stringent than corresponding Federal standards. These laws or standards must be identified by the State in a timely manner (EPA 1988b). In addition, the importance of nonpromulgated criteria or other advisory information to be considered is formally recognized in the NCP in the development of remediation goals or cleanup levels. The following Federal and State laws may contain ARARs pertinent to the INEL:

- RCRA, discussed in Section 5 of this report
- TSCA, discussed in Section 7
- SDWA, discussed in Section 8
- CWA, discussed in Section 9
- State of Idaho requirements, discussed in Section 11.

In the past, DOE has taken the position that regulations addressing groundwater and surface water are inapplicable because of the doctrine of sovereign immunity. DOE has now decided to comply with such regulations as a matter of policy. In the CERCLA context, this means regulations that are not applicable may be relevant and appropriate.

6.3.1 Types and Applications of ARARs

ARARs typically fall into three categories: chemical-specific, location-specific, and action-specific. Brief descriptions of each ARAR type are given below:

- *Chemical-specific* ARARs are health-based or environmentally based numerical values limiting the amount of a contaminant that may be discharged to or allowed to remain in environmental media. These include, for example, maximum contaminant levels established under the SDWA. Generally, chemical-specific ARARs are used when setting preliminary cleanup levels.
- *Location-specific* ARARs restrict activities or limit concentrations of contaminants in effluent because a site is in a special location, such as a floodplain, wetland, or historical area.

- *Action-specific* ARARs are technology- or activity-based triggers, which may include the limitation of discharges of treated water to streams by a particular action. Figure 6-1 presents several action-specific ARARs that may be required for cleanup of contaminated groundwater at a Superfund site.

6.3.2 Waiver of ARARs

ARARs most pertinent to groundwater and surface water remedies relate to the setting of cleanup levels and water quality standards, operation of treatment processes and disposal activities, discharge limitations, site-specific physical characteristics, and management of treatment residuals. CERCLA, Section 121(d)(4), specifies six conditions under which ARARs may be waived:

1. The remedial action selected is only part of a total remedial action that will attain the required level or standard of control when completed
2. Compliance with the ARARs, criteria, or limitation at the facility will result in a greater risk to human health than alternative options
3. Compliance with the ARARs, criteria, or limitation is technically impractical from an engineering perspective
4. The remedial action selected will attain a standard of performance equivalent to that of the ARARs
5. With respect to a State standard, criteria, or limitation, if the State has not consistently applied it to other, similar circumstances at remedial actions, or if the State has not demonstrated the intention to apply it consistently
6. If an action is undertaken solely under CERCLA, Section 104, using the Hazardous Substance Response Trust Fund (Superfund), and if the remedial action selected to attain an ARAR will not provide a balance between the need to protect public health and welfare and the environment, and the availability of monies from the Fund to respond to other sites that present (or may present) an immediate threat to public health and welfare and the environment.

6.4 Interface of CERCLA with Other Statutes

CERCLA is designed to provide the impetus for cleanup of hazardous waste sites that pose an imminent danger to human health or the environment. As such, it does not list all actions that must be taken during a remedial effort. Instead, CERCLA refers to other laws that may apply during certain phases of site remediation. Since other statutes may be "applicable" or "relevant and appropriate," it is necessary to determine whether other statutes apply. Tables 6-1 and 6-2 describe some situations to which Federal and State regulations may apply, respectively.

Figure 6-1. Examples of action-specific ARARs.

Table 6-1. Situations in which CERCLA mandates compliance with other Federal regulations.

Situation	Applicable regulations		
	Clean Water Act	Safe Drinking Water Act	Toxic Substances Control Act
Water is being discharged to a surface water or a publicly owned treatment works.	X		
Water is being discharged to an injection well.		X	
PCBs are present in the water being discharged or managed.			X
Contamination threatens a present or potential domestic water supply well.		X	

Table 6-2. Situations in which CERCLA mandates compliance with State of Idaho regulations.

Situation	Applicable rule(s) and regulation(s)					
	Solid Waste Management Regulations and Standards	Rules and Standards for Hazardous Waste	Well Construction Standards and Rules	Rules for the Construction and Use of Injection Wells	Water Quality Standards and Wastewater Treatment Requirements	Idaho Groundwater Quality Protection Act
A water supply is located within 1/4 mile of a proposed sanitary landfill.	X	—	—	—	—	—
A treatment, storage, or disposal facility is operated.	—	X	—	—	—	—
Water wells, monitoring wells, low-temperature geothermal wells, injections wells, or other artificial openings are maintained in the ground greater than 18 ft in depth.	—	—	X	—	—	—
Water is being discharged to an injection well.	—	—	—	X	—	—
Water is being discharged to a surface water or publicly owned treatment works.	—	—	—	—	X	—
The quality of the groundwater is being threatened or appears to be in danger of contamination.	—	—	—	—	—	X

6.5 Natural Resource Damage Assessments

CERCLA is the mechanism for Federal response to unauthorized releases (threatened or actual) to the environment of oil and/or defined hazardous substances. CERCLA also defines the liabilities of responsible parties (past and/or present) for the costs of both emergency removal and longer-term remedial actions in responding to these threats to human health and the environment. The cost-recovery provisions of CERCLA, however, extend beyond those required for emergency and remedial actions. CERCLA, Section 107 (as amended by SARA, Section 107), provides for the assessment of additional cost to liable parties for damages resulting in "injury to, destruction of, or loss of natural resources" because of releases of oil and/or defined hazardous substances [Section 107(a)(c)]. CERCLA, through the NCP, provides for the designation of Federal and State trustees of natural resources (on, above, or under lands under their trusteeship) who are empowered to assess such damages, make claims against the responsible parties (or the Hazardous Substance Response Trust Fund), and to recover those funds to restore or replace the damaged natural resource. If natural resources have been impacted by the release, the lead agency will notify the State or Federal Trustee promptly. The Trustee is to initiate actions and is required to coordinate these actions through the lead agency when there is more than one Trustee. The Secretary of Energy has been designated by the President as the trustee for DOE land. Private parties may not recover damages under the natural resource damage provisions of CERCLA.

Natural resources are defined by CERCLA, Section 101(16), to include land, fish, wildlife, biota, air, water, groundwater, drinking water supplies, and other such resources belonging to, managed by, held in trust by, pertaining to, or otherwise controlled by the United States (including the resources of the fishery conservation zone established by the Fishery Conservation and Management Act of 1976), any State or local government and foreign government, any Indian tribe, or, if such resources are subject to a trust restriction or alienation, any member of an Indian tribe.

Liability cannot be assessed for natural resource damages under CERCLA, Section 107, for the following:

- Injuries that occurred entirely before the enactment of CERCLA
- Injuries to certain natural resources that were specifically identified as an irreversible and irretrievable commitment of natural resources in an environmental impact statement or other comparable environmental analysis
- Injuries resulting from the application of a Federally registered pesticide product.

The statute of limitations for filing an action for natural resource damages is three years after the later of the following: the date of discovery of the loss and its connection with the release in question, or the date on which final regulations are promulgated under CERCLA, Section 301. NPL sites, Federal facilities identified under CERCLA, Section 120, or any facility at which a CERCLA remedial action is scheduled are exempt from this statute. An action must be brought at these sites within three years of completion of remedial action.

7. TOXIC SUBSTANCES CONTROL ACT

The Toxic Substances Control Act (TSCA) of 1976 regulates toxic substances, particularly chemical substances and mixtures, under Title I, asbestos hazard emergency response under Title II, and indoor radon abatement under Title III. The law was enacted in response to the proliferation of "chemical substances and mixtures . . . whose manufacture, processing, distribution in commerce, use or disposal may present an unreasonable risk of injury to health of the environment."

Under TSCA, the term "chemical substance" includes both organic and inorganic substances of a particular molecular identity, and any element or combined radical. This term does not include any mixture, foods, food additives, devices, drugs, cosmetics, pesticides, or tobacco products. It also does not include any source, special nuclear, or byproduct material as defined by the Atomic Energy Act. If a toxic substance is mixed with nuclear material, the toxic substance is regulated under TSCA. The term "mixture" means any combination of two or more chemical substances if the combination does not occur in nature and is not ... the result of a chemical reaction...

Under TSCA, the U.S. Environmental Protection Agency (EPA) may prohibit or limit the manufacture of a toxic substance, require warning labels and production records, ban ingestion of a toxic substance, restrict use of a substance or mixture, and regulate disposal of a toxic substance. In addition, EPA has authority under TSCA to force recalls of products that contain unacceptable concentrations of a toxic substance.

One of the substances specifically regulated under TSCA is polychlorinated biphenyls (PCBs). These regulations are codified at 40 CFR 761. Not mentioned in TSCA, but proposed for regulation under it, are low-level wastes and naturally occurring or accelerator-produced radioactive materials; these are discussed in Chapter 12 of this report. Additionally, EPA is considering regulating under TSCA the use, storage, and disposal of mixtures, items, and wastes with both PCB and radioactive constituents (56 FR 111, p. 26745).

7.1 Purpose and Major Provisions of 40 CFR 761

The only TSCA regulations that contain groundwater and surface water monitoring requirements are the PCB regulations, which are codified at 40 CFR 761. The authority for these regulations are from Title I, 15 USC 2605, 2607, 2611, 2614, and 2616. These regulations establish requirements for, and prohibitions of, the manufacturing, processing, storage, distribution in commerce, use, and disposal of PCBs and PCB items. All persons who manufacture, process, distribute in commerce, use, or dispose of PCBs or PCB items are subject to these regulations. Examples of substances subject to the regulations include PCB-contaminated dielectric fluids, contaminated solvents, oils, waste oils, heat transfer fluids, hydraulic fluids, paints, sludges, slurries, dredge spoils, contaminated soils, materials contaminated as a result of spills, and other chemical substances resulting as byproducts at any point in a manufacturing process.

The TSCA regulations contain 10 subparts. Subpart D (Storage and Disposal) addresses groundwater and surface water monitoring with respect to chemical waste landfills that receive PCBs or PCB items.

The spill cleanup requirements of TSCA which protect groundwater and surface water may be applicable or relevant and appropriate requirements (ARARs) under remedial actions initiated in compliance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Additional information about CERCLA compliance with other laws through ARARs is presented in Chapter 6 of this report.

7.2 Groundwater Monitoring Requirements, Subpart D

TSCA groundwater and vadose zone monitoring requirements are promulgated in 40 CFR 761, Subpart D, Subsection 761.75, "Chemical Waste Landfills." The groundwater and vadose zone monitoring requirements which must be met by a chemical waste landfill for the disposal of PCBs and PCB items of concentrations greater than 500 parts per million (ppm) are identified at 40 CFR 761.75(b)(6)(ii). PCBs and PCB items contaminated at levels of less than 500 ppm may still be regulated if the original PCB material was contaminated at levels of 500 ppm or above.

The following environmental setting stipulations apply to such landfills:

- The bottom of the landfill, either a landfill liner system or an existing soil barrier, must be 50 ft above the historical high water table
- The landfill must not be in a groundwater recharge area, floodplain, or shore lands
- There should be no hydraulic connection between the site and standing or flowing surface water
- The landfill must have groundwater monitoring wells and a leachate collection system in the vadose zone immediately adjacent to the landfill.

The landfill operator is required to install and maintain one or a combination of three leachate collection systems. The purpose of this requirement is to determine if any leachates (i.e., liquids containing PCBs or combinations of PCBs and hazardous waste) are penetrating the bottom of the landfill, migrating into the vadose zone, and eventually migrating into the groundwater.

A TSCA chemical waste landfill is required to assess the quality of background groundwater prior to receiving waste. It may be required to meet additional groundwater monitoring requirements if one of the following two situations is encountered.

First, if TSCA-regulated substances are disposed of in the same facility with wastes regulated by the Resource Conservation and Recovery Act (RCRA), then the chemical waste landfill may be required to obtain a permit and meet the additional groundwater monitoring requirements of RCRA, as described in Chapter 5 of this report.

Second, the EPA Regional Administrator can render a decision requiring the continued monitoring of the groundwater. Such a decision is made at the discretion of the Administrator upon review of the chemical waste landfill's operating plan and is based on the projected environmental impact.

Although there are no TSCA chemical waste landfills per se at the Idaho National Engineering Laboratory (INEL), in the past PCBs have been disposed of in Pit 9 at the Radioactive Waste Management Complex (RWMC). During the Pit 9 remediation process under CERCLA, the TSCA regulations may become ARARs.

7.3 Technical Specifications for Groundwater Monitoring Programs Under TSCA

Groundwater monitoring requirements for chemical waste landfills regulated under TSCA are presented in the technical requirements of 40 CFR 761.75. Both groundwater and vadose zone monitoring

are required to identify potential contaminant releases. The technical requirements for groundwater monitoring are discussed in the following sections.

7.3.1 Siting Criteria

Chemical waste landfills should be sited so that the bottom of the landfill is at least 50 ft above the historical high groundwater table level. Floodplains, shorelands, and groundwater recharge areas are to be avoided. Areas of low to moderate relief are preferred to minimize erosion and to help prevent landslides or from slumping. In addition, surrounding and underlying site soil characteristics must be determined to meet specific physical parameters (56 FR 111, p. 26745).

7.3.2 Placement and Number of Wells

Chemical waste landfills permitted under TSCA (40 CFR 761) must have baseline data for both surface watercourses and groundwater prior to commencement of operations. The number of wells required depends on the geology of the site, but must not be less than three. These wells must be equally spaced on a line through the center of the disposal area with the wells extending from the highest to the lowest elevation of the water table.

7.3.3 Well Design and Construction

All TSCA monitoring wells must be cased, and the annular space must be backfilled, and the surface must be plugged. The backfill must extend from the surface to the top of the monitor zone. The backfill and plug must be constructed with Portland cement or an equivalent material to prevent percolation of surface water into the well bore. The well casings must have a cap. Prior to sampling, a well must be purged of a volume of liquid equal to that initially contained in the well. Discharge from this activity must meet State or Federal discharge standards or else be recycled to the chemical waste landfill.

7.3.4 Vadose Zone Monitoring

Under TSCA a leachate monitoring/collection monitoring system is required above the chemical waste landfill. Three basic leachate collection monitoring designs are acceptable for this monitoring system: a simple leachate collection monitoring system, a compound leachate collection monitoring system, and suction lysimeters.

The simple leachate collection monitoring system involves a gravity-flow drain field installed above the waste disposal facility liner. The regulations suggest this method for use when semisolid or leachable solid wastes are placed in a lined pit excavated in a relatively thick, unsaturated, homogeneous layer of low-permeability soil.

The compound leachate collection monitoring system incorporates a gravity flow drain field installed above the waste disposal facility liner and above a secondary installed liner. This design is suggested for semi-liquid or leachable solid wastes placed in a lined pit that is excavated in a relatively permeable soil.

For relatively permeable, unsaturated soil immediately adjacent to the bottom of the sides of the chemical waste landfill, the regulations recommend the use of a network of porous ceramic cups, or suction lysimeters, connected by hoses or tubes to vacuum pumps.

7.3.5 Groundwater Sampling

Water sampling methods and analytical procedures employed in complying with TSCA must meet the requirements of 40 CFR 136 (as amended in 41 FR 232, pp. 52779-52786; December 1, 1976) under "Guidelines Establishing Test Procedures for the Analysis of Pollutants." All data and records of the sampling and analysis are required to be maintained until at least 20 years after the chemical waste landfill is no longer used for the disposal of PCBs.

As a minimum, all water samples must be analyzed for PCBs, pH, specific conductance, and chlorinated organics.

7.4 Regulations Specific to Surface Water

In general, TSCA regulations which pertain to groundwater also apply to surface waters. However, some TSCA regulations have been written specifically addressing surface waters. A synopsis of those regulations follows.

7.4.1 Surface Water Monitoring Requirements

Landfills that receive PCBs must sample ground and surface waters prior to commencing operations. Analytical data from these samplings are used to establish a water quality baseline. In addition, if there are any surface water courses designated by the EPA Regional Administrator, those waters must be sampled at least monthly while the landfill is being used. These waters must also be sampled for a period of time, to be designated by the Regional Administrator, not less than once every six months after final closure of the disposal area.

7.4.2 Siting Criteria

When selecting a chemical landfill site, the following factors must be taken into consideration:

1. Floodplains, shorelands, and groundwater recharge areas are to be avoided. The landfill site should also be placed so that the bottom of the landfill is above the 100-year flood water elevation. Additionally, there must be no hydrological connection between the site and standing or flowing surface water.
2. If the landfill is sited below the 100-year floodwater elevation, the operator must provide surface water diversion dikes around the entire perimeter of the landfill site. The dikes must be constructed such that the minimum height of the dike is at least 2 ft above the 100-year floodwater elevation. If the landfill site is above the 100-year floodwater elevation, there must be diversion structures capable of diverting all of the surface water run-off from a 24-hour, 25-year storm.
3. The siting of a landfill must consider a location of low-to-moderate relief in order to minimize erosion due to storm waters and to help prevent the landsliding or slumping of saturated soils.

7.5 Requirements Pertaining to Both Groundwater and Surface Water

7.5.1 Chemical Waste Landfill Operations

All chemical waste landfills are required to develop an operations plan that is to include such details as procedures to be used for "record keeping, surface water handling,..., leachate collection systems, sampling and monitoring procedures, monitor well construction, environmental emergency plans, ..." [40 CFR 761.75(b)].

7.5.2 Spill Policy

When a spill of regulated PCB materials occurs, the adequacy of the cleanup must be verified. The requirements for spill cleanup include the following:

1. Spills directly into surface waters are subject to final cleanup standards to be established at the discretion of the EPA regional office. These spills are also subject to immediate notification requirements and measures to minimize further environmental contamination.
2. Site-specific characteristics such as shallow groundwater, soil type, or proximity to shallow domestic wells may pose exceptionally high potential for surface water contamination. The EPA Regional Administrator has therefore been given authority to require cleanup levels lower than those stipulated in the regulations.
3. For spills that have the potential to contaminate surface waters, groundwater, defined wetlands, or drinking water sources, the responsible party must decontaminate the spill in accordance with site-specific requirements established by the EPA regional office.

7.5.3 Relationship of Policy to Other Statutes

The spill cleanup policies of TSCA do not obviate cleanup standards or requirements for the reporting of spills imposed, or to be imposed, under other Federal statutory authorities, including but not limited to, CWA, RCRA, CERCLA, and SARA. Where more than one requirement applies, the stricter standard must be met.

7.6 Proposed Changes to 40 CFR 761

The EPA has proposed amendments to its rules under TSCA for PCBs under 40 CFR 761 (59 FR 233, pp. 62788 - 62875). Changes are being proposed for requirements for determining PCB concentrations; storage and disposal; decontamination levels and procedures; and the reporting and recordkeeping requirements for PCBs, PCB Items, environmental media contaminated with PCBs, or PCBs in association with radioactive materials. In addition, the EPA proposed to insert additional definitions and references, regulate the disposal of liquids in landfills, coordinate PCB disposal approvals with other Federal and state programs, and revise the reportable quantity in the spill cleanup policy. Since the EPA is currently conducting a review of the toxicity of PCBs and several structurally related chemicals, it is proposing flexibility in certain disposal regulations to allow for changes in its position on PCB toxicity.

8. SAFE DRINKING WATER ACT

The Safe Drinking Water Act (SDWA) was enacted in 1974 to establish minimum national standards for public water supply systems. To meet this objective, drinking water standards for public water supplies were established, underground injection activities were regulated, and sole-source aquifers were defined and designated.

8.1 Purpose and Major Aspects of the Safe Drinking Water Act

The SDWA established national primary drinking water standards and required the application of water treatment technologies to water supply systems for the purpose of protecting human health from contaminants in drinking water. The Act applies to both private and public water systems that generally have at least 15 service connections or supply at least 25 full-time residents. Most of the water supply systems at the Idaho National Engineering Laboratory (INEL) meet the definition of nontransient, noncommunity systems because they serve over 25 persons for six months of the year (40 CFR 141.2). Some INEL systems qualify as transient, noncommunity systems. DOE Order 5400.5 requires DOE drinking water systems to meet the standards for community drinking water systems for radioactive contaminants. This affords added protection. The SDWA has three major components:

1. The establishment of primary and secondary drinking water standards under Title XIV, Part B, Section 1411 (implementing regulations are in 40 CFR 141-143).
2. A program to regulate the underground injection of wastes and other materials under Title XIV, Part C, Section 1421 - 1426 (implementing regulations are in 40 CFR 144-148).
3. The definition and designation of sole-source aquifers under Title XIV, Part C, Section 1427. The establishment of a well head protection program to protect areas of aquifer recharge under Title XIV, Part C, Section 1428 (implementing regulations are in 40 CFR 149).

These three components are discussed in the following sections.

8.1.1 Drinking Water Standards

Under the SDWA, the Environmental Protection Agency (EPA) promulgated the National Primary Drinking Water Regulations (NPDWRs). The NPDWRs establish maximum contaminant levels (MCLs) in Subpart B, monitoring and analytical requirements in Subpart C, maximum contaminant level goals (MCLGs) in Subpart F, and treatment technique requirements in Subpart K. MCLGs and MCLs are required to be proposed and promulgated simultaneously under the 1986 amendments to the SDWA. Eighty-three contaminants were identified in the 1986 amendments to the SDWA for which EPA was to develop MCLGs and MCLs.

In setting MCLs, EPA considers both cost and available treatment technologies. MCLGs are strictly health-based and set at levels that would result in no known or anticipated health effects and that include an adequate margin of safety. The objective is to set the MCL as close as possible to the corresponding MCLG.

National secondary drinking water regulations establish secondary maximum contaminant levels (SMCLs) for substances or characteristics that may affect the aesthetic quality of drinking water, such as color or odor, but do not threaten public health. At considerably higher concentrations of these contaminants, health implications may also exist as well as aesthetic degradation. The SMCLs are established as guidelines for State

use and therefore are not Federally enforceable, although a State may choose to include these guidelines in its drinking water standards.

The original 83 MCLs were promulgated prior to 1988, 25 more were promulgated by 1991, and an additional 25 MCLs are to be promulgated every three years. Currently, many contaminants are "listed" for regulation although no MCL or MCLGs have been identified. Many other contaminants have proposed or tentative MCL and MCLGs. These standards and guidelines are presented in Tables 8-1 and 8-2.

8.1.2 Underground Injection Control Program

The SDWA requires that the underground injection of wastes and other materials be regulated. EPA has established regulations and a permit program to control these activities. Under the Underground Injection Control (UIC) program (40 CFR 144-148), EPA has distinguished five different classes of injection wells and has designated construction, operating, monitoring, and reporting requirements. Only Class V injection wells are currently allowed in Idaho. While UIC programs are intended to be administered by the States, EPA will administer this program in States that do not have primacy. The UIC program in Idaho (Title 42 Chapter 39) is administered by the State of Idaho, and a discussion on this program and its requirements is in Section 12.5 of this report.

8.1.3 Sole-Source Aquifer Program

The purpose of the Sole-Source Aquifer Program (40 CFR 149) is to protect aquifers that serve as the sole or principal drinking water source for a community or a given area. EPA, on its own or in response to a petition submitted by the affected community, can designate an aquifer as being sole-source. Once an aquifer is designated as a sole-source, EPA can be petitioned to review the potential impacts that a Federal financial assistance project may have on the aquifer and consequently on public health. Assistance in the development of comprehensive groundwater protection plans for critical protection areas within the sole-source aquifer is also possible through an EPA demonstration program. In addition, EPA can prohibit the expenditure of Federal financial assistance project funds for projects/activities within a sole-source aquifer area if it determines that the conduct of such actions could contaminate the aquifer. Sole-source aquifer designation does not effect direct Federal funding.

EPA Region X was petitioned numerous times over nine years to designate the Eastern Snake River Plain Aquifer (ESRPA), which underlies the INEL, as a sole-source aquifer. The petition history is described in detail in *Support Document for the EPA Designation of the Eastern Snake River Plain Aquifer as a Sole Source Aquifer* (EPA, 1990). On October 7, 1991, EPA published a final determination designating the Eastern Snake River Plain Aquifer as a sole-source aquifer (56 FR 194, 50634).

Waste disposal practices at the INEL have resulted in groundwater contamination beneath the site. After the EPA sole-source designation, any Federal financial assistance projects are subject to EPA review under Section 1424(e) of the SDWA to ensure that such projects do not contaminate the aquifer (EPA, 1991). However, the INEL is operated by direct Federal funding and it is not funded through Federal financial assistance projects. Groundwater protection requirements of the SDWA would therefore be met through negotiated compliance authorized under another provision of law [e.g., Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)]. In addition, Department of Energy (DOE) Order 6430.1A states that recharge areas for sole-source aquifers shall be avoided or receive lowest siting priority for treatment, storage, or disposal facilities for hazardous, nonhazardous, or radioactive solid waste.

Table 8-1. EPA primary drinking water standards and guidelines as of May 1995.

Contaminant	MCL ^a (mg/L)	MCLG ^b (mg/L)
INORGANICS		
Aluminum ^{il}	--	--
Antimony ^{ik}	0.006	0.006
Arsenic ⁱ	0.05	--
Asbestos ^{ic} [million fibers/liter (longer than 10 μ m)]	7	7
Barium ^{if}	2	2
Beryllium ^{ik}	0.004	0.004
Boron ^{il}	--	--
Bromate ^{il}	0.01	zero
Cadmium ^{ic}	0.005	0.005
Chloramine ^{ip}	4	4
Chlorate ^{il}	--	--
Chlorine ^{ip}	4	4
Chlorine dioxide ^{it}	0.8	0.3
Chlorite ^{il}	1	0.08
Chromium (total) ^{ic}	0.1	0.1
Copper ^{idl}	TT	1.3
Cyanide ^{ik}	0.2	0.2
Fluoride ⁱ	4.0	4.0
Hypochlorite ^{ip}	--	4
Hypochlorous acid ^{ip}	--	4
Lead ^{icm}	TT	zero
Manganese ^{il}	--	--
Mercury ^{ic}	0.002	0.002
Molybdenum ^{il}	--	--
Nickel ^{il}	--	--
Nitrate (as N) ^{ic}	10	10
Nitrite (as N) ^{ic}	1	1 ^c
Nitrate + nitrite (both as N) ⁱ	10	10
Selenium ^{ic}	0.05	0.05
Strontium ^{il}	--	--
Sulfate ^{ip}	500	500
Thallium ^{ik}	0.002	0.0005
Vanadium ^{il}	--	--
Zinc ^{il}	--	--
Zinc chloride ^{il} (measured as zinc)	--	--

Table 8-1. (continued).

Contaminant	MCL ^a (mg/L)	MCLG ^b (mg/L)
ORGANICS		
Acifluorfen ^{IT}	—	zero
Acrylamide ^{ic}	TT	zero
Acrylonitrile ^{IT}	—	zero
Adipates (diethylhexyl) ^{IPg}	0.4	0.4
Alachlor ^{ic}	0.002	zero
Aldicarb ^{if}	0.007	0.007
Aldicarb sulfone ⁱ	0.007	0.007
Aldicarb sulfoxide ⁱ	0.007	0.007
Atrazine ^{ic}	0.003	0.003
Bentazon ^{IT}	—	0.02
Benzene ⁱ	0.005	zero
Benzo(a)pyrene (PAH) ^{ik}	0.0002	zero
Bromacil ^{IL}	—	—
Bromobenzene ^{IL}	—	—
Bromochloroacetonitrile ^{IL}	—	—
Bromodichloromethane (THM) ^{IP}	0.1	zero
Bromoform (THM) ^{IP}	0.1	zero
Bromomethane ^{IT}	—	—
Carbofuran ^{ic}	0.04	0.04
Carbon tetrachloride ⁱ	0.005	zero
Chloral hydrate ^{IP}	0.06	0.04
Chlordane ^c	0.002	zero
Chlorodibromomethane (THM) ^{IP}	0.1	0.06
Chloroethane ^{IL}	—	—
Chloroform (THM) ^{IT}	0.1	zero
Chloromethane ^{IL}	—	—
Chloropicrin ^{IL}	—	—
Chlorotoluene o- ^{IL}	—	—
Chlorotoluene p- ^{IL}	—	—
Chrysene (PAH) ^{IP}	0.0002	zero
Cyanazine ^{IT}	—	0.001
Cyanogen chloride ^{IL}	—	—
2-4-D ⁱ	0.07	0.07
DCPA (Dacthal) ^{IL}	—	—
Dalapon ^{ik}	0.2	0.2
Di(2-ethylhexyl)adipate ^{ik}	0.4	0.4

Table 8-1. (continued).

Contaminant	MCL ^a (mg/L)	MCLG ^b (mg/L)
ORGANICS (continued)		
Dibromoacetonitrile ^{il}	--	--
Dibromochloropropane ⁱ	0.0002	zero
Dibromomethane ^{il}	--	--
Dicamba ^{il}	--	--
Dichloroacetaldehyde ^{il}	--	--
Dichloroacetic acid ^{it}	--	zero
Dichloroacetonitrile ^{ip}	0.06	--
Dichlorobenzene, o-, m- ^{ic}	0.6	0.6
Dichlorobenzene, p ⁱ	0.075	0.075
Dichlorodifluoromethane ^{il}	--	--
Dichloroethane (1,1-) ^{il}	--	--
Dichloroethane (1,2-) ⁱ	0.005	zero
Dichloroethylene (1,1-) ⁱ	0.007	0.007
Dichloroethylene (cis 1,2-) ⁱ	0.07	0.07
Dichloroethylene (trans-1,2-) ⁱ	0.1	0.1
Dichloromethane ⁱ	0.005	zero
Dichloropropane (1,2-) ⁱ	0.005	zero
Dichloropropane (1,3-) ^{il}	--	--
Dichloropropane (2,2-) ^{il}	--	--
Dichloropropene (1,1-) ^{il}	--	--
Dichloropropene (1,3-) ^{it}	--	zero
Diethylhexyl phthalate ^{ik} (PAE)	0.006	zero
Dinitrotoluene (2,4-) ^{il}	--	--
Dinitrotoluene (2,6) ^{il}	--	--
Dinoseb ^{ik}	0.007	0.007
Diquat ^{ik}	0.02	0.02
Endothall ^{ik}	0.1	0.1
Endrin ^{ik}	0.002	0.002
Epichlorohydrin ^{ic}	TT	zero
Ethylbenzene ^{ic}	0.7	0.7
Ethylene dibromide ^{ic}	0.00005	zero
ETU ^{il}	--	--
Fluorotrichloromethane ^{il}	--	--
Glyphosate ^{ik}	0.7	0.7
Heptachlor ^{ic}	0.0004	zero
Heptachlor epoxide ^{ic}	0.0002	zero
Hexachlorobenzene ^{ik}	0.001	zero
Hexachlorobutadiene ^{it}	--	0.001
Hexachlorocyclopentadiene (HEX) ^{ik}	0.05	0.05
Hexachloroethane ^{il}	--	--

Table 8-1. (continued).

Contaminants	MCL ^a (mg/L)	MCLG ^b (mg/L)
ORGANICS (continued)		
Isophorone ^{il}	--	--
Lindane ^{ic}	0.0002	0.0002
Methomyl ^{il}	--	--
Methoxychlor ^{ic}	0.04	0.04
Methyl tert butyl ether ^{il}	--	--
Metolachlor ^{il}	--	--
Metribuzin ^{il}	--	--
Monochloroacetic acid ^{il}	--	--
Monochlorobenzene ^{ic}	0.1	0.1
Oxamyl (Vydate) ^{ik}	0.2	0.2
Pentachlorophenol ⁱ	0.001	zero
Picloram ⁱ	0.5	0.5
Polychlorinated biphenyls (PCBs) ⁱ	0.0005	zero
Prometon ^{il}	--	--
Simazine ^{ik}	0.004	0.004
Styrene ^{ic}	0.1	0.1
2,4,5-T ^{il}	--	--
2,3,7,8-TCDD (Dioxin) ^{ik}	3 X 10 ⁻⁸	zero
Tetrachloroethane (1,1,1,2-) ^{il}	--	--
Tetrachloroethane (1,1,2,2-) ^{il}	--	--
Tetrachloroethylene ^{ic}	0.005	zero
Toluene ^{ic}	1	1
Toxaphene ^{ic}	0.003	zero
2,4,5-TP (silvex) ^{ic}	0.05	0.05
Trichloroacetic acid ^{ip}	0.06	0.3
Trichloroacetonitrile ^{il}	--	--
Trichlorobenzene ^{ik} (1,2,4-)	0.07	0.07
Trichloroethane (1,1,1-) ⁱ	0.2	0.2
Trichloroethane (1,1,2-) ^{ik}	0.005	0.003
Trichloroethanol (2,2,2-) ^{il}	--	--
Trichloroethylene ⁱ	0.005	zero
Trichlorophenol (2,4,6-) ^{il}	--	--
Trichloropropane (1,2,3-) ^{il}	--	--
Trifluralin ^{il}	--	--
Vinyl chloride ⁱ	0.002	zero
Xylenes (total) ^{ic}	10	10

Table 8-1. (continued).

Contaminant	MCL ^a (mg/L)	MCLG ^b (mg/L)
RADIONUCLIDES		
Beta and photon ^{iPh} emitters	4 mrem EDE/year	zero
Gross alpha particle activity ^{iPh}	15 pCi/L	zero
Radium-226/228 ^{iPh}	20 pCi/L	zero
Radon ^{iPh}	300 pCi/L	zero
Uranium ^{iPh}	20 pCi/L	zero

- a. MCL = maximum contaminant level
- b. MCLG = maximum contaminant level goal
- c. Final rule published January 30, 1991, effective date July 30, 1992. *National Primary Drinking Water Regulations; Final Rule*, Volume 56, Book 20, U.S. Environmental Protection Agency, Washington, D.C., January 30, 1991, d. Final rule published June 7, 1991, effective date November 6, 1991, *Maximum Contaminant Level Goals and National Primary Drinking Water Regulations for Lead and Copper*, Volume 56, Book 110, U.S. Environmental Protection Agency, Washington, D.C., June 7, 1991. The NPDWR for lead and copper consists of treatment technique requirements that includes corrosion control treatment, source water treatment, lead service line replacement, and public education.
- d. At tap.
- e. MCLG for total nitrate and nitrite = 10 mg/L.
- f. Final rule published July 1, 1991, effective date July 30, 1992, *National Primary Drinking Water Regulations; Final Rule*, Volume 56, Book 126, U.S. Environmental Protection Agency, Washington, D.C., July 1, 1991.
- g. Proposed July 25, 1990, *National Primary and Secondary Drinking Water Regulations; Synthetic Organic Chemicals and Inorganic Chemicals; Proposed Rule*, Volume 55, Book 143, U.S. Environmental Protection Agency, Washington, D.C., July 25, 1990.
- h. Proposed July 18, 1991, *National Primary Drinking Water Regulations; Radionuclides; Proposed Rule*, Volume 56, Book 138, U.S. Environmental Protection Agency, Washington, D.C., July 18, 1991.
- i. EPA, Drinking Water Regulations and Health Advisories, U.S. EPA, Washington, D.C., May, 1995.
- j. EDE = effective dose equivalent.
- k. Final rule published July 17, 1992. *National Primary Drinking Water Regulations; Synthetic Organic Chemicals and Inorganic Chemicals; Final Rule*, Federal Register Volume 57, Number 138, U.S. Environmental Protection Agency, Washington D.C., July 17, 1992.
- l. Action level for copper is 1.3 mg/L.
- m. Action level for lead is 0.015 mg/L.

TT = Treatment technique.

T = Tentative.

P = Proposed for regulation.

L = Listed for regulation.

Table 8-2. EPA secondary drinking water guidelines as of May 1995.

Contaminant	SMCL ^a
Aluminum	0.05 to 0.2 mg/L
Chloride	250 mg/L
Color	15 color units
Copper	1.0 mg/L
Corrosivity	non-corrosive
Fluoride	2.0 mg/L
Foaming Agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor number
pH	6.5 – 8.5
Silver	0.1 mg/L
Sulfate	250 mg/L
Total dissolved solids	500 mg/L
Zinc	5 mg/L

a. SMCL = secondary maximum contaminant level

However, DOE retains the option of waiving requirements contained in DOE orders. A majority of groundwater recharge to the ESRPA near the INEL is in the uplands to the northeast and along the Big Lost River during intermittent flows. A lesser amount of recharge is from local precipitation (USGS 89-4008).

8.1.4 Wellhead Protection Program

The Wellhead Protection (WHP) program was established in the 1986 Amendments to the SDWA to protect groundwaters that supply wells and wellfields comprising public water supply systems. The States were required to submit to EPA, within three years of enactment of the 1986 SDWA Amendments, a program to protect wellhead areas within their jurisdiction. The implementation of a WHP program requires the use of groundwater and related geographic data for modeling and mapping the boundaries of the wellhead protection area, locating sources of contamination, installing monitoring wells where necessary, assessing management options for preventing contamination, or modeling the effects of a spill (EPA 1990). Groundwater monitoring is not explicitly required under the WHP program, but is strongly encouraged in sensitive areas (EPA 1987).

The WHP program for the State of Idaho is being developed and will be integrated into existing programs of the Idaho Department of Health and Welfare (IDHW), Division of Environmental Quality. The State of Idaho Draft Wellhead Protection program was first distributed for public comment in July 1992. When approved by EPA, the Idaho WHP program will implement Policy 11-A of the Idaho Groundwater Protection Plan. Compliance with the Idaho WHP program will be voluntary. The INEL is in the process of developing a WHP program with technical requirements appropriate for the INEL.

8.2 SDWA Regulations Pertaining to Groundwater Monitoring

The SDWA contains numerous provisions related to groundwater although the primary emphasis is on the development and implementation of drinking water standards and protection programs, not on specific groundwater monitoring requirements or remedial activities. Monitoring takes place within the drinking water system. The principal groundwater monitoring requirements established by the SDWA are located in the regulations implementing the UIC program. The UIC program in the State of Idaho is administered by the Department of Water Resources.

The Idaho UIC program developed under the SDWA provides standards and procedures for underground injection of fluids. Underground injection wells are divided into five general classes for permitting and regulatory purposes as discussed in Section 12.5.

Currently, only Class V wells are allowed under State of Idaho rules for the "Construction and Use of Injection Wells," IDAPA 37.03.03. Under these rules and regulations Class I, II, III, and IV injection wells are not authorized for construction or use in the State of Idaho. Injected fluids that will, or that are likely to, reach an underground source of drinking water must meet the SDWA MCLs for chemical, radiological, and biological contaminants. Since the INEL currently has numerous Class V injection wells, the facility is subject to these regulations. Groundwater monitoring is not explicitly a permit condition for Class V injection wells. If the Director of the Idaho UIC program determines that the injection well may have an adverse effect on groundwater quality, however, then groundwater monitoring may become a permit condition. The specific groundwater monitoring-related requirements under the Idaho UIC program are outlined in Section 12.5 of this report.

The drinking water standards promulgated under the SDWA are important considerations when groundwater remediation under the Federal Facility Agreement and Consent Order (FFA/CO) is required or anticipated. MCLs developed under the SDWA generally are applicable or relevant and appropriate

requirements for current or potential drinking water sources within the area of attainment for CERCLA remedial actions. For Superfund, cleanup levels that are more stringent than MCLs may be required to achieve adequate protection. For example, MCLGs may be considered when setting cleanup levels in situations where multiple pathways or multiple contaminants increase risks.

9. CLEAN WATER ACT

The Federal Water Pollution Control Act (FWPCA) of 1972, as amended (33 USC 1251 et seq.), established the framework to control water pollution. The FWPCA was amended by the Clean Water Act (CWA) in 1977. The goal of the CWA is to control and eliminate water pollution by focusing on those pollutants determined to be most harmful to receiving waters and the sources of such pollutants. In 1987, the CWA was amended by the Water Quality Act (WQA). Under the WQA, the existing CWA programs were expanded to address new discharge areas and technical areas not previously covered by regulation. Additionally, the WQA contains a number of initiatives designed to identify and establish corrective measures for water bodies which have failed to attain existing water quality objectives.

9.1 Purpose and Major Aspects of the Clean Water Act

The CWA of 1977 established the objective "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." To achieve this objective, the Act set forth two major goals with target dates: (1) a preliminary "fishable and swimmable" goal, that "whenever attainable ... water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water be achieved by July 1, 1983;" and (2) eliminate discharges of pollutants into navigable waters by 1985. Section 102(a) of the CWA directed the EPA to establish comprehensive programs for preventing, reducing, or eliminating the pollution of navigable waters and groundwater and improving the sanitary condition of surface and underground waters. Although the intent of the CWA is to restore and maintain both surface water and groundwater, most of the regulations that have been enacted under the CWA deal specifically with surface water and not with groundwater.

The CWA's approach to reaching the goals stated above focused on the regulation of pollutants and sources of pollutants. Three types of pollutants are categorized under the CWA: conventional pollutants such as suspended solids, nonconventional pollutants such as ammonia, and toxic pollutants such as heavy metals and toxic organic compounds.

Additionally, the CWA divides the source of pollution to water into two distinct groups: point source and non-point source. Point sources are distinct entities, such as industries and municipal sewage treatment plants [commonly known as publicly owned treatment works (POTWs)], that discharge wastewater into navigable waters through discrete conveyances. Point sources may discharge directly into navigable waters or indirectly through a POTW.

Nonpoint sources are sources of wastewater which are not discharged from a specific pipe, drainage ditch, or similar conveyance. These sources may include agricultural lands and runoff from such areas as construction sites, streets, parking lots, and some storage yards.

EPA defines "waters of the U.S." in 40 CFR 122.2 to include the following:

- Navigable waters.
- Interstate waters, including interstate wetlands.

- All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats. The use, degradation, or destruction of these would affect or could affect interstate or foreign commerce, including any such waters.
 - potentially used by interstate travelers or foreign travelers for recreational or other purposes
 - from which fish or shellfish are or could be taken and sold
 - that are used or could be used for industrial purposes by industries in interstate commerce.
- All impoundments of waters otherwise defined as waters of the United States under this definition.
- Tributaries of waters identified in the items above.
- The territorial sea.
- Wetlands.

Note: Water treatment systems, including treatment ponds or lagoons designed to meet requirements of the CWA (other than cooling ponds as defined in 40 CFR 423.11(m) which also meet the criteria of this definition) are not waters of the United States. This exclusion applies only to manmade bodies of water which neither were originally created in waters of the United States (such as disposal area in wetlands) nor resulted from the impoundment of waters of the United States. This definition also applies to the requirements of the spill prevention and the sewage sludge disposal programs under the CWA.

The National Pollutant Discharge Elimination System (NPDES) program requires permits for the discharge of pollutants from point sources to the "waters of the U.S." The Big Lost River, Little Lost River, Birch Creek, and associated tributary channels, playas and spreading areas, portions of which are located on the Idaho National Engineering Laboratory (INEL), are considered "waters of the U.S." under these regulations. Other INEL areas are currently under review for classification as "waters of the U.S." The 1987 amendments require that industrial or municipal storm water discharges be regulated as NPDES discharges if discharges are subject to NPDES permits issued as of February 1987, or discharges are "associated with industrial or construction activities." Each category is subject to specific compliance procedures. Permits for storm water discharges are obtained under the "NPDES Permit Application Regulations for Storm Water Discharges" (40 CFR 122.26).

9.2 Regulations Pertaining to Groundwater

As noted previously, the CWA was enacted for the purpose of protecting and/or improving the quality of national water resources including groundwater resources. Section 402(b)(1)(D) requires States to control the discharge of pollutants to wells prior to the approval of an NPDES program. Because the State of Idaho does not currently have primacy for NPDES programs, EPA Region X has regulatory authority. EPA relies on the authority of the Safe Drinking Water Act, the Underground Injection Control (UIC) Program, and Resource Conservation and Recovery Act (RCRA) to regulate discharges to wells.

Groundwater with a hydrogeologic connection to surface water may be regulated under the CWA. Several sections of the CWA contain limited provisions applicable to groundwater. These are summarized below.

The water quality criteria established under the CWA are potentially applicable to groundwater monitoring programs since the Federal water quality criteria can be applicable or relevant and appropriate requirements (ARARs) under Comprehensive Environmental Response Compensation and Liability Act (CERCLA) actions (see Section 6). The water quality criteria enacted pursuant to Section 304(a)(1) apply to all bodies of water, including groundwater.

When contaminated groundwater at a CERCLA or RCRA site is pumped, treated to reduce contaminant concentrations, and discharged to surface water, an NPDES permit under the CWA, Section 402, may be needed. In addition, if groundwater discharges to surface waters cause water quality standards to be violated or if NPDES permit conditions are violated, enforcement actions could be taken.

The NPDES general permit for storm water discharges issued to Idaho by EPA Region X has been revised by the Idaho 401 certification special permit conditions (57 FR 175, p. 41330). The revision states that all storm water shall be treated and disposed of in such a manner that the groundwater standards of Idaho are not violated. The groundwater standards are specified in Section 01.02299 of the "Water Quality Standards and Wastewater Treatment Requirements" (see Section 13). The permit is also revised to cover all areas administered by EPA Region X in the State of Idaho.

A sludge management program has been established under 40 CFR 503, "Standards for the Use or Disposal of Sewage Sludge." These regulations stipulate that an aquifer must not be contaminated by active surface disposal areas for domestic sewage sludge. A groundwater monitoring system or a leachate collection system may be used to demonstrate compliance with this requirement. The monitoring program must demonstrate that the sludge placed on an active sewage disposal unit is not contaminating an aquifer. The data and results from the monitoring program must be developed and certified by a qualified groundwater scientist.

9.3 Regulations Pertaining to Surface Water

The CWA primarily focuses on the protection and improvement of the nation's surface water resources. Four programs were established to control and eliminate water pollution by identifying and monitoring pollutant areas. The following sections discuss these programs and specify monitoring and reporting requirements (see Sections 9.3.1 and 9.3.2, respectively).

9.3.1 Surface Water Programs

The following four major programs have been developed under the CWA to implement the cleanup and control of pollutant discharges to surface water:

1. NPDES
2. National Pretreatment Program

3. Sewage Sludge Management Program

4. Spill Prevention Program.

9.3.1.1 National Pollutant Discharge Elimination System. The statutory authority for the NPDES program is established in Section 402 of the CWA. The NPDES program was developed to control the discharge of pollutants from point sources to waters of the United States. Section 402 stipulates that EPA must develop permit conditions for every point source discharge to waters of the U.S. Prior to the WQA of 1987, these point sources included only those discharges from industrial processes and POTWs. The amendments of the WQA require that storm water discharges from areas where certain industrial activities occur also be permitted and regulated as point sources.

The requirements of the NPDES program are contained in the following regulations: 40 CFR 122, 123, 124, and 125. These regulations outline basic program requirements and permit conditions. Additionally, EPA has developed specific discharge requirements for 52 specific industrial categories. These requirements are found in 40 CFR Subchapter N (Parts 405-471).

At the INEL, the only activities subject to the NPDES regulations are (1) industrial operations and wastewater treatment facilities discharging wastewater to waters of the U.S., and (2) storm water runoff from areas associated with industrial and construction activities. INEL industrial and sanitary wastewaters that discharge directly to land application sites are subject to State of Idaho regulation, not NPDES requirements. However, wastewater discharges to land application sites that can commingle with storm water are also regulated under NPDES storm water permits.

The principal means of enforcing the NPDES program is through the issuance of NPDES permits. For direct discharges of industrial and sanitary wastewaters to waters of the U.S., the NPDES permits contain effluent limitations which limit the concentration and or mass of pollutant parameters present in the waste stream.

The CWA mandates that effluent limits be developed based on technology-based, toxicity-based, and water quality controls. Under Section 304 of the CWA, the EPA has developed two water quality criteria: one for the protection of human health and one for the protection of aquatic life. These criteria are used by States as guidelines in the development of their water quality standards (as required by Section 303). The guidelines themselves are not enforceable, but the State water quality standards developed from them are enforceable. In addition, the State water quality standards must be, at least, as stringent as the Federal water quality standards.

Point source discharges of storm water from industrial and construction activities at the INEL are regulated via general permits issued under the NPDES program (40 CFR 122.26). Two NPDES general permits for storm water discharges, one for construction activities and one for industrial activities, were issued for multiple States including Idaho (57 FR 175, pp. 41236-41342 and pp. 41176-41233). The U.S. Department of Energy Idaho Operations Office (DOE-ID) has received coverage for the entire INEL for industrial and construction activities to discharge under these permits. A requirement of these general NPDES storm water permits is that a pollution prevention plan be developed which identifies potential sources of storm water contamination, and establishes Best Management Practices (BMP) to ensure that pollutants are not discharged to waters of the U.S. via storm water runoff. Two stormwater pollution prevention plans have been developed for the INEL, one governing point source discharges associated with industrial activity, and

one for point source discharges associated with construction activity. In addition to establishing BMPs to prevent pollution of waters of the U.S., these plans establish inspection and notification requirements. Runoff monitoring requirements are also identified in the Storm Water Pollution Prevention Plan for industrial activities. These requirements are discussed in Section 9.3.2.

9.3.1.2 National Pretreatment Program. The National Pretreatment Program is authorized under Section 307 of the CWA. The program is designed to regulate the discharge of nondomestic wastewaters to POTWs. These wastestreams may contain pollutants which are not susceptible to treatment at a POTW, or may cause a POTW upset resulting in the discharge of inadequately treated sewage. Any INEL facility which discharges wastestreams other than domestic to the Idaho Falls sewer system is subject to these regulations. The regulatory requirements for pretreatment are defined in 40 CFR 128 and the General Pretreatment Standards, 40 CFR 403.

The General Pretreatment Regulations state three primary objectives of the pretreatment program:

1. Prevent the introduction of pollutants into POTWs which will interfere with the operation of a POTW, including interference with its use or disposal of municipal sludge
2. Prevent the introduction of pollutants into POTWs which will pass through the treatment works or otherwise be incompatible with such works
3. Improve opportunities to recycle and reclaim municipal and industrial wastewaters and sludges.

The pretreatment regulations require that municipalities develop and implement a pretreatment program to regulate the industrial flows received at the POTW. These plans must be approved by EPA, and all industrial dischargers within the municipality must comply with the provisions set forth in the plan. The City of Idaho Falls has developed an Industrial Pretreatment Program in accordance with 40 CFR 403 and the CWA which has been approved by EPA (Municipal Code, Chapter 1, Section 8). INEL facilities discharging non-domestic wastewaters to the Idaho Falls sewer system must comply with the Idaho Falls sewer use ordinance, and submit an Industrial Waste Acceptance (IWA) form with the City. Section 12 of this document describes the Idaho Falls pretreatment program.

9.3.1.3 Sewage Sludge Management Program. Under the authority of Section 405 of the CWA, as amended by a WQA of 1987, the EPA promulgated regulations that establish a comprehensive sewage sludge management program. This program is intended to protect the public health and the environment, including water resources, from adverse affects of pollutants in sewage sludge during its use or disposal. The EPA program includes: (1) requirements for state sludge management programs and (2) revisions to the NPDES program regulations to include sewage sludge requirements in NPDES permits (54 FR 18716). These regulations establish permit requirements and procedures, as well as requirements for states wanting to implement approved sewage sludge management programs as either part of state NPDES programs or under separate authority. In addition, the regulations establish the programmatic framework for implementing the technical standards for sewage sludge use or disposal. These standards are codified in 40 CFR 503, "Standards for the Use and Disposal of Sewage Sludge." The standards apply to sewage sludge that is used or disposed of by application to land, distributed and marketed, placed in sludge-only landfills (monofills) or surface disposal sites, or fired in a sewage sludge incinerator (58 FR 9248).

Two types of sludges are generated at the INEL: (1) domestic sewage sludge and (2) industrial sludge. The use or disposal of domestic sludge via land application is regulated under 40 CFR 503. This part does not establish requirements for the use or disposal of industrial sludge generated at an industrial facility, including industrial sludge combined with domestic sewage sludge. Land disposal of industrial sewage sludge, and a mixture of industrial and domestic sewage sludge, must comply with the requirements of 40 CFR 257. The INEL owns and operates several sewage treatment works. Some of these treatment works treat only domestic sewage or only industrial sewage while other treatment works commingle industrial and domestic sewage which results in a combined sludge. The INEL has developed a domestic sewage sludge management policy for the disposal of sludge from sewage treatment plants. Sewage sludge from treatment plants at the INEL that has been found to contain levels of radioactivity above background levels, is disposed of at the Radioactive Waste Management Complex (RWMC) as low-level waste.

Any existing "treatment works treating domestic sewage" (TWTDS) required to have or requesting site-specific pollutant limits, as provided in 40 CFR 503, must submit permit application information within 180 days after publication of standards applicable to its sewage sludge use or disposal practice(s), as specified under 40 CFR 122.21. TWTDS as defined in 40 CFR 122.2 includes facilities that generate sewage sludge or otherwise effectively control the quality of the sewage sludge or the manner in which it is disposed. Any existing treatment works with a currently effective NPDES permit must submit information before its next NPDES permit renewal. In addition, the EPA may require permit applications from any TWTDS at any time, if a determination is made that a permit is necessary to protect public health or the environment from potential adverse effects from pollutants in the sewage sludge.

Domestic sewage is defined as waste and wastewater from humans or household operations that is discharged to a treatment works. Domestic sewage sludge is defined as the solid residuals that are removed from domestic sewage wastewater during the treatment processes from a treatment works. Standards are included in 40 CFR 503 for domestic sewage sludge that is applied to the land, placed on a surface disposal site, or fired in an incinerator. The standards include general requirements, pollutant limits, management practices, and operational standards. These regulations also require a permit from the EPA Region X for land application of sludge from domestic sources from any INEL treatment system. However, if a domestic sewage sludge surface disposal project involves small amounts of sewage sludge that can be applied to land at rates that may be absorbed by existing vegetation, then no permit is required from EPA if the conditions of 40 CFR 503.22, Subpart B, are met. A sludge disposal plan is required by the State of Idaho under Title 1, Chapter 2, "Water Quality Standards and Waste Water Treatment Requirements," in Section 01.02650.

If only domestic sewage sludge will be land applied to a surface disposal unit, the site is required to apply for a permit with the EPA Region X 180 days prior to operation of the domestic sewage sludge disposal unit. The requirements for domestic sewage sludge disposal sites/units found in 40 CFR 503 include the following:

- A sewage sludge site must be located 60 meters or more from an active fault
- A sewage sludge site must not be located in an unstable area
- A sewage sludge site must not be located within a 100-year floodplain
- A sewage sludge site/unit must not be located in a wetland pursuant to the CWA, Section 402 and 404

- Runoff from an active sewage sludge unit must be collected and disposed of in accordance with NPDES permit requirements
- The runoff collection system must be designed to control and contain runoff from a 24-hour, 25-year storm event
- A sewage sludge unit with a liner and leachate collection system must be operated and maintained during the active period of the site/unit, and for three years after closure
- Public access shall be restricted while a disposal unit within a disposal site remains active and for 3 years after closure of the last unit within the disposal site
- Pollutant limits for sewage sludge disposed of on land must not exceed the concentrations listed in Table 1, 40 CFR 503.23. Furthermore, this concentration limit is reduced if the active sewage sludge unit is less than 150 meters from a facility's property line.

Specific recordkeeping requirements are outlined in 40 CFR 503.27(a)(1)(2). During the preparation of the domestic sewage sludge for surface disposal, records must be maintained regarding concentrations of pollutants in the sewage sludge to certify and document that the concentrations limits specified in Table 1 on Section 503.23 are not exceeded. In addition, a description of how management practices and operational standards have been met must be included in the report. These practices and standards are specified under Section 503.14, 503.32, and 503.33. The records generated will be maintained for five years. Class I sludge management facilities, POTWs as defined in 40 CFR 501.2, are required to submit an annual report to the EPA Region X prior to February 19 of each year.

Land application of sludge is not considered disposal because the sewage is being beneficially reused. Domestic sewage sludge applied to land for its beneficial properties does not require a permit but must meet the requirements of 40 CFR 503, Subpart B. These requirements limit the amount of certain pollutants in sludge applied to land for beneficial purposes, such as the concentration of bacteria and pathogens allowed in the sludge, and also require vector attraction reduction measures as specified in 40 CFR 503.33. However, the general requirements and management practices need not be met if the sludge meets the pollutant concentration requirements in Table 3, 40 CFR 503.13.

Currently, no EPA permit is required for land disposal of industrial sludge; however, land disposal of industrial sludge must comply with requirements in 40 CFR 157. These requirements include the following:

- Facilities located within floodplains cannot restrict the base flood
- Facilities cannot adversely modify the habitat of endangered species
- Surface and groundwater must not be contaminated by any facility
- Facilities must minimize the potential spread of disease.

9.3.1.4 Spill Prevention Program. Section 311 of the CWA regulates the discharge of oil or hazardous substances into or upon the navigable waters of the U.S. [which is defined in the CWA, Section 502(7) as waters of the U.S.]. Any spills or discharges of quantities of designated hazardous substances (at

the same or greater amount than that specified in 40 CFR 117.3) must be reported immediately after the discharge event. [40 CFR 110.10]. Under 40 CFR 112, owners or operators of onshore and offshore facilities that store oil in sufficient quantities and that because of their location could reasonably be expected to discharge oil in quantities that may be harmful into or upon the navigable waters of the U.S. are required to prepare and implement facility Spill Prevention Control and Countermeasures Plans.

9.3.2 Regulations Pertaining to Surface Water Monitoring

For each of the four programs under the CWA described above, there are specific monitoring and reporting requirements which ensure compliance with the Act. These requirements are discussed below.

9.3.2.1 NPDES Monitoring Requirements. At the INEL, the monitoring requirements for direct point source discharges of industrial process and sanitary wastewaters are substantially different from those of regulated point source storm water discharges. These requirements are discussed in the following sections.

9.3.2.1.1 Industrial and Sanitary Point Source Discharge Monitoring. At the present time, there are no direct discharges of industrial process or sanitary wastewater from INEL facilities which are subject to NPDES regulations. If it is determined that a process does discharge wastewater to waters of the U.S., a NPDES permit must be applied for, and subsequently complied with upon issuance. The principal compliance mechanism contained in a NPDES permit for direct discharges is effluent limitations for each wastestream. They limit certain pollutant characteristics of a discharge and are normally expressed in numeric terms limiting mass and/or concentration of pollutant parameters.

NPDES permits for direct discharges require the permitted facility to self-monitor for the parameters specified in the permit. The frequency of such monitoring varies with each permit based on such factors as volume of flow, concentration of expected pollutants, and the quality of the receiving water. When conducting self-monitoring, it is required that sampling and analysis of the parameters specified in the NPDES permit be conducted in accordance with the methods specified in 40 CFR 136. These regulations specify the acceptable sampling methods, containers, preservation requirements, holding times, and analytical methods that must be followed to adequately assess the quality of the discharge. The data obtained from the self-monitoring process is entered on a Discharge Monitoring Report (DMR) and submitted to EPA Region X. If sampling and analysis are performed more frequently than is specified by the permit, then all data must be included on the DMR. If no discharge of wastewater occurs from the permitted outfall during a given monitoring period, the DMR must still be submitted to EPA Region X indicating that no discharge has occurred.

9.3.2.1.2 Point Source Storm Water Monitoring. Under its current NPDES Storm Water permit, the INEL is required to conduct monitoring of point source storm water discharges from industrial activities.

A Storm Water Pollution Prevention Plan (SWPPP) has been developed for industrial activities at the INEL, and one has also been developed for construction activities. The industrial storm water regulations contain specific monitoring requirements for runoff from certain industrial areas, including treatment, storage, and disposal (TSD) units. The regulations define three classes of facilities requiring monitoring. These classes and required monitoring frequencies are as follows:

- a. Class I facilities are required to conduct semi-annual monitoring and annual reporting. Included as Class I are facilities using materials subject to Superfund Amendments and Reauthorization

Act (SARA) 313 regulations, RCRA land disposal units without final covers (landfills), hazardous waste incinerators, and coal piles.

- b. Class II facilities are required to conduct annual monitoring. Class II facilities include chemical and allied products, and ready mix concrete.
- c. Class III facilities are subject to an annual site inspection and do not have any monitoring or reporting requirements. All CWA regulated facilities which are not a general permit Class I or Class II are a Class III.

The industrial SWPPP defines monitoring locations for each potential point source discharge from an INEL facility area. The SWPPP includes, for each of these monitoring points, the parameters to be surveyed for and the required monitoring frequency. This analysis must also be conducted in accordance with the requirements specified in 40 CFR 136. Not all industrial areas at the INEL require storm water discharges to be monitored and analyzed for specific pollutants. All areas will be inspected annually, at a minimum, to determine if any new potential storm water contaminants are present.

There are no requirements to conduct sampling and analysis of run-off from construction sites. However, these sites are regularly inspected to ensure that erosion and contaminated run-off control measures are being implemented, are properly maintained, and are effective.

9.3.2.2 Pretreatment Monitoring Requirements. The general pretreatment regulations (40 CFR 403) require municipalities to prepare a pretreatment program which is submitted to the "Approval Authority" (in Idaho, this is EPA Region X) for approval. Upon having the program approved, the municipality becomes the "Control Authority" and is required to implement the provisions of the program. Part of the program includes monitoring and reporting requirements for certain industrial discharges to the POTW.

40 CFR 403 requires that discharges which fall under the purview of the National Categorical Standards monitor and report at least at the frequency specified in the applicable categorical standard. The POTW may at its discretion require additional monitoring above and beyond the requirements of the categorical standard. Currently, no INEL facility discharging to the Idaho Falls POTW is classified as a categorical industrial user.

The general pretreatment regulations state that if a noncategorical industrial user is considered to be a significant industrial user (SIU), that discharger will be required to report to the Control Authority twice annually on the nature and concentration of its wastestream. Several criteria are evaluated to determine if a facility is an SIU based on daily flows, percentage of contribution to the POTW, or types and concentration of pollutants in the wastestream. The INEL has two facilities in the City of Idaho Falls that require monitoring of effluents being discharged to the POTW. These requirements are detailed within the IWA agreements. Specific requirements stipulated in the Idaho Falls Sewer Use Ordinance (SUO) governing the discharges from these facilities are included in Section 12.

9.3.2.3 Sludge Disposal Monitoring Requirements. 40 CFR 503 establishes the requirements for the disposal of domestic sewage sludge. However, these regulations do not specifically require surface water monitoring as part of the management practices for domestic sewage sludge disposal sites. The regulations do require that the sewage sludge placed on an active sewage sludge unit do not contaminate an

aquifer. A groundwater monitoring system or a leachate collection system may be used to demonstrate compliance with this requirement. The monitoring program must demonstrate that the sewage sludge placed on an active sewage sludge unit is not contaminating an aquifer. The data and results from the monitoring program must be developed and certified by a qualified groundwater scientist.

9.3.2.4 Spill Monitoring Requirements. Any spills or discharges designated as hazardous substances at the same or greater amount than that specified in 40 CFR 117.3 must be reported within 24 hours of the discharge event.

10. UNDERGROUND STORAGE TANKS

Subtitle I of the Resource Conservation and Recovery Act (RCRA) provides for the development and implementation of a comprehensive regulatory program addressing underground storage tanks (USTs). The Environmental Protection Agency (EPA) promulgated UST regulations (40 CFR 280-281) to satisfy the RCRA mandates. There are two areas under the UST regulations that have groundwater monitoring provisions: release detection and release response and corrective action.

Groundwater monitoring is not explicitly required under the UST regulations. The requirements for assessment, detection, and corrective action imply that groundwater monitoring may be required to obtain the required site-specific data. With the exception of groundwater monitoring used as a leak detection method (40 CFR 280.43), there are no regulations that establish technical specifications.

10.1 Purpose and Major Provisions of UST Regulations

The regulations under 40 CFR 280 and 281 establish requirements for leak detection, leak prevention, financial responsibility, and corrective action for all USTs containing regulated substances to ensure the protection of human health and the environment. The technical and financial responsibility requirements for USTs were published as a final rule on September 23, 1988 (53 FR 185, p. 37082-37247), and codified at 40 CFR 280. The objectives of State program approval are codified at 40 CFR 281.

USTs are regulated by the EPA unless State regulations are promulgated that are at least as strict as Federal standards. Although the State of Idaho does not have a comprehensive UST program at this time, it does partially regulate certain types of USTs through existing State regulatory programs. For example, although the EPA (through 40 CFR 280, Subpart D) regulates tanks that contain petroleum products, the Hazardous Materials and Petroleum Product Spills portion of the Idaho water quality regulations addresses unauthorized releases of petroleum products from tanks, including those on the Idaho National Engineering Laboratory (INEL).

10.2 Tanks and Tank Systems Not Regulated Under UST Program

Three groups of tanks and tank systems are exempted from the current UST regulations. These groups are described in the following sections.

10.2.1 Exemption for Tanks

Under Subtitle I of RCRA, the following types of tanks are excluded from the definition of "underground storage tank" and, therefore, are exempt from UST regulations (40 CFR 280.12):

- Farm or residential tanks of 1,100 gal or less capacity used for storing motor fuel for noncommercial purposes
- Tanks used for storing heating oil for consumptive use on the premises where stored
- Septic tanks

- Pipeline facilities, including gathering lines, regulated under
 - The Natural Gas Pipeline Safety Act of 1968 (49 USC App. 1671, et seq.)
 - The Hazardous Liquid Pipeline Safety Act of 1979 (49 USC App. 2001, et seq.)
- Intrastate pipeline facilities regulated under State laws
- Surface impoundments, pits, ponds, or lagoons
- Storm water or wastewater collection systems
- Flow-through process tanks
- Liquid traps or associated gathering lines directly related to oil or gas production and gathering operations
- Storage tanks situated on or above the floor of underground areas, such as a basement, cellar, mine, drift, shaft, or tunnel.

In addition, "underground storage tank" does not include any pipes connected to any tank described above.

10.2.2 Exemptions for UST System Classes

The following six classes of UST systems are not excluded from requirements in 40 CFR 280 [40 CFR 280.10(b)]:

- Mixtures of hazardous wastes and regulated substances, including wastes listed under Subtitle C of the Safe Drinking Water Act (SDWA)
- Equipment and machinery that contain regulated substances for operational purposes
- Wastewater treatment tanks regulated under Section 402 or 307(b) of the Clean Water Act (CWA)
- Any UST system whose capacity is 110 gal or less
- Tanks with *de minimis* concentrations of regulated substances
- Tanks used for emergency spill protection or overflow control.

10.2.3 Deferred Tanks and Systems

The following tanks and tank systems are deferred from UST requirements of Subparts B, C, D, E, and G of 40 CFR 280, but must still comply with the requirements of Subpart A, "Program Scope and Interim Prohibitions," and Subpart F, "Release Response and Corrective Action for UST Systems Containing Petroleum or Hazardous Substances:"

- Airport hydrant fueling systems
- Field constructed tanks for underground bulk storage
- Wastewater treatment tank systems
- Tanks containing radioactive wastes and materials regulated under the Atomic Energy Act (AEA) and tanks that are part of nuclear power generation facilities regulated by the NRC.

However, it should be noted that the EPA is deferring further regulation of tanks containing radioactive wastes and materials until additional information can be gathered on the effectiveness of existing Nuclear Regulatory Commission (NRC) license provisions in preventing leakage from these tanks [40 CFR 280.10(c)]. Fuel tanks solely for use by emergency power generators have been deferred from the release detection requirements. All other requirements such as Interim Prohibition (Subpart A); UST Design, Construction, Installation, and Notification (Subpart B); General Operating Requirements (Subpart C); Release Reporting, Investigation, and Confirmation (Subpart E); Release Response and Corrective Action (Subpart F); Closure (Subpart G); Financial Responsibility (Subpart H) are still applicable [40 CFR 280.10 (d)].

10.3 UST Regulation Subparts

Interim prohibitions for UST systems are listed in Subpart A of 40 CFR 280. Tanks and tank systems cannot be installed [40 CFR 280.11 (a)] unless the UST system

- Will prevent releases due to corrosion or structural failure for the operational life of the UST system.
- Is cathodically protected against corrosion, constructed of noncorrodible material, steel clad with a noncorrodible material, or designed in a manner to prevent the release or threatened release of any stored substance. (A UST system without corrosion protection may be installed at a site that is determined by a corrosion expert not to be corrosive enough to cause a release during its operating life. The owners and operators must maintain records that demonstrate compliance for the remaining life of the tank.)
- Is constructed or lined with material that is compatible with the stored substance.

Subpart B of 40 CFR 280 includes requirements for the design, construction, and installation of tank systems and for notification procedures if leaks, spills, or overflows occur. Subpart C lists general operating requirements for UST systems. Subpart D lists procedures for detecting leaks, including pressure testing, inventory control, and tank gauging. Subpart D also describes requirements for vapor monitoring, where soil gases are analyzed to detect minute leaks of volatile substances, such as petroleum distillates. Subpart D also includes groundwater monitoring requirements. Subpart E of 40 CFR 280 presents release reporting and investigation requirements. Subpart F contains the corrective action provisions of UST regulations, including requirements for initial responses, abatement measures, site characterizations, product removal, and soil and groundwater cleanup. Subpart G describes closure procedures for out-of-service UST systems.

10.4 Groundwater Monitoring and Response Provisions of UST Regulations

The UST regulations contain provisions for optional and required groundwater monitoring. The regulations may be applicable or relevant and appropriate requirements (ARARs) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), if the release is hazardous enough to warrant inclusion on the National Priorities List (NPL) or if the National Contingency Plan (NCP) under CERCLA is triggered. Groundwater monitoring provisions in the UST program are contained in the release detection section and the release response and corrective action sections of the regulations, as described below.

10.4.1 Release Detection

A system for detecting leaks must be implemented for USTs and associated piping to monitor and minimize any potential product releases. The regulations define seven methods that can be used for detecting leaks in tanks and the conditions under which they may be used.

Groundwater monitoring [40 CFR 280.43(f)] can be used to monitor for free product on top of the groundwater table to determine the presence of a release from a UST system. This release detection method has the following limitations:

- The water table must be 20 ft or less below the surface
- The surface soils must have a minimum conductivity of 0.01 cm/sec
- The monitoring wells must be placed within the excavation zone or as close to the excavation zone as is technically feasible
- The regulated substance must be immiscible in water and have a specific gravity of less than one.

Groundwater monitoring wells drilled for release detection must also meet certain construction requirements. The wells must be constructed to allow waste constituents to flow into the wellbore under both high and low groundwater conditions, while preventing the inflow of natural soils or filter pack. The wells should also be sealed from the surface to the top of the filter pack to preclude the incursion of any surface waters, and the monitoring devices (continuous or manual) must be capable of detecting the presence of at least 1/8 in. of free product on top of the groundwater.

This leak detection method would not be feasible at the INEL since the depth to the water table exceeds 20 ft. However, another type of a tank leak detection method can be used if the tank owner/operator can demonstrate that the method can detect a 0.2 gal per hour leak rate or a release of 150 gal within a month, with a probability of detection of 0.95 [280.43 CFR (e)(1-8) and 280.43 CFR (h)(1-2)].

10.4.2 Release Response and Corrective Action

Once a release is confirmed, the owner/operator must follow the release response provisions in 40 CFR 280.53 and corrective action steps promulgated in 40 CFR 280.60 through 280.66. The implementing agency must be notified within 24 hours of any suspected or confirmed release of spills in excess of 25 gal or

that cause a sheen on nearby surface waters, and of planned or implemented corrective actions [40 CFR 280.53(a)(1)].

The need for groundwater monitoring is implied in regulations 40 CFR 280.63 and 280.65 for the following "trigger" situations [40 CFR 280.65(a)]:

- There is evidence that drinking water wells have been affected
- Free product is detected on the water table or within the aquifer
- There is evidence that contaminated soil is in contact with groundwater
- As required by the implementing agency.

When a release to the environment is confirmed, groundwater monitoring is required during site characterization and corrective action discussed in Section 10.4.2 through 10.4.2.3. Other release detection requirements are discussed below.

10.4.2.1 Initial Site Characterization. The owner/operator must submit a site characterization report to the implementing agency within 45 days of release confirmation. This document must include, but is not limited to, data on surrounding populations, water quality, use and approximate locations of wells potentially affected by the release, subsurface soil conditions, locations of subsoil sewers, climatological conditions, and land use (40 CFR 280.63).

10.4.2.2 Investigations for Soil and Groundwater Cleanup. The owner/operator must define the full extent of soil contamination caused by the release and define the presence and concentrations of dissolved product contamination in the groundwater. The trigger situations that require full characterization of soil and groundwater contamination are listed above. The results of the subsurface investigation required under 40 CFR 280.65 must be submitted "as soon as practicable or in accordance with a schedule established by the implementing agency."

10.4.2.3 Corrective Action Plan. The owner/operator must submit additional information or develop and submit a Corrective Action Plan (CAP) (40 CFR 280.66) for responding to contaminated soil and groundwater according to a schedule and format established by the implementing agency. The CAP must include the following:

- Description of the physical and chemical characteristics of the regulated substance (e.g., toxicity, persistence, and potential for migration)
- A hydrogeologic characterization of the facility and the surrounding area
- Description of both the surface water and groundwater (i.e., proximity, quality, and current and projected uses)
- The potential effect of residual contamination on nearby surface water and/or groundwater and
- An exposure assessment.

The owner/operator must monitor, evaluate, and report results of the plan implementation according to a schedule established by the appropriate regulatory agency. Cleanup of the soil or groundwater may begin prior to regulatory approval of the CAP, if the owner/operator notifies the appropriate agency of the intent to clean up, complies with all conditions imposed by the regulatory agency, and includes self-initiated cleanup measures in the CAP that is submitted to the implementing agency for approval (40 CFR 280.66).

10.5 Surface Water Monitoring and Response Provisions of UST Regulations

There are only a few instances in 40 CFR 280, where surface water is referenced. Part 280.50 states that reporting will be necessary if there is an indication of surface water contamination due to the leakage or spillage of substances from a UST. A sheen on the surface water near an UST system may be an indicator of surface water contamination from petroleum products. Corrective action measures must be taken when a release of petroleum products or hazardous substances occurs to the environment, including surface water [40 CFR 280.53(a)(1)]. For clean-up, a CAP is necessary (described in Section 10.4.2.3). Within the CAP, the proximity, quality, and current and future uses of nearby surface water, as well as the potential effects of residual contamination on nearby surface water, should be considered [40 CFR 280.66(b)(3-4)]. 40 CFR 280.65(a)(4) also states that the implementing agency may request that an investigation be conducted to determine the potential effects of contaminated soil and ground water on nearby surface water resources.

11. PROTECTION OF FLOODPLAINS AND WETLANDS

Executive Order 11990, "Protection of Wetlands," and Executive Order 11988, "Floodplain Management," were signed by President Carter to establish a national criteria for Federal agencies for the management and protection of wetlands and floodplains in the United States. Most federal agencies have issued regulations to implement these orders. For the U.S. Department of Energy (DOE), the regulatory and compliance requirements for these two orders are stipulated in 10 CFR 1022. It is the intent of both orders that Federal agencies fulfill the floodplain/wetland requirements through existing procedures such as those established for implementation of the National Environmental Policy Act (NEPA) [10 CFR 1021], which provide a method of environmental review for evaluating the potential effects of any action that may take place in a wetland or floodplain. This section summarizes the orders and the relevant implementing regulations. Tables summarizing the technical requirements for compliance with the orders and regulations are included in Sections 16 and 17.

11.1 Purpose and Major Aspects of the Executive Orders

Executive Order 11990, "Protection of Wetlands," directs each Federal agency to provide leadership and take action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands in carrying out agency duties and responsibilities. This order also ends most direct Federal assistance for wetland conversion.

Executive Order 11988, "Floodplain Management," directs Federal agencies to consider floodplain management when formulating and evaluating water or land use plans. The order directs Federal agencies to take a leadership role and to take action to avoid adverse impacts associated with the occupancy and modifications of floodplains. Because many wetlands are located within floodplains, this order influences much wetland development.

The executive orders apply to such Federal activities as construction or improvement projects, acquisition and disposal of land, and programs affecting land use, including regulation of licensing. Areas affected include all wetland locations whether they are located along or near rivers, streams, oceans, ponds, marshes, bogs, vernal pools, or related bodies and floodplain locations in these areas or any area that is subject to a 100-year flood.

11.2 Floodplain/Wetland Management Requirements

Regulations have been promulgated to ensure effective implementation of the executive orders for floodplain and wetlands management. The Idaho National Engineering Laboratory (INEL) contains several areas to which these regulations apply. As of July 1995, there has been no official identification of floodplain locations on the INEL; however, tentative identifications have been made and a formal floodplain analysis is expected to be completed by Fiscal Year 1997. A U.S. Fish and Wildlife Services (USFWS) INEL Wetlands Inventory map has been developed, but it is not an official wetland delineation document for regulatory purposes. An INEL wetland guidance document as well as a characterization and distribution report of the INEL wetlands, playas, and waters of the U.S. are in preparation. If areas delineated on the INEL are defined as jurisdictional wetlands by the U.S. Army Corps of Engineers (Corps) or as waters of the U.S., both area types receive protection under the provisions of the Clean Water Act (CWA) as well as other regulatory requirements.

The Corps has provided a broad definition of the term wetland that has been used for its delineation criteria manuals developed in 1987, 1989, and 1991 (see 33 CFR 328.3). The U.S. Environmental Protection Agency (EPA), the USFWS and the Soil Conservation Service (SCS) have developed similar wetland definitions used for administration of their wetland programs. However, the Corps, EPA, and SCS wetland definitions include only the areas that are vegetated under normal circumstances, while the USFWS definition encompasses both vegetated and nonregulated areas. The USFWS also requires only one of the wetland criteria to be present for designation as a wetland, while the other three agencies require all criteria to be met for designation. At present, the four agencies have agreed to use the 1987 "Federal Manual for Identifying and Delineating Jurisdictional Wetlands" as the standard for identifying and delineating wetlands for regulatory purposes, e.g., Section 404 of the CWA discussed in Section 11.3 (Grumbles, 1994). This manual is currently proposed for additional revisions, which may result in expanding the jurisdiction of Section 404 of the CWA to include drainage, excavation, channelization, and other activities that could adversely impact wetlands. The 1987 manual states that, "If hydrophyte vegetation is being maintained only because of man-induced wetland hydrology that would no longer exist if the activity were to be terminated, the area should not be considered a wetland."

The policies and procedures for discharging the DOE's responsibilities with respect to the executive orders, 10 CFR 1021, and 10 CFR 1022 are incorporated in various DOE orders, including DOE Order 6430.1A, "General Design Criteria." This DOE order states that, to the extent possible, DOE shall accommodate the requirements of Executive Order 11988 and Executive Order 11990 through applicable DOE Order 5440.1E procedures. Where required, as in obtaining Resource Conservation and Recovery Act (RCRA) permits, compliance with the regulations must be accomplished jointly with compliance with DOE Order 5440.1E. The specific requirements of the regulations are discussed in the following sections.

11.2.1 10 CFR 1021 Compliance with the National Environmental Policy Act

Federal agency compliance with the National Environmental Policy Act (NEPA) is mandated in 10 CFR 1021. NEPA establishes a national policy for the protection of the environment (including floodplains and wetlands). This regulation also revokes the NEPA regulations that were previously promulgated by the Energy Research and Development Administration (10 CFR 711) as well as those promulgated by the Federal Energy Administration (10 CFR 208) and NEPA regulations of other predecessor agencies of the DOE. These regulations apply to all organizational elements of the DOE except the Federal Energy Regulatory Commission.

The purpose of NEPA includes providing sufficient evidence and analysis for determining whether to prepare an Environmental Impact Statement (EIS) or to issue a Finding of No Significant Impact (FONSI). When appropriate, DOE is required to include a floodplain/wetlands assessment in its NEPA Environmental Assessments. Categorical Exclusions from NEPA environmental review requirements are available only to those proposals that would not adversely affect environmentally sensitive resources including floodplains and wetlands.

11.2.2 10 CFR 1022 Compliance with Floodplain/Wetlands Environmental Review Requirements

The regulatory requirements stipulated in 10 CFR 1022 provide an outline for instituting a nationally consistent method of environmental review of Federal actions. They also ensure that the potential effects of any action that may take place in a wetland or floodplain are evaluated and consider flood hazard and wetland

management. Further, they require that all Federal agencies issue or amend existing procedures to ensure the protection of wetlands and comply with the intent of the Executive Orders.

Floodplains are defined in 10 CFR 1022.4 as the lowlands adjoining inland and coastal waters and relatively flat areas and flood-prone areas of offshore islands including, at a minimum, that area inundated by a 1 percent or greater chance flood in any given year. The base floodplain is defined as the 100-year (0.1 percent) floodplain. The critical action floodplain is defined as the 500-year (0.2 percent) floodplain. Wetlands are defined in these same regulations as those areas that are inundated by surface or groundwater with a frequency sufficient to support and under normal circumstances do or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

The methods and procedures for identifying wetlands and floodplains are given in 10 CFR 1022.11(b). Acceptable methods and procedures for identifying wetlands include utilizing the resources of the USFWS National Wetlands Inventory, the U.S. Department of Agriculture, United States Geological Survey topographic maps, and state wetlands inventories. Acceptable methods and procedures for identifying floodplains include utilizing the Flood Insurance Rate Maps (FIRMs) or the Flood Hazard Boundary Maps (FHBM) prepared by the Federal Insurance Administration for the Department of Housing and Urban Development. For proposed actions in an area of predominantly Federal or State land holdings where FIRM or FHBM maps are not available, such as the INEL, information is to be sought from the land administering agency or from agencies with floodplain analysis expertise.

Results of the determination of whether the proposed action will occur in a floodplain or wetland are to be included in any statements prepared under Section 102(2)(c) of NEPA. This statement is to include the following information:

- Project description
- Floodplain/wetlands effects
- Alternatives to the proposed action.

11.2.3 Floodplain Location Requirements of the Resource Conservation and Recovery Act

RCRA facility permitting and operating requirements include floodplain location standards and definitions of terms. All permitted RCRA treatment, storage, or disposal facilities located in a 100-year floodplain must be identified and the owner/operator must show that the facility is designed to withstand a 100-year flood. These requirements include the following:

- Facilities placed in a 100-year floodplain must be designed, constructed, operated and maintained to prevent washout of any hazardous waste by a 100-year flood. This requirement may be modified if procedures are in place which will cause waste to be removed safely before flood waters can reach the facility to a location where the wastes will not be vulnerable to flood waters.

- Existing surface impoundments, waste piles, land treatment units, landfills and miscellaneous units must demonstrate that there will be no ill effects on human health or the environment if a washout occurs.

A 100-year floodplain is defined by RCRA to mean any land area subject to a one percent or greater chance of flooding in any given year from any given source. A 100-year flood means a flood that has a 1% chance of being equaled or exceeded in any given year.

In meeting RCRA's Part B permitting regulations, owners and operators of all facilities must identify whether the facility is located within a 100-year floodplain, indicate the source of data for the determination, and include a copy of the relevant Federal Insurance Administration (FIA) flood map, if used, or the calculations and maps used where an FIA map is not available. Information must also be provided identifying the 100-year flood level and any other special flooding factors, such as wave action, which must be considered in designing, constructing, operating, or maintaining the facility to withstand washout from a 100-year flood.

Where maps of the National Flood Insurance Program produced by the FIA are available, they are generally considered determinative of whether a facility is located within or outside of the 100-year floodplain. Where the FIA map excludes areas, those areas must be considered and a determination made as to whether they are in the 100-year floodplain. The owner or operator must use equivalent mapping techniques to determine whether the facility is within the 100-year floodplain, and if so located, what the 100-year flood elevation would be. Because FIA maps do not exist for most of the INEL, FIA-equivalent maps will have to be produced to determine whether a proposed facility is located within or outside of the 100-year floodplain.

When it is determined that a RCRA-permitted facility lies within a 100-year floodplain, additional information is required for the Part B permit including

- An engineering analysis indicating the hydrostatic and hydrodynamic forces expected to result at the site as a consequence of a 100-year flood.
- Structural or other engineering studies showing the design of operational units and flood protection devices at the facility and how these will prevent washout.
- In lieu of the engineering studies and analyses, a detailed description of procedures may be submitted which will be followed to remove hazardous waste to safety before the facility is flooded. This description must include information relative to the timing of movement relative to flood levels, a description of locations to which the waste will be removed, written procedures, identification of resources and equipment, and an analysis of the potential for accidental discharge during movement.

11.3 Specific Wetland Management Requirements

Wetland and areas designated as waters of the U.S. are afforded protection by a variety of legislative policies and guidelines under the jurisdiction of several Federal and state agencies.

Section 404 of the CWA establishes a Federal regulatory program for the discharge of dredged or fill material into "waters of the United States," defined in 33 CFR 328.3 to include among others, intrastate

wetlands, lakes, rivers, streams (including intermittent streams), playa lakes, and natural ponds. Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA [other than cooling ponds as defined in 40 CFR 423.1(m)] are not considered to be waters of the U.S.

Administered by the Corps and the EPA, the Section 404 permit program is designed to minimize the adverse impacts to rivers, streams, lakes, and wetlands. Section 404 consists of three main parts:

1. Section 404(a) authorizes the Corps to issue permits for filling navigable waters (which includes wetlands as defined by the Corps). The Corps evaluates each permit based on guidelines to comply with the CWA. The Corps often relies on public interest and other agency reviews for evaluating permits.
2. Section 404(b) requires that the Corps issue permits in accordance with guidelines developed by the EPA. Among other things, these guidelines state that "no discharge of dredged or fill material shall be permitted if there is a practical alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem..." and that "no discharge of dredged or fill material shall be permitted which will cause or contribute to significant degradation of the waters of the U.S."
3. Section 404(c) authorizes EPA to veto a decision by the Corps to issue a permit to fill a wetland. Specifically, "(t)he Administrator (of EPA) is authorized to...deny or restrict the use of any defined area for specification...as a disposal site whenever he determines... that the discharge... will have unacceptable adverse effects on municipal water supplies, shellfish beds and fishery areas (including spawning and breeding areas), wildlife, or recreational areas."

Not all activities in wetlands involve a discharge or dredged or fill material; and therefore, they do not require a Section 404 permit even though they can cause wetland conversion or damage. These actions have traditionally included lowering groundwater levels, flooding wetlands, and excavating wetlands where the dredged material is disposed of on an upland site. However, recent court decisions have modified these "exemptions" so that permits from the Corps are required for many activities previously excluded from the permitting process. In summary, the Section 404 permit program has evolved from a water quality statute toward a wetlands protection statute.

The Corps has established a Nationwide Permit (NWP) Program [33 CFR Part 330 Appendix A] that provides regulations for activities having minimal impact while reducing paperwork and delays. The NWP Program authorizes minor discharges of dredged or fill material into waters of the U.S. (including wetlands) as well as minor activities in navigable waters of the U.S. and can eliminate the Section 404 permit process requirement. The INEL has been granted authority under this program that allows for minor actions in areas designated as waters of the U.S.

Other sections of the CWA are also important to wetland management and protection:

1. Section 401 allows the State of Idaho to establish a water quality certification process that can be used as an important tool for wetland protection. This certification may be required, depending upon the type of project or activity that impacts streambed or wetland areas. In conjunction with the "Joint Application for Permit" required for a Section 404 permit, the Idaho Department of

Environmental Quality issues this water quality certification, which must be received before a Section 404 permit is issued by the Corps.

2. Section 402 of the CWA, as discussed in Section 9.3.1.1 of this document, establishes the National Pollutant Discharge Elimination Systems (NPDES) for regulating point source pollution into waters of the U.S. Section 311 of the CWA (see Section 9.3.1.4) regulates the discharge of oil or hazardous substances into or upon the navigable waters of the U.S., which include all waters of the U.S. including wetlands.
3. Lastly, Section 319 of the CWA, Nonpoint Source Management Program, directs states to develop programs to reduce the level of pollution from nonpoint sources to navigable waters of the U.S. For Idaho, the Idaho Water Quality Standards and Wastewater Treatment Requirements, Idaho Code, Title 1, Chapter 2, contain regulations governing nonpoint source activities impacting waters of the State, including wetlands (see Section 12.6 of this document).

Federal projects that Congress specifically authorizes enjoy special dredge-and-fill disposal status under Subsection 404(r) if certain conditions are met. These conditions include (1) an EIS must be submitted to Congress prior to project funding, (2) no actual discharge of material associated with project construction may have occurred prior to submittal of the EIS, and (3) the activity must comply with the CWA, Section 307, Effluent Standards and Prohibitions. In this special case, a federal project involving discharge of dredged or fill material is not subject to Section 404 regulation nor is it subject to any state permitting program authorized under CWA Section 404.

In situations meeting the above requirements, i.e., where actions are exempt from CWA requirements, the Corps of Engineers (Corps) and EPA review EISs involving dredge and fill activities to determine if the documents contain sufficient information on the proposed discharges and whether the proposals are consistent with EPA's 404(b)(1) guidelines for the discharge of dredged or fill materials. The EPA or the Corps may inform DOE that an EIS either does not contain the requisite information or is inconsistent with the 404(b)(1) guidelines. Where the EIS is found to be inconsistent with the 404(b)(1) guidelines, the Cover Sheet and Summary must contain the following sentence:

"The EPA/the Corps has determined that this project as proposed is not consistent or otherwise in compliance with the Section 404(b)(1) guidelines of the Clean Water Act."

The EIS must then include the EPA/Corps comments in the copy that is circulated and submitted to Congress prior to requesting either authorization or appropriation of funds and prior to actual discharge of material. The last part of CWA Section 404 indicates that federal agencies must, in addition to the requirements of Section 404, observe any additional state or interstate agency dredge and fill laws or requirements.

The Oil Pollution Act of 1990 (as amended), 33 USC 2701 et seq., provides for the prevention of, liability for, removal of, and compensation for the discharge, or substantial threat of discharge of oil into or upon the navigable waters of the United States, defined as waters of the U.S., which includes wetlands. DOE could be liable for any discharge of oil or substantial threat of discharge of oil into waters of the U.S. including wetland areas identified on the INEL. The Oil Pollution Act also requires owners/operators of any nontransportation-related onshore facility that, because of its location, could reasonably be expected to cause substantial harm to the environment by discharging oil into or upon the navigable waters or adjoining

shorelines to prepare and submit a facility response plan to the EPA (40 CFR 112.20). Under 40 CFR 112, proximity to environmentally sensitive areas has been identified as a factor in the substantial harm evaluation. Environmentally sensitive areas may include areas such as wetlands, critical habitats for endangered or threatened species, and critical biological resources areas (40 CFR 112.2). All facility response plans must be consistent with the requirements of the National Oil and Hazardous Substance Pollution Contingency Plan [40 CFR 300] and any applicable Area Contingency Plans prepared pursuant to Section 311(j)(4) of the CWA. A substantial harm evaluation of INEL facilities has been conducted and is reevaluated annually. It has been determined that the INEL is not a substantial harm facility and, therefore, does not require a facility response plan under the Oil Pollution Act.

12. STATE OF IDAHO REGULATIONS

The State of Idaho has both water protection programs and waste management programs that include groundwater and surface water provisions.

12.1 State of Idaho Program Overview

Most of the environmental programs in Idaho are administered by the Idaho Department of Health and Welfare (IDHW), Division of Environmental Quality (DEQ), and the Idaho Department of Water Resources (IDWR). The State works with the Environmental Protection Agency (EPA) Region X, and each year develops a work plan, known as the State/EPA Agreement, which identifies priorities for the State and the resources needed to carry out necessary programs (Jessup 1988).

The Director of the Department of Health and Welfare has the primary authority to manage all State environmental programs. The Director delegates management responsibility to the Administrator of the DEQ. The politically appointed Board of Health and Welfare incorporates the functions of rulemaking and hearings. The DEQ administers and directs two programs designed to protect and enhance the environment and public health. These programs are: 1) Permits and Enforcement; and 2) Planning and Support Services. The Permits and Enforcement program performs all permitting and permit review functions for the DEQ. It is also responsible for inspecting permitted facilities.

A system of IDHW, Division of Environmental Quality (DEQ), regional offices administer the Idaho environmental regulations for all media. Additionally, the IDWR has a Resource Administration Division that manages water-use programs, including water allocation and permits, adjudication, and dam safety.

The following sections discuss specific State of Idaho rules and regulations concerning groundwater and surface water.

12.2 Solid Waste

The Solid Waste Management Regulations and Standards (Title 1, Chapter 6) were developed by the IDHW to provide standards for the management of solid wastes to prevent health hazards, public nuisances, or pollution of the environment. Title 1, Chapter 6 further states that solid wastes should be managed such that they will not cause or contribute to the pollution of groundwater or surface water. These standards include requirements for the review of plans and the approval of procedures and operational and post-operational standards for landfills, incinerators, and processing facilities, and for the transportation and storage of solid wastes.

12.2.1 Groundwater Standards

Groundwater standards for the siting of sanitary landfills are specified in Title 1, Chapter 6, Section 01.06006. Water table test boring holes, wells, excavations, and depth to water table, if encountered, must be included within the site plan of operation. Topographic maps must be prepared and include identification of water supplies on or within 1/4 mile of the proposed landfill boundaries and all water courses, ponds, lakes and reservoirs. All landfills must be located and operated so that solid waste is not dumped directly into groundwater.

12.2.2 Surface Water Standards

Specific standards for sanitary landfill operations relative to the management of surface waters are given in Title 1, Chapter 6, Section 01.06006. Preparation of a plan of operations, including a topographic map identifying all water courses, ponds, lakes or reservoirs at or near the landfill site is required. Additionally, all landfills must be located and operated such that solid waste is not dumped directly into surface water, and adequate protection must be provided to prevent the pollution of surface water or groundwater.

Surface drainage waters must be diverted from the landfill. The entire site, including the landfill surfaces, shall be graded and provided with drainage facilities to minimize runoff onto and into the sanitary landfill to prevent erosion or washings and to prevent the collection of standing water as required in Section 39-7415, Idaho Code. Where there is a probability that surface waters may cause a leachate problem or if a leachate problem develops, a collection and treatment system for leachate will be required.

Title 1, Chapter 6, also states that all liquid effluents from incinerators to be discharged to surface waters or groundwaters of the State should meet federal and Idaho water quality standards and requirements including permit requirements.

12.3 Hazardous Waste

The State of Idaho adopted by reference the Federal regulations for hazardous waste management pursuant to the Idaho Hazardous Waste Management Act, Sections 39-4401 et seq., Idaho Code. On February 4, 1991, the State of Idaho received final authorization from EPA to administer the hazardous waste management program (55 FR 235, p. 50327). These regulations are administered by the IDHW and referred to as Title 1, Chapter 5, Rules and Standards for Hazardous Waste. The adopted sections are 40 CFR 124, 260-266 (excluding 264.149, 264.150, 265.149, 265.150, and 265.430), 268 [excluding 268.5, 268.6, 268.42(b), and 268.44], and 270. The State of Idaho excluded from adoption sections of other Federal regulations pertaining to hazardous waste, such as the Dredge or Fill Program under Section 404 of the Clean Water Act (CWA), and the National Pollutant Discharge Elimination System (NPDES) program under the CWA.

On April 5, 1989, Senate Bill 1266 was signed, which gave the Governor of Idaho authority to coordinate State oversight programs at the Idaho National Engineering Laboratory (INEL). Senate Bill 1266 also provided funding for the DEQ to study the State's oversight role and to report to the next session of the Legislature.

12.3.1 Groundwater Monitoring

Groundwater monitoring requirements for owner/operators of treatment, storage, and disposal (TSD) facilities in the State of Idaho are categorized into three separate areas that parallel the Federal regulations under Resource Conservation and Recovery Act (RCRA). These three areas are as follows:

- General groundwater monitoring requirements
- Interim status groundwater monitoring requirements
- Groundwater monitoring requirements for permitting a TSD facility.

12.3.1.1 General Groundwater Monitoring Requirements. The State of Idaho groundwater regulations, identical to those in 40 CFR 264, Subparts F and G, for owner/operators of TSD facilities, are

contained in Title 1, Chapter 5, Section 01.05008. These requirements state that owner/operators must develop and implement a groundwater monitoring program for the purposes of detection, assessment, compliance, or corrective action. The groundwater monitoring system (GWMS) must consist of a sufficient number of wells, installed at appropriate locations and depths, to yield samples from the uppermost aquifer. Details on GWMSs are in Section 5 of this report.

12.3.1.2 Interim Status Groundwater Monitoring Requirements. Owner/operators of interim status land-based TSD facilities must comply with the regulations in Title 1, Chapter 5, Section 01.05009. These regulations are identical to those in 40 CFR 265, Subparts F and G. Owner/operators of land-based TSD facilities, including surface impoundments, landfills, and land treatment units, are required to design, construct, operate, and maintain a GWMS that is capable of evaluating the facility's impact on groundwater in the uppermost aquifer underlying the facility. Details on interim status groundwater monitoring requirements are in Section 5 of this report.

12.3.1.3 Groundwater Monitoring Requirements for Permitting a TSD Facility. The specific permit application requirements regarding the protection of groundwater are contained in Title 1, Chapter 5, Section 01.05012. The data requirements are identical to those in 40 CFR 270.14, including the following: a summary of the groundwater monitoring data collected during interim status; results of a detailed hydrogeologic investigation characterizing the uppermost aquifer; and sufficient information to establish a detection, compliance, or corrective action program, if required. Details on groundwater monitoring requirements for permit applications and permitted facilities are in Section 5 of this report.

12.3.2 Surface Water Monitoring

The surface water monitoring requirements for owners/operators of RCRA-regulated facilities in the State of Idaho are parallel to the Federal regulations. The Federal regulations containing monitoring requirements for permitted facilities found in 40 CFR 264, Subparts F, G, J, K, L, M, N, and X, are reciprocal to Title I, Chapter 5, Section 01.05008; and the Federal regulations containing monitoring requirements for interim status facilities found in 40 CFR 265, Subparts F, G, J, K, L, M, and N, are reciprocal to Title I, Chapter 5, Section 01.05009. The regulations state that surface water monitoring and inspection is required as part of the design and operation standards for RCRA-regulated waste management units. The requirements for surface water monitoring are not as detailed as the groundwater monitoring requirements. However, owners/operators of these units must ensure that the design, construction, and maintenance of waste management units prevent hazardous constituents from migrating out of the unit to adjacent surface waters. Routine monitoring and inspection is necessary to demonstrate compliance. Groundwater and surface water monitoring is specifically required, where applicable, during corrective action, since these activities are multi-media environmental investigations. Details on surface water monitoring requirements are in Section 5 of this report.

12.4 Well Construction Standards

The Idaho Water Resources Board adopted rules and regulations, (Title 03, Chapter 09 "Well Construction Standards Rules") providing procedures for the construction, maintenance, and abandonment of wells under the authority provided by Title 42, Chapter 2, Section 42-238(4), Idaho Code, "Appropriation of Water - Permits, Certificates, and Licenses - Survey." Wells must be constructed in a manner to protect groundwater from waste and contamination. The rules under Title 03, Chapter 09 apply to all water wells, monitoring wells, low-temperature geothermal wells, injection wells, and other artificial openings and excavations in the ground that are greater than 18 ft in vertical depth below land surface. These rules are discussed below:

- Rule 1: Title and Scope. These rules are applicable to all water wells, monitoring wells, low-temperature geothermal wells, injection wells, and other artificial openings and excavations in the ground that are more than 18 ft in vertical depth below land surface.
- Rule 10: Definitions. Important terms in the rules and regulations are defined here.
- Rule 25: Construction Standards for Cold Water Wells. Rule 25 establishes the minimum standards that will protect against waste and contamination of groundwater resources. Casing specifications and guidance for the construction of artesian, gravel-packed, driven, dug, cathodic protection, and monitoring wells are provided. Surface instrumentation, completion standards, disinfection and contamination, and plugging and abandonment procedures are discussed.
- Rule 30: Construction Standards and Bonding of Low-Temperature Geothermal Resource Wells. Rule 30 establishes standards as above except that they apply to wells with a bottom hole temperature greater than 85°F and less than 212°F. Owners of low-temperature geothermal resource wells must file a surety or cash bond with the Director of the Idaho Water Resource Board in an amount not less than \$5,000 or more than \$20,000, depending on the depth of the well, before constructing, modifying, or deepening the well after July 1, 1987.
- Rule 35: Health Standards. Rule 35 establishes minimum construction, location and maintenance standards for public water supply wells, including procedures to follow when mineralized or contaminated water is encountered in a wellbore, minimum distances to septic tanks, drain fields, etc., and proper maintenance procedures for the well owner. All wells constructed for public water supply must also meet requirements set forth by IDHW, Title 01, Chapter 01, "Idaho Rules for Public Drinking Water Systems."
- Rule 40: Areas of Drilling Concern. Rule 40 describes the designation of "areas of drilling concern" to protect public health or to prevent contamination of ground and/or surface water because of such factors as aquifer pressure, vertical depth to the aquifer, temperature of groundwater, or contaminated ground or surface waters.
- Rule 45: Drilling Permit Requirements. Rule 45 establishes requirements for obtaining a permit to drill, construct, enlarge, or deepen a well.
- Note: The INEL has received permission to submit a single annual well drilling permit to IDWR for monitoring wells and observation wells drilled during the year (letter from DOE/ID to IDWR, 12/93 letter OPEVES-93-098).
- Rule 50: Penalties. Rule 50 establishes the penalty provisions for noncompliance with minimum well construction standards/rules as specified in 42-238 and 42-238(b), Idaho Code.

12.5 Underground Injection Wells

Title 42, Chapter 39, of the Idaho Code contains the waste disposal and injection well statutes for the State of Idaho. The Idaho Water Resources Board promulgated the rules, regulations, and minimum standards for construction and use of injection wells in August 1984. These requirements contained in Title 03, Chapter 03, ("Rules for Construction and Use of Injection Wells") are periodically revised; the latest update was in 1994. Injection wells are divided into five classes. At this time, Class I, II, III, and IV injection wells are not authorized by the State of Idaho for construction or use (IDAPA 37.03.03). The State of Idaho is currently

operating under an EPA-approved underground injection control (UIC) program. The five classes of injection wells, as defined by the State of Idaho, are as follows:

- Class I: Wells used to inject hazardous or other industrial and municipal wastes below the lowermost formation containing a drinking water source [defined as an aquifer with less than 10,000 mg/L total dissolved solids (TDS)].
- Class II: Wells used to inject fluids that are brought to the surface with conventional oil or gas production, utilized for enhanced recovery of oil or gas, or used for liquid hydrocarbon storage at standard temperature and pressure in the injection formation.
- Class III: Wells used for mineral extraction except for solution mining in conventional mines.
- Class IV: Wells used to inject hazardous or radioactive wastes into or above a formation that contains a drinking water source.
- Class V: All wells not included in Classes I, II, III, or IV. Class V wells include, but are not limited to, air conditioning, heat pump and cooling water return flow wells, wells used for disposal of sanitary wastes, stormwater runoff and agriculture wastewater wells, recharge wells, and radioactive materials injection wells other than Class IV. A list of all Class V well types is provided in Title 03, Chapter 03.

The UIC rules in Title 03, Chapter 03 prohibit injection of radioactive or hazardous materials through an existing well or above a drinking water source. Parameters for the quality of fluids discharged and allowable uses of injection wells are specified in these regulations, as are classifications of well types and permitting requirements for injection wells. The UIC rules for the State of Idaho are summarized below:

- Rule 1: Title and Scope. The authority is provided under Title 42, Chapter 39, State of Idaho Code, to promulgate these regulations for the protection of groundwater.
- Rule 10: Definitions. Important terms in the rules and regulations are defined here.
- Rule 25: Classification of Injection Wells - Authorizations, Prohibitions, and Exemptions. These rules establish the classification scheme for injection wells in the State of Idaho. Under IDAPA 37.03.03025,03(a) the permitting, construction, or use of any Class I, II, III, or IV injection well is not authorized. The injection of hazardous or radioactive wastes into or above a drinking water source is prohibited under IDAPA 37.03.03025,03(b).
- Rule 30: Inventory Information and Permit Requirements for Class V Shallow Injection Wells. Class V shallow injection wells are used to inject nonhazardous or nonradioactive wastes. Permits are not required for shallow injection wells (less than 18 ft. deep) unless required by the director. Owner/operators of Class V wells are required to complete an information inventory for the Director, which includes the facility name, location, well owner, function of the well, number of wells, and operational status, and other pertinent information.
- Rule 35: Application for Permit to Construct, Modify, or Maintain an Injection Well. These rules provide the procedures for permitting Class V wells (other than those Class V wells,

authorized without permit). Permit applications must use a topographic map to identify all injection wells, approximate drainage areas, hazardous waste facilities, all drinking water supply wells, and all other wells, springs, and surface waters extending 1 mi. beyond property boundaries. The permit application must also include the distance to the nearest domestic well and the depth to groundwater, and provide alternative methods of waste disposal. Additional information may be required by the Director of the IDWR as described in Title 03, Chapter 03.

- Rule 40: Application Processing. These rules provide details on the permit process. The Director will prepare a draft permit or denial, which will include the permit application, permit conditions, and any compliance schedules or monitoring requirements. The director will provide public notice of any draft permit to construct, maintain or modify a Class V injection well by means of a legal notice in a newspaper of general circulation in the county in which the well is located.
- Rule 45: The Director's Action on Draft Permits and Duration of Approved Permits. These regulations establish permit conditions to ensure that drinking water sources will be protected from waste, unreasonable contamination, or deterioration of groundwater quality that could result in violations of the water quality standards. Specific construction, operation, maintenance, monitoring equipment, and abandonment requirements are established. Permits remain in effect for no more than 10 years.
- Rule 50: Standards for the Quality of Injected Fluids and Criteria for Location and Use. These standards, which are the minimum standards that are to be adhered to for all deep injection wells and shallow injection wells requiring permits and rule authorized wells not requiring permits, are based on the premise that if the injected fluids meet primary maximum contaminant levels (MCLs) for drinking water standards (see Section 8) and if groundwater produced from adjacent points of diversion for beneficial use meets the water quality standards, then that aquifer will be protected from unreasonable contamination and preserved for diversion to beneficial uses. Standards for quality of fluids injected by Class V wells requiring permits and criteria for location (including minimum distance from a point of diversion for beneficial use to prevent groundwater contamination) and use of Class V wells are established.
- Rule 55: Monitoring, Record Keeping, and Reporting Requirements. Owner/operators of Class V wells must provide monitoring, record keeping, and reporting data as required by the Director, if it is determined that the well may be adversely affecting a drinking water source or is injecting a contaminant that could have an unacceptable effect upon the quality of the groundwaters of the State.
- Rule 60: Permits will be assignable to a new owner or operator of an injection well if the new owner or operator shall, within 30 days of the change, notify the Director of such change. The new owner or operator will be responsible for complying with the terms and conditions of the permit from the time that such change takes place.
- Rule 65: Any owner or operator is legally responsible for any violation of the regulations. Violations include the following: failure to comply with a permit, applicable standards for water quality, or permit application notification requirements; falsifying in an issued permit any statement, representation, or certification; modifying a monitoring device or method; failure to respond to any notification of a violation when a response is required; and improper abandonment of

a well. A violation may result in cancellation of the permit by the Director of the Idaho Water Resources Board. The Director may seek a legal restraining order prohibiting any person from violating the regulations and can pursue civil remedies as may be appropriate and provided by law against the violator.

Rule 70: Under Title 67, Chapter 52, of the Idaho Code, the Idaho Water Resources Board must provide conveniently located hearings to address the injection well application. This rule provides legal recourse to the owner or operator filing a petition. In addition, any person disagreeing with the status of the application can address his grievances by written notification to the Director of the Idaho Water Resources Board. This notification must be submitted within 30 days after receiving notice of approval, disapproval, or conditional approval.

Rule 75: Exemption from Drinking Water Source Designation. These regulations define the conditions necessary for an aquifer to be exempted from the definition of "drinking water source" and be used for disposal of certain contaminants as determined by the Director.

The required monitoring data may include, but are not limited to, surface injection pressures, flow rates and volumes, analysis of the injectate, and groundwater monitoring, as determined by the Director. The "trigger" actions for groundwater monitoring are not defined in the regulations, nor are the technical standards. The standards are identified for the quality of fluids discharged as well as criteria for the location and uses established for permitting all Class V injection wells. The frequency of monitoring is established by the permit, and all monitoring tests and analyses must be conducted by State-certified laboratories or be approved by the Director.

12.5.1 Surface Water Monitoring Standards

These rules and regulations do not contain any surface water standards or requirements.

12.6 Idaho Water Quality Standards

The IDHW Rules and Regulations, Title 1, Chapter 2, "Water Quality Standards and Wastewater Treatment Requirements," provide for the protection of both surface waters and groundwaters, designate protected uses for the State waters, and establish water quality standards protective of those uses.

12.6.1 Groundwater Standards

Groundwater use classifications, use designation, general quality criteria, and criteria for use as a water supply are established in Title 1, Chapter 2, Section 01.02299. For the State of Idaho, the designated use includes: agricultural, domestic water, industrial water, and potable water supplies. Water quality criteria are established for hazardous, deleterious, and radioactive materials for all groundwaters of the State. Additional criteria are established in Section 01.02299.05 if groundwater is to be used as a domestic or potable water supply (as established in Section 01.02250.03a). The requirements established in Title 1, Chapter 02 for potable water supplies are not as comprehensive as those in Title 1, Chapter 8, which mirror the SDWA Standards and, therefore, should not be used in lieu of the Federal Standards for drinking water. Under Section 01.0202(b), the Director may designate groundwaters that exist at higher than potable water quality or that are highly vulnerable to contamination as special resource waters.

12.6.2 Surface Water Standards

Surface waters are designated according to the uses for which they are presently suitable or intended to become suitable. The designated beneficial uses for which the surface waters of the state are to be protected include (Section 01.02250):

- Water supply (agriculture, domestic, and industrial),
- Aquatic life (cold water biota, warm water biota, and salmonid spawning),
- Recreation,
- Wildlife habitat,
- Aesthetics.

The State has adopted criteria for toxic substances and radioactivity for domestic water supplies. In accordance with toxic substance criteria established in 40 CFR 131.36(b)(1), the National Toxics Rule, the State has incorporated Federal standards in the manner provided in IDAPA 16-01.02250.07. Radioactive materials or radioactivity are not to exceed concentrations specified in Title 1, Chapter 8, Idaho Code, "Idaho Rules for Public Drinking Water Systems," for domestic water supplies.

In Title 1, Chapter 2, Section 01.02200, the general water quality criteria, which may apply to surface waters at the INEL, state that all surface waters of the State shall be free from: (a) hazardous materials, (b) toxic substances, (c) deleterious materials, (d) radioactive materials, (e) floating, suspended or submerged matter, (f) excess nutrients, (g) oxygen-demanding materials, and (h) sediment in concentrations found to be of public health significance or to adversely affect designated or protected beneficial use. This regulation also contains procedures for establishing site-specific water quality criteria and provides numerical limits for a variety of parameters based on intended use (e.g., recreational, cold water biota) of the water.

12.6.3 Hazardous Material and Petroleum Product Spills

Title 1, Chapter 2, Section 01.02850 addresses the unauthorized release of hazardous materials to surface water, groundwater, or land such that there is a likelihood that the release would enter State waters. Section 01.02851 contains requirements for reporting suspected releases for petroleum storage tank systems into nearby surface water or groundwater, while Section 01.02852 addresses petroleum release response and corrective actions to be initiated after confirming a petroleum release.

12.6.3.1 Requirements Applicable to Groundwater and Surface Water. The owner/operator is required to make a "reasonable" effort to abate and stop a hazardous material spill, contain the release in such a manner that it will not reach surface waters or groundwaters, immediately notify the IDHW of the spill, and to collect, remove, and dispose of the spill in a manner approved by the IDHW. For petroleum releases, owners/operators must report to the IDHW within 24 hours and follow procedures for release investigations and remediation. Corrective actions are required for petroleum spills that result in a release that exceeds 25 gallons or that produces a sheen on nearby surface water. Owners/operators are also required, unless directed otherwise by the Director of the IDWR, to perform an initial site characterization concerning the release. This information must include, but is not limited to (a) data on the nature and estimated quantity of the release, (b) data concerning surrounding populations, water quality, location of wells affected by the release, and subsurface soil conditions, and (c) data from measurements that assess the site for the presence of petroleum contamination. Although these regulatory requirements do not actually specify surface water or groundwater

monitoring, the response action that must be undertaken might include monitoring any waters that may have been affected.

Title 1, Chapter 2, also provides regulations governing nonpoint activities, point source discharges of wastewater into mixing zones or receiving waters, and discharges which may result in water quality standards violation.

12.7 Idaho Drinking Water Regulations

Drinking water standards are established in Title 1, Chapter 8, "Idaho Rules for Public Drinking Water Systems." These standards apply to all public drinking water systems within Idaho. Drinking water systems at the INEL meet the definition of a public drinking water system. Presently the State of Idaho's MCLs adopt the MCLs of the Federal Program under the SDWA by reference. MCLs under the SDWA have been established or proposed for inorganic and organic contaminants, microbiological contaminants, radium-226, radium-228, radon-222, uranium, beta and photon emitters, and gross alpha particle radioactivity. Maximum Contaminant Level Goals (MCLGs) are defined as the level at which a contaminant may be found in drinking water for which no adverse health effects are known. Specific MCLs and MCLGs are found in 40 CFR 141 as referenced in Title 1, Chapter 8.

Secondary Maximum Contaminant Levels (SMCLs) were established previously by the State of Idaho for those chemical substances and physical characteristics that affect the aesthetic quality of drinking water but do not endanger public health. The State of Idaho has adopted the Federal SMCLs of 40 CFR 143 by reference. The SMCLs are not enforceable but are intended as guidelines.

Because the standards for those chemicals addressed by the State must be equal to or more stringent than the Federal standards, and because MCLs, MCLGs, and SMCLs are periodically revised, updated, or replaced and the compounds addressed by these guidelines may change, the State has approved the Federal standards as State drinking water standards for all contaminants. Information resources such as the Safe Drinking Water Hotline at (800) 426-4791 should be consulted for the most up-to-date information.

12.7.1 Groundwater

Drinking water systems are required to be monitored to determine if drinking water standards have been exceeded. All INEL drinking water systems are monitored as required by the SDWA and the Idaho regulations.

The State drinking water standards are not groundwater monitoring requirements *per se*, but they are important considerations when groundwater remediation is either required or anticipated. The MCLs or MCLGs can be used as applicable or relevant and appropriate requirements (ARARs) for required levels of groundwater cleanup under CERCLA (see Section 6 of this report).

12.7.2 Surface Water

Because the INEL does not obtain any drinking water from surface water, specific surface water requirements are not discussed here.

12.8 Idaho Environmental Protection and Health Act

The primary goal of the Idaho Environmental Protection and Health Act (Sections 39-101 through 39-130 of the Idaho Code) is to provide for the protection of the environment and the promotion of personal health. This goal is to be partially accomplished by maintaining the existing high quality of State groundwater and surface water in order to protect existing and projected future water uses such as drinking, agriculture, industry, and aquaculture water supplies. Groundwater and surface water are to be protected as a valuable public resource against unreasonable contamination and deterioration. The quality of degraded groundwater and surface water is to be restored where feasible and appropriate.

12.8.1 Groundwater

To reach the goal of maintaining the existing high quality of State groundwater, the Act designates the IDHW as the primary agency to coordinate and administer groundwater quality protection programs for the State; to provide the scope and duties of the Groundwater Quality Council and certain State agencies; to define terms; to create a Groundwater Quality Council; to provide for completion of a groundwater quality plan; to provide for adoption, amendment, or rejection of the plan by the Legislature; to provide for a chairman and quorum of the Groundwater Quality Council; to provide duties of State and local governments regarding the groundwater quality plan; and to determine liability for application of a pesticide or fertilizer product. The Idaho Environmental Protection and Health Act designated the IDHW to provide for completion of a groundwater quality plan, to provide for the plan's adoption, amendment, or rejection by the legislature, and to provide duties for State and local governments regarding the plan. The Ground Water Quality Plan was adopted by the 1992 Legislature.

Title 67, Chapter 65, Local Planning Act, was amended by Section 67-6537, Idaho Code, to include the consideration of the effect of amending, repealing, or adopting a comprehensive plan on the quality of groundwater in the area.

12.8.2 Surface Water

The director of the Department of Health and Welfare will administer a system to safeguard the quality of surface waters.

12.9 Idaho Wastewater—Land Application Permit Rules

Title 1, Chapter 17, "Wastewater-Land Application Permit Rules," of the IDHW Rules and Regulations establishes the procedures and requirements for issuance and maintenance of permits for the treatment of municipal and industrial wastes by application to land. The requirements of this Title are supplemented by the IDHW "Guidelines for Land Application of Municipal and Industrial Wastewater" (IDHW, 1994). Title 1, Chapter 2, Section 01.02600 entitled, "Land Application of Wastewater(s) or Recharge Waters," provides additional requirements that reference the Title 1, Chapter 17 requirements. The Title 1, Chapter 2 requirements are further discussed in Section 12.9.2 of this section.

12.9.1 Permit Requirements, Application, and Conditions

Title 1, Chapter 17, states that no person shall discharge to a land application facility without a valid permit. "Person" is defined in the Title to include Federal agencies. According to the Title, the IDHW Director may exclude facilities from permit requirements if covered adequately by other law. Permit applications must be submitted to the IDHW 180 days prior to the start-up of a new facility, expiration of an existing permit, or within 180 days after the effective date of these regulations for an existing facility.

The technical contents of the permit application include, but are not limited to, the following:

- A topographic map of the facility site identifying and showing the location and extent of public and private drinking water supply sources
- The physical, chemical, and biological characteristics of the wastewater
- The climatic, hydrogeologic, and soil characteristics of the facility site.

During operation of the facility the owner of the facility must operate and maintain all monitoring systems that were installed or used to achieve compliance with the permit. The regulations also contain specific reporting requirements when any noncompliance is discovered that may endanger the public health or the environment. The owner must contact the Director of the IDHW orally within 24 hours of discovering the noncompliance.

Because environmental conditions and wastewater compositions vary from facility to facility, the Director may establish specific permit conditions on a case-by-case basis. Characteristics that may cause the Director to establish specific permit conditions include but are not limited to the geologic and climatic nature of the facility site, the size of the site and its proximity to population centers and to groundwater and surface waters, and the need for monitoring and record keeping to determine if the facility is being operated in conformance with its design and whether the design is adequate to protect public health and the environment.

12.9.2 Groundwater Monitoring Requirements

Title 1, Chapter 2, Section 01.02600 states that provision must be made for monitoring the quality of the groundwater in proximity of the application site. The groundwater monitoring program is subject to approval by the IDHW. All data and reports resulting from the groundwater monitoring program must be submitted to the IDHW upon request. The minimum frequency of monitoring and data submittal will be determined by the IDHW and in general will be dependent upon (a) the nature and volume of wastewater material or recharge water, (b) the frequency and duration of application, and (c) the characteristics of the soil mantle on and lithology underlying the application site. The rules in Title 1, Chapter 17, state that a facility may be subject to monitoring requirements including, but not limited to, the following:

- The installation, use, and maintenance of monitoring equipment
- Monitoring or sampling methodology, frequency, and locations
- Monitored substances or parameters
- Testing and analytical procedures
- Reporting requirements including both frequency and form.

The IDHW Guidelines state that hydrogeologic investigations for land treatment of wastewater will often be required to obtain meaningful data to define groundwater flow systems. The wells drilled for defining the hydrogeology are sometimes used for monitoring even though they may be improperly constructed for these purposes. The Guidelines recommend properly constructed wells be used for monitoring. The Guidelines state that a proper design procedure generally requires a two-phase program: establishing observation wells to define the hydrogeology of the site, and installing monitoring wells designed to measure the impact of the facility on groundwater. An effective monitoring system should be capable of detecting or evaluating potential

or existing contamination. The Guidelines propose that, before drilling observation wells for the development of the monitoring system, existing groundwater quantity and quality data should be reviewed. When designing the monitoring system to meet specific hydrogeologic conditions, the designer should identify certain site parameters including site geology, direction of groundwater flow and velocity, possible groundwater mounding, depth and thickness of aquifer, seasonal variations in quantity and quality of groundwater, locations of nearby production wells, location of nearby surface water or wetlands that may be impacted, and other pertinent information. The Guidelines state that a minimum of three observation wells will be necessary to determine the horizontal component of groundwater flow. In complex areas or to obtain the vertical component of flow, more observation wells may be necessary. The number of monitoring wells required depends on the complexity of the site hydrogeology. There should be at least one up-gradient and two down-gradient monitoring wells installed in water-bearing zones that could transmit contaminants. Monitoring well construction should take into account the water quality during construction in case possible well construction modifications are needed.

The Guidelines are fairly specific as to accepted monitoring system design and installation criteria. Although the Guideline report is not a requirements document, it is suggested for use in satisfying permit requirements.

12.9.3 Applicability of Land Application to Surface Water

Title 1 Chapter 17, "Wastewater-Land Application Permit Rules," is concerned with the application of municipal or industrial wastes to land and therefore is not highly relevant to surface water. The sections in Title 1 Chapter 17 applicable to surface water are as follows:

- Section 01.17300.05, parts e and f, pertaining to Permit Requirements and Application, state that the facility permit application should include a topographic map of the wastewater treatment facility and the surrounding outer limits one quarter mile beyond the facility boundary. The topographic map should identify and show the location and extent of: wells, springs, wetlands, surface waters, floodplains, and drinking water supply sources,
- Section 01.17600.01, part c, pertinent to Specific Permit Conditions, states that conditions necessary for the protection of the environment and the public health may differ from facility to facility because of varying environmental conditions and wastewater composition. Specific conditions shall be established in consideration of characteristics specific to a facility and inherent hazards of those characteristics (e.g., size of the site and its proximity to ground and surface water).

12.10 Regulations for Subsurface Sewage Disposal Systems

The intent of "Rules for Individual/Subsurface Sewage Disposal Systems," (Title 1, Chapter 3) is to govern the design, construction, siting and abandonment of individual/subsurface sewage disposal systems and establish the requirements for obtaining installation permits. These rules are intended to ensure that blackwastes and wastewater generated in the State of Idaho are safely contained and treated and that blackwaste and wastewater contained in or discharged from each system

- Are not accessible to individuals
- Are not accessible to insects, rodents, or other wild or domestic animals
- Do not give rise to a public nuisance due to odor or unsightly appearance

- Do not injure or interfere with existing or potential beneficial uses of the waters of the State.

Title 1 Chapter 3 states that unless there is a valid installation permit, any modification, repair or construction of any subsurface sewage disposal systems within the State of Idaho is in violation of State law. Information required in the permit application may include, but is not limited to, the following:

- The location of all existing water supply systems features and surface water locations
- Soil description and profile, groundwater data, percolation or permeability test results, and/or a site evaluation report
- Proposed operation, maintenance, and monitoring procedures to ensure the system's performance and failure detection.

Title 1, Chapter 3, describes the construction requirements, standards, and specifications for septic tanks, standard drainfields, standard absorption beds, and seepage pits. These rules also give the minimum distances between the systems mentioned above and public water supplies, water distribution lines, and surface waters. Abandonment requirements are also detailed within the State rules.

12.11 Specific County and City of Idaho Falls Requirements

12.11.1 City of Idaho Falls Requirements to Protect Surface Water

The Idaho Falls Sewer Department regulates all industrial waste entering the Idaho Falls Publicly Owned Treatment Works (POTW) by implementing a pretreatment program within the City of Idaho Falls Sewer Ordinance (City of Idaho Falls, Municipal Code, Chapter 1, Section 8). The purpose of the pretreatment program is to prevent interference with the POTW operations, to assure discharge waters have been adequately treated, and to improve the opportunity to recycle and reclaim wastewaters and sludges from the system. The requirements specified in the Sewer Ordinance enables the city to comply with all applicable State and Federal laws required by the Clean Water Act of 1977 and the general Pretreatment Regulations (40 CFR 403).

All INEL in-town facilities that discharge industrial wastewater to the City of Idaho Falls (City) sewer system must complete and adhere to an Industrial Wastewater Acceptance (IWA) Form. Each IWA Form represents a written agreement between the City Sewer Department and the specific INEL facility. The IWA may contain effluent limitations, monitoring and reporting requirements, sampling frequencies, and types of samples to be taken of discharges to the sewer system by the INEL facility. Two INEL Idaho Falls facilities, the INEL Research Complex (IRC) and the Willow Creek Building (WCB), are considered significant industrial users (under EPA's noncategorical industry discharger classification), which requires these facilities to report to the City annually on the nature and concentration of their wastestream. These additional requirements are detailed within the facility-specific IWA Forms. [At present, no INEL in-town facilities that discharge to the City's POTW are classified as categorical dischargers.] The City Sewer Ordinance also requires notification to the City immediately following a slug load or accidental discharge of substances prohibited by the Sewer Ordinance. The City may also require the submission of an Accidental Discharge/Slug Control Plan (ASPP) to the City Director of Public Works.

12.11.2 County Requirements

The INEL lies in portions of six separate counties: Bingham, Bonneville, Butte, Custer, Clark, and Jefferson. Local county officials from the Health Department, in each of these counties were contacted and

questioned about county ordinances regulating surface water and groundwater. From the county officials it was concluded that none of the counties that the INEL lies in have ordinances regulating surface water and groundwater.

12.12 Conjunctive Management of Surface and Groundwater

The IDWR adopted Title 3, Chapter 11, "Rules Governing Conjunctive Management of Surface and Ground Water," in October 1994, which prescribes procedures for responding to a delivery call (i.e., a request from the holder of a water right for administration of water rights under the prior appropriation doctrine) made by the holder of a senior-priority surface or groundwater right against the holder of a junior-priority groundwater right in an area having a common groundwater supply. These rules are to be incorporated into general rules governing water distribution in Idaho when such rules are adopted.

Under Section 03.11020.03, the rules are designed to integrate the administration and use of surface and groundwater in a manner consistent with the traditional policy of reasonable use of both surface and groundwater. In accordance with the prior appropriation doctrine, these rules treat surface water and groundwater located in an area with a common groundwater supply as a single source. The rules include the basis for determining the reasonableness of the diversion and use of water by both the holder of a senior-priority water right who requests priority delivery and the holder of a junior-priority water right against whom the call is made. These rules may impact the INEL's water rights if a delivery call is made by the holder of a senior-priority water right.

13. REGULATIONS PERTAINING TO RADIOACTIVE AND MIXED WASTE

Numerous regulations have been enacted to regulate the handling and disposal of radioactive wastes. Since radioactive wastes vary considerably in physical and chemical properties, most regulations deal with only certain types of radioactive wastes. Mixed wastes are defined as wastes that are classified as radioactive wastes and contain a hazardous waste that exhibits hazardous waste characteristics identified in Title 40, Code of Federal Regulations (CFR) Part 261, Subpart C or is a listed hazardous waste in 40 CFR 261, Subpart D. The radioactive and hazardous portions of mixed wastes are governed under separate regulations.

The Federal regulations pertaining to radioactive or mixed wastes that are relevant or may become relevant to the Idaho National Engineering Laboratory (INEL) and that require environmental monitoring are listed below and discussed in the following sections.

- Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes (40 CFR 191)
- Radioactive Waste: Byproduct Material (10 CFR 962)
- Radiation Protection of the Public and the Environment (Draft Proposed Rule 10 CFR 834)
- Licensing Requirements for Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste (10 CFR 72)
- Environmental Protection Standards for Management and Land Disposal of Low-Level Radioactive Waste (Draft Proposed Rule, 40 CFR 193)
- Land Disposal of Naturally Occurring and Accelerator-Produced Radioactive Materials (Draft Proposed Rule 40 CFR 764)
- Radiation Protection Criteria for Cleanup of Land and Facilities Contaminated with Residual Radioactive Materials (Proposed Rule 40 CFR 194).

The U.S. Department of Energy (DOE) has issued DOE orders that establish additional policies, guidelines, and minimum requirements for facilities managing radioactive and mixed wastes. These orders include policy requirements for the protection of surface water and groundwater relevant to radioactive and mixed waste treatment, storage, and disposal systems. See Section 14 of this document for details. DOE orders that include requirements for radioactive and mixed waste management at DOE facilities are currently under revision and substantial changes are expected.

13.1 Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level Wastes, and Transuranic Radioactive Wastes (40 CFR 191)

13.1.1 General Scope of 40 CFR 191

The purpose of 40 CFR 191 is to establish environmental standards for the management, storage, and disposal of spent nuclear fuel, high-level waste (HLW), and transuranic (TRU) waste and applies to sites used to manage, store, or dispose of the designated spent fuel or wastes, if the sites are (1) regulated by the U.S. Nuclear Regulatory Commission (NRC) or by Agreement States, or (2) operated by the DOE and are not regulated by the NRC or an Agreement State (40 CFR 191.01). The State of Idaho was an Agreement State from October 1968 until June 1991, when the State voluntarily withdrew its Agreement.^a

Although Idaho is not currently an Agreement State, the INEL is operated by DOE; consequently 40 CFR 191 would apply to the facilities at the INEL that are used to manage, store, or dispose of spent nuclear fuel, HLW, and TRU wastes, such as the Idaho Chemical Processing Plant (ICPP) and the Radioactive Waste Management Complex (RWMC).

The subparts of the 40 CFR 191 regulations carefully distinguish between standards applicable to management and storage operations and standards applicable to disposal operations. Each of the subparts is briefly described below. Each subpart either implies the need for groundwater monitoring or directly requires monitoring.

13.1.2 Details of 40 CFR 191 Pertaining to Groundwater

Subpart A of 40 CFR 191, entitled "Environmental Standards for Management and Storage," contains definitions used in the regulation and standards for protection of the public from radiation exposure during waste management and storage. It applies to radiation doses received by members of the public as a result of the management and storage of radioactive waste at any facility that is operated by DOE or that is regulated by the NRC or by an Agreement State [40 CFR 191.03(a)(b)].

Radiation from facilities regulated by the NRC or by Agreement States shall not exceed 25 millirems to the whole body, 75 millirems to the thyroid, and 25 millirems to any other critical organ. The radiation from facilities operated by the Department of Energy and not regulated by the NRC or Agreement States shall not exceed 25 millirems to the whole body and 75 millirems to any critical organ [40 CFR 191.03(a)].

Alternative radiation standards of up to 100 millirems of continuous exposure dose equivalent per year and infrequent exposure of up to 500 millirems dose equivalent per year may be issued for facilities that are not regulated by the NRC or Agreement States, upon meeting standards established in 40 CFR 191.03(b) [40 CFR 191.04(a)(1)].

a. Personal Communication between Steve West (Idaho Department of Health and Welfare) and Stella Steele (Science Applications International Corporation), June 21, 1993.

Subpart B, "Environmental Standards for Disposal," contains specifications for containment, assurance, and individual and ground water protection requirements for facilities disposing of spent nuclear fuel. Subpart B is applicable to (1) radioactive materials released into the accessible environment as a result of the disposal of spent nuclear fuel or high-level or transuranic radioactive wastes, (2) radiation doses received by members of the public as a result of such disposal, and (3) radioactive contamination of certain sources of groundwater in the vicinity of disposal systems for such fuel or wastes (40 CFR 191.11). It does not apply to wastes disposed of before the effective date of the rule (November 18, 1985). Subpart B contains release limits that must be complied with (and thus demonstrated prior to disposal) for 10,000 years following permanent closure.

The major requirements under Subpart B that may apply to the INEL pertain to waste containment, assurance of site integrity, and individual protection from radiation.

13.1.2a Waste Containment. The waste containment requirements emphasize the use of a "reasonable expectation, on the basis of the record before the implementing agency, that the compliance will be achieved" [40 CFR 191.13(b)] and that the cumulative releases of radionuclides to the accessible environment for 10,000 years after disposal shall

- Have a likelihood of less than one chance in 10 of exceeding the standards listed in 40 CFR 191 Appendix A [40 CFR 191.13(a)(1)]
- Have a likelihood of less than one chance in 1,000 of exceeding ten times the standards listed in 40 CFR 191 Appendix A [40 CFR 191.13(a)(2)].

The operative words are "reasonable expectation." "Complete assurance" is not required.

13.1.2b Assurance Requirements. The "assurance requirements" under Subpart B of 40 CFR 191 are intended to provide confidence that the disposal facility will be able to isolate contaminants from the accessible environment for a prescribed period of time. These provisions do not apply to facilities regulated by the NRC (40 CFR 191.14). NRC facilities are regulated by requirements stated in 10 CFR 60. The requirements for DOE and/or Agreement States can be summarized as follows:

- Maintain active institutional controls to prevent unauthorized access for as long as possible after disposal [40 CFR 191.14(a)]
- Use a maximum of 100 years of active institution controls when calculating performance assessments [40 CFR 191.14(a)]
- Monitor the site after disposal "to detect substantial and detrimental deviations from expected performance" [40 CFR 191.14(b)]
- Monitor in ways that do not jeopardize the isolation of the wastes [40 CFR 191.14(b)]
- Conduct monitoring until there are no significant concerns to be addressed by further monitoring [40 CFR 191.14(b)]

- Use permanent markers as passive institutional controls to indicate the dangers and locations of the wastes [40 CFR 191.14(c)]
- Use engineered and natural barriers to isolate the wastes from the environment [40 CFR 191.14(d)]
- Avoid locating disposal sites near old mining areas, projected future mining or drilling areas, or areas near scarce resources, including groundwaters that are either irreplaceable because there are no reasonable alternative sources of drinking water available for substantial populations or that are vital to the preservation of unique and sensitive ecosystems [40 CFR 191.14(e)]
- Select disposal sites so as not to preclude recovery of wastes for a reasonable period of time after disposal [40 CFR 191.14(f)].

13.1.2c Individual Protection Requirements. "Disposal systems for waste and any associated radioactive material shall be designed to provide a reasonable expectation that, for 10,000 years after disposal, undisturbed performance of the disposal system shall not cause the annual committed effective dose received through all potential pathways from the disposal system, to any member of the public in the accessible environment, to exceed 15 millirems." [40 CFR 191.15(a)].

13.1.2.1 Environmental Standards for Groundwater Protection Under 40 CFR 191. Groundwater protection standards are addressed in 40 CFR 191, Subpart C. It is applicable to direct radiological doses to the public from activities subject to Subparts B, and it also applies to radionuclide contamination of underground sources of drinking water at such facilities. It requires that disposal systems for waste and any associated radioactive material be designed to provide a reasonable expectation that for 10,000 years after disposal, radionuclide concentrations in groundwater will not exceed the limits specified for radioactivity in 40 CFR 141 [5 pCi/L for combined radium-226 and radium-228, and 15 pCi/L for gross alpha particle activity (including radium-226 but excluding radon and uranium)].

13.1.3 Details of 40 CFR 191 Pertaining to Surface Waters

This regulation does not contain any surface water requirements.

13.2 Radioactive Waste: Byproduct Material (10 CFR 962)

13.2.1 General Scope of 10 CFR 962

The purpose of the DOE rule in 10 CFR 962 is to interpret the Atomic Energy Act (AEA) definition of the term "byproduct material" as it applies to DOE wastes that are hazardous wastes under Resource Conservation and Recovery Act (RCRA). The rule establishes the regulatory jurisdiction of both the AEA and RCRA over DOE mixed wastes.

The rule contains no specific provisions relating to groundwater or surface water. The rule does, however, clarify the applicability of other regulations over DOE byproduct material. Radioactive components are governed by AEA standards. For example, disposal of HLW and TRU waste would be governed by 40 CFR 191. However, the hazardous, nonradioactive components of byproduct material would be governed by

RCRA. RCRA contains technical requirements for both groundwater and surface water that are applicable to the INEL (see Section 5).

13.3 Radiation Protection of the Public and the Environment (Draft Proposed Rule 10 CFR 834)

On March 25, 1993, DOE published a Notice of Proposed Rulemaking (58 FR 56, pp. 16268-16322) to establish standards for the protection of the public and the environment against radiation from DOE activities (10 CFR 834, "Radiation Protection of the Public and the Environment"). The current draft regulatory language for 10 CFR 834 is dated September 1994 and has not been published in the Federal Register. DOE reopened the comment period on 10 CFR 834 on August 31, 1995, (60 FR 169, pp. 45381-45385) for 30 days to solicit additional comments on the September 1994 draft rule. The September 1994 draft rule is substantially different from the March 1993 proposed rule and may undergo additional revisions as comments are received and incorporated into the final rule. The section reviews applicable portions of the September 1994 draft rule 10 CFR 834 as it applies to monitoring, protecting, or managing groundwater.

13.3.1 General Scope of Draft Proposed Rule 10 CFR 834

The purpose of 10 CFR 834 is to govern activities conducted by, or for, DOE that could result in the release of radioactive material, the exposure of members of the public to ionizing radiation, or contamination of the environment with radionuclides from DOE activities. Public dose limits in this rule are intended to apply to doses to members of the general public from routine DOE operations and operational occurrences. The dose limits are not intended to be safety design criteria or guidelines for mitigating the consequences of accidents.

The requirements presented in 10 CFR 834 do not apply to activities regulated through a license by the NRC or by a Agreement State acting under an agreement with the NRC; activities conducted under the authority of the Director, Office of Naval Reactors; exposures of patients to ionizing radiation for medical purposes; exposures to background radiation, including global fallout from nuclear testing or past accidents; exposures of workers that arise during performance of work duties; or consumer products containing nominal amounts of radioactive material or producing nominal amounts of radiation (10 CFR 834.1).

13.3.2 Details of Draft Proposed Rule 10 CFR 834 Pertaining to Groundwater

10 CFR 834 requires that a Environmental Radiological Protection Plan (ERPP) be established for DOE activities that routinely generate, handle, process, or dispose of radioactive materials. DOE activities must be conducted in accordance with the ERPP. The ERPP provides requirements for groundwater management by identifying existing or anticipated DOE activities subject to the requirement; establishing measures to be used in implementing the requirement; establishing methods to be used in monitoring, reporting, and recording compliance with the requirements; implementing an as low as is reasonably achievable (ALARA) program; conducting environmental monitoring, including sources of emissions in liquid waste streams [10 CFR 834.211 and 834.212], effluent monitoring [10 CFR 834.7(b)(1)], environmental surveillance [10 CFR 834.7(b)(2)]; and providing for groundwater protection [10 CFR 834.215]. The Groundwater Protection Management Program (GWMPMP) required by this rule can be described or included in the ERPP.

According to 10 CFR 834.7, an Environmental Monitoring Program (EMP) must be established to characterize releases of radioactive material from a DOE activity, estimate the dispersal pattern in the environment, characterize the pathways of exposure to the public, and estimate the doses to individuals, to the population, and to the biota in the vicinity of the DOE activity [10 CFR 834.7(a)]. The EMP should include effluent monitoring to determine quantities and concentrations of pollutants in liquid discharges and characterize effluent streams, discharge modes, and radiological properties of the sources. Environmental surveillance is also required in the EMP to determine the location and magnitude of the concentrations of pollutants in the environment, provide information from direct measurement and sampling to confirm the adequacy of the effluent monitoring, and identify exposure pathways to estimate doses to the public [10 CFR 834.7(b)].

Under Subpart B, Radiation Dose Limits for Members of the Public, 10 CFR 834.101 establishes primary dose limits as a result of routine DOE operations and operational occurrences. The dose limits attempt to reduce the likelihood of radiation dose to the public from exposure to contaminated groundwater. At the INEL, standards for groundwater dose limits apply because groundwater is used for drinking. 10 CFR 834.214 states that, the drinking water system for a DOE activity shall be managed in a manner that complies with the provisions of 40 CFR Part 141, which contains the national primary drinking water regulations under the Safe Drinking Water Act (SDWA). Additionally, "discharges from DOE activities shall be managed in a manner that will not cause private or public drinking water systems downstream or down-gradient of the facility discharge to exceed the drinking water maximum contamination levels in 40 CFR Part 141" [10 CFR 834.214(b)].

10 CFR 834.101 states that a DOE activity shall be conducted in a manner such that the exposure of members of the public to ionizing radiation must comply with the ALARA program requirements in 10 CFR 834.104 and not cause a total effective dose equivalent (TEDE) greater than 100 mrem in a year from all sources of ionizing radiation and exposure pathways with exclusions provided in 10 CFR 834.101(a)(2)(i)-(iv). Temporary limits for the public in excess of 100 mrem in a year, but not in excess of 500 mrem, may be authorized by DOE under request conditions described in 10 CFR 834.101(b)(1)-(3).

The rule also requires no new or increased discharge to active or virgin soil columns and phasing out of radiologically contaminated liquid waste discharges to soil columns; drainage systems (e.g., trenches, ponds, and seepage basins); and groundwater as soon as practicable. The requirements do not apply to disposal of liquid waste containing radionuclides in those cases where the liquid waste stream is treated by best available technology and the practice results in a lesser risk of adverse impacts on human health and the environment than any other practical alternative waste management practice. The elements required for evaluating alternative practices must include a risk assessment, migration assessment, and monitoring [10 CFR 834.212(i)-(iii)]. A contingency plan must be established and followed if the actual concentrations of radionuclides are found to be in excess of primary drinking water regulations under the SDWA [10 CFR 834.212(c)(3)(i) and (ii)]. Practices that conform to the requirements for discharges must be coordinated with the EPA or the State of Idaho when the authority has been delegated to them.

A preoperational study is also required under 10 CFR 834 as part of the EMP. The study must begin at least 1 year prior to the start up of a new activity, when practicable; establish background levels of radiation and radioactive components; characterize pertinent environmental and ecological parameters; and identify potential pathways for human exposure or environmental impact [10 CFR 834.7(b)(4)(i)-(iv)].

Subpart D of 10 CFR 834, "Requirements Applicable to Liquid Sources of Radiation," establishes the requirement for a GWPMP to protect groundwater from radiological contamination. The GWPMP plan can be described or included in the ERPP. According to 10 CFR 834.215, the GWPMP plan shall: "(1) document the quality and quantity of ground water; (2) identify possible sources of contamination, including waste management units and soil columns; (3) assess the potential for radiological contamination of the ground water by a DOE activity; (4) describe strategies for controlling contamination, including preventive and remedial measures to comply with applicable Federal environmental laws and regulations; (5) describe measures for monitoring the groundwater; and (6) be coordinated with appropriate State representatives."

10 CFR 834 also provides requirements for protecting groundwater by controlling residual radioactive material from decontamination; cleaning up of land and buildings contaminated with residual radioactive material from DOE or inactive processing sites; and managing uranium and thorium byproduct material (not subject to 40 CFR 192) and naturally occurring and accelerator produced radioactive material residue or waste [10 CFR 834.306(a)(1)-(3)]. Controls must be designed so that concentrations of radionuclides in groundwater and residual radioactive material will not exceed the requirements in 10 CFR 834.306. Long-term management of residual radioactive material in residue and waste from a DOE activity is required by 10 CFR 834, and the management must comply with the GWPMP [10 CFR 834.306(e)(2)(iii)].

13.3.3 Details of Draft Proposed Rule 10 CFR 834 Pertaining to Surface Water

The ERPP, required by 10 CFR 834, must include environmental monitoring and dose limitations for the release of radioactive materials in liquid waste streams. Additional requirements are provided for radionuclides in liquid waste discharges from DOE activities into sanitary sewers [10 CFR 834.213].

According to 10 CFR 834.211, a DOE activity must be managed so a release of radioactive materials in liquid waste streams (other than sanitary sewers) will comply with ALARA process requirements; be treated by the best available technology if (a) the liquid waste discharged otherwise would contain, at the point of discharge, a concentration of radioactive material, averaged over the year, greater than the derived concentration guide values for ingestion, or (b) the annual TEDE to members of the public resulting from the liquid discharge contributes 10 mrem or more, or (c) the collective dose exceeds 100 person-rem and the liquid discharge contributes 50% or more of this collective dose, or (d) it is a planned feature that is part of the GWPMP for the DOE activity. A DOE activity must not result in the release of settleable solids to natural waterways if the concentration of radioactive material in the solids in the waste stream exceeds 5 pCi/g of settleable solids for alpha-emitting radionuclides; or 50 pCi/g of settleable solids for beta-emitting radionuclides [10 CFR 834.211(a)(3)(i)-(ii)].

The proposed rule indicates that storm water runoff and purge waters that are contaminated with residual radioactive material shall be considered liquid waste streams and controls must be implemented to prevent such contamination or to control the discharge in a way that is consistent with management practices used to control nonradioactive components [10 CFR 834.211(b)]. DOE activities having a National or State Pollution Discharge Elimination System (NPDES) permit that includes radionuclides discharged by those DOE activities and operating in accordance with those permits are exempt from 10 CFR 834.211 for permitted sources [10 CFR 834.211(e)]. Also, discharges of liquid waste from a DOE activity is prohibited from causing a private or public drinking water system to exceed the drinking water radiological limits of 40 CFR Part 141 [10 CFR 832.211(f)].

Subpart F of 10 CFR 834, "Requirements of the Protection of Biota" includes a section addressing the protection of aquatic organisms in natural aquatic environments. It states, "a DOE activity shall be conducted in a manner that the absorbed dose to aquatic animal organisms (e.g. fish, crustaceans, mollusks, and benthic invertebrates) will not exceed 1 rad (0.01 gray) per day from exposure to radiation or radioactive material discharge in liquid waste to natural waterways" (10 CFR 834.231).

13.4 Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste (10 CFR 72)

13.4.1 General Scope of 10 CFR 72

This regulation provides requirements for the licensing, design, and operation of independent spent fuel storage installations (ISFSIs) and for operation of DOE-owned monitored retrievable storage (MRS) installations. The primary difference between ISFSIs and MRS installations, in terms of regulation, is ownership. The ISFSIs can be owned by power companies or independent companies, but the MRS installations must be owned by DOE under the Nuclear Waste Policy Act (NWPA) of 1982. Siting restrictions relative to floodplains and seismically active areas, and design requirements for ISFSIs and MRS installations to withstand natural occurrences such as floods are also contained in 10 CFR 72.

13.4.2 Details of 10 CFR 72 Pertaining to Groundwater

This regulation does not contain specific groundwater monitoring, protection, or management requirements. It does, however, contain exposure limits and the stipulation that the facility be designed to keep "levels of radioactive material in effluents to the environment as low as is reasonably achievable" [10 CFR 72.24(l)]. Additionally, licensing requirements include development of an environmental monitoring program, consequently many of the requirements and standards given in the following surface water section also apply to groundwater.

13.4.3 Details of 10 CFR 72 Pertaining to Surface Water

In siting an MRS, consideration must be given to "present and projected future uses of land and water within the region and...any special characteristics that may influence the potential consequences of a release of radioactive material during the operational lifetime of the ISFSI or MRS" [10 CFR 72.98(2) and (3)].

Some of the licensing requirements include estimation of the quantity of each of the principal radionuclides expected to be released annually to the environment in liquid and gaseous effluent produced during normal ISFSI or MRS operations; an analysis of the potential dose equivalent or committed dose equivalent to an individual outside the controlled area from accidents or natural phenomena events that result in the release of radioactive material to the environment or direct radiation from the ISFSI or MRS; the establishment of an environmental monitoring program; and the submission of an annual report (10 CFR 72.44).

The radiological exposures during normal operations and anticipated occurrences must not exceed 25 mrem to the whole body or 75 mrem to the thyroid and 25 mrem to any other organ, for anyone who is located beyond the controlled area. Planned discharges of radioactive materials, radon and its decay products are excepted (10 CFR 72.104).

Effluent monitoring systems must be provided for the handling and storage system. Means for measuring the amount of radionuclides in effluent under normal operating and accident conditions must be provided for these systems. A means of measuring the flow of the diluting medium (water), must also be provided. Analysis must be made to show that releases to the general environment during normal operations and anticipated occurrences will be within the exposure limits (stated above). Systems designed to monitor the release of radioactive materials must have means for calibration and testing their operability (10 CFR 72.126).

13.5 Environmental Protection Standards for Management and Land Disposal of Low-Level Radioactive Waste (Draft Proposed Rule 40 CFR 193)

13.5.1 General Scope of Draft Proposed Rule 40 CFR 193

EPA issued an Advanced Notice of Proposed Rulemaking on 8/31/83 entitled, "Environmental Radiation Protection Standards for Low-Level Radioactive Waste Disposal," (48 FR 170 p. 39563) to request information relevant to developing protection standards for low-level waste disposal. A draft proposed rule, dated 7/27/88, entitled "Environmental Standards for the Management, Storage, and Land Disposal of Low-Level Radioactive Waste and Naturally Occurring and Accelerator-Produced Radioactive Waste," was issued and provided intended regulations for both predisposal activities and disposal of LLW and NARMs to reduce radiation exposures to the public. The issuance of the proposed rule stalled in the Office of Management and Budget (OMB) and was returned to the EPA for revisions. As of June 1995, discussions between NRC and EPA on how to regulate LLW, NARMs, and below regulatory concern (BRC) wastes had not yet reached a consensus. After the proposed rule was drafted, the new EPA Groundwater Protection Strategy was released (EPA, 1991). The new strategy deletes the old EPA Groundwater Classification System; consequently, much of the 40 CFR 193 groundwater requirements may change. As discussed in the following section, 40 CFR 764, which regulates land disposal of NARMs, is to be used in conjunction with 40 CFR 193. Therefore, the final forms of 40 CFR 193 and 40 CFR 764 are not known. The notice of Proposed Rule-Making is expected in September of 1995. If 40 CFR 193 is promulgated, it would be implemented by NRC and its Agreement States for commercial LLW and NARMs and by DOE for defense nuclear wastes.

The purpose of the EPA draft LLW management, storage, and disposal standards is to establish a set of uniform requirements that will complement, not supplant, existing LLW requirements. The implementation requirements of the standards are designed to reduce the likelihood of unintentional intrusion into the wastes and to encourage selection of sites not likely to attract future exploration. EPA intends to create a more integrated program by promulgating these standards.

The EPA draft standards will apply to both DOE facilities and NRC-regulated facilities. This includes the LLW disposal site(s) at the INEL. EPA has submitted this proposed regulation to the OMB. When OMB completes its analysis of the regulation, it is anticipated that EPA will promulgate this regulation. All existing facilities will have to comply with the regulation's standards at the time of their relicensing (within five years) and it is proposed that current DOE facilities will have five years to make the necessary changes to their existing facilities or cease storing or processing waste. When it becomes effective at DOE facilities, 40 CFR 193 will be triggered by the management or disposal of any LLW. In addition, the proposed regulation may cause the release of radionuclides from LLW to be regulated under CERCLA. The hazardous substances,

including certain radionuclides, regulated under CERCLA are listed in 40 CFR 302, Table 302.4. The proposed regulation is divided into Subparts A, B, C, D, and E.

Subpart A limits the radiation exposure to members of the public from the management and storage of LLW prior to disposal. Radiation exposure to workers and contractors at DOE facilities is governed by DOE orders.

Subpart B of the LLW standards imposes requirements on the land disposal of LLW. The standard limits the annual EDE to a member of the public to no more than 25 mrem to the whole body or any organ (except the thyroid) or 75 mrem to the thyroid, from planned discharges. Also included are environmental monitoring provisions and implementation requirements, which must be designed to deter future intrusion. EPA specifically avoided presenting details of a monitoring program because it considers details to be the responsibility of the implementing agency.

Subpart C contains information on the BRC waste category. BRC wastes are those that will not result in an effective whole body radiation dose of over 4 mrem/year to any member of the public. Wastes in this category include items such as smoke detectors and radium watch dials, which have such a low level of radioactivity that they do not require disposal in a LLW facility. The EPA draft rule suggests that States can establish regulations for LLWs that are BRC.

Subpart D indicates that the greatest individual health risk from LLW disposal occurs from exposures to contaminated water resources. Therefore, the Agency approach is to minimize contact between the wastes and water, as well as to reduce direct human contact with the wastes. To reduce this contact, Subpart D lists techniques that could be used to isolate wastes from the environment, including the following: solidifying wastes; placing wastes in a solid matrix; disposing of the wastes in a location where the hydro-geology, geology, and climate limit radionuclide movement through water; disposing of wastes at various depths; and using various techniques to cap the wastes. Techniques to isolate the wastes from people include active institutional controls, such as access restrictions, and passive institutional controls, such as warning markers. Specific site design factors are not required; they are only suggested.

13.5.2 Details of Draft Proposed Rule 40 CFR 193 Pertaining to Groundwater

The groundwater protection provisions of EPA draft 40 CFR 193 are contained primarily in Subpart E. The provisions require that groundwater at the disposal site be classified into Class I, Class II, or Class III groundwaters. The initial classification review area is an area circumscribed by a 2-mi. radius bounding the site in all directions. The EPA *Guidelines for Ground-Water Classification Under EPA Ground-Water Protection Strategy* (EPA 1988d) provides guidance for conducting the classification. Classification of groundwater using this system is no longer used by the EPA as described in Section 2 of this document. Therefore, this section of 40 CFR 193 will likely be modified. The rest of this section discusses 40 CFR 193 as it stood October 1, 1991.

Once the groundwater is classified, compliance with the groundwater protection standards must be demonstrated for the site-specific groundwater class. Although the regulation does not specifically state how compliance with this requirement is to be demonstrated, groundwater monitoring is necessary to demonstrate compliance.

If Class I groundwaters are present, a non-degradation standard applies, which effectively prohibits the siting of a LLW facility at that location. For Class II groundwater, two options are available. Under the first option, a 4-mrem/year standard is applied to high-yield aquifers (which are or could be a community water supply), and a 25-mrem/year standard is applied to low-yield aquifers (which could not provide a community water system). These standards assume that the individual consumes 2 L per day of affected groundwater. Under the second option, a 4-mrem/year standard is applied to all Class II aquifers, regardless of yield.

For Class IIIA groundwaters, the permitted level of contamination is determined by the class of groundwater to which the groundwater is hydrodynamically connected. If different levels of protection apply, the most restrictive takes precedence.

For Class IIIB groundwaters, the 25-mrem/year standard applies, but the standard requires that all routes of exposure be included. The 25-mrem/year standard, as applied to Class IIIB groundwaters, is the outer regulatory bound if a more restrictive standard does not apply.

The standards represent the upper limit of effective whole body dose equivalent to a member of the public in the general environment from all sources, including air, surface water, and groundwater. "The general environment refers to locations outside an area delineated by permanent markers and properly recorded government ownership" (EPA draft 40 CFR 193, 7/27/88). The contribution of radioactivity from the low-level radioactive waste disposal facility is limited to an increase that does not exceed the overall limit. Thus, baseline groundwater conditions must be determined and included in dose calculations.

To demonstrate compliance with the requirements for protection of Class II and Class III groundwaters, the following are necessary:

- Baseline groundwater conditions must be determined
- Radionuclide movement from the site to the groundwater must be predicted
- Radionuclide movement within the groundwater system must be predicted
- The whole body dose equivalent of an individual must be predicted based on the radionuclide concentrations present at the withdrawal location. For Class II groundwaters, the dose calculation assumes consumption of 2 L of water per day
- The predicted dose must be compared to the standard applicable to that class of groundwater.

Specific directions for determining baseline conditions or radionuclide movement are not given in the regulations. Finally, a monitoring program is required "to detect substantial and detrimental deviations from expected performance." As stated earlier, no detailed requirements for monitoring are provided in the EPA draft regulation.

13.5.3 Details of Draft Proposed Rule 40 CFR 193 Pertaining to Surface Water

As discussed in Section 13.6.1, Subpart A and B radiation exposure to the public limitations apply to all environmental pathways including surface water. Subpart D, which suggests site design criteria, applies

to both surface water and groundwater. Subpart E, discussed in Section 13.6.2, relates mainly to groundwater, however, exposure standards include the risk from all environmental media with specific references to surface water.

13.6 Land Disposal of Naturally Occurring or Accelerator-Produced Radioactive Materials (Draft Proposed Rule 40 CFR 764)

13.6.1 General Scope of Draft Proposed Rule 40 CFR 764

As stated in Section 13.6.1, EPA issued a draft proposed rule for standards for the management, storage, and land disposal of NARMs. If promulgated, this regulation is planned to be implemented in conjunction with 40 CFR 193. The purpose of these proposed regulations is to establish uniform standards for high-concentration NARMs, thus closing a gap in the existing regulations. The regulations define a classification system for NARM wastes and require that these wastes be disposed of in a regulated LLW facility. Regulated LLW facilities include DOE-authorized LLW facilities.

13.6.2 Details of 40 CFR 764 Pertaining to Groundwater and Surface Water

There are no provisions in EPA draft 40 CFR 764 that pertain to groundwater. However, the draft does require that NARM wastes be disposed of in a regulated LLW facility. The groundwater and surface water provisions for an LLW facility are contained in proposed 40 CFR 193 (see Section 13.6). The LLW facility must meet these requirements for the combination of LLW and NARM wastes. Facilities containing only NARM waste must also meet all LLW facility requirements.

13.7 Radiation Protection Criteria for Cleanup of Land and Facilities Contaminated with Residual Radioactive Materials (Proposed Rule 40 CFR 194)

13.7.1 General Scope of Proposed Rule 40 CFR 194

In 1986, the EPA published an advance notice of proposed rulemaking to develop public health and environmental radiation protection criteria for cleanup of residual radioactivity of contaminated land and facilities (51 FR 117, pp 22264 - 22266). The intent is to define criteria for unrestricted use for these sites. The types of affected facilities include (a) licensees of the NRC or its agreement states, (b) DOE and the Department of Defense sites, and (c) other sites where NARMs have been used.

The proposed regulations would specifically include the several hundred facilities of the DOE Surplus Facilities Management Program that are scheduled for decommissioning over the next 20 years. These facilities include reactors, waste burial grounds, fuel processing facilities, radiochemical laboratories, and waste treatment plants, in addition to the 25 DOE-controlled Formerly Utilized Site Remedial Action Program sites.

The proposed regulations do not address radioactive waste disposal sites that are not intended for unrestricted public access, management, and disposal of naturally radioactive material mining and processing waste such as gypsum and phosphate piles, and uranium mine wastes. Among the issues raised by the

proposed rule are the basis for the criteria for future unrestricted use, the form of the criteria, the issuance of guidance versus standards, and interim use of institutional controls.

13.7.2 Details of Proposed Rule 40 CFR 194 Pertaining to Groundwater and Surface Water

The advance notice provides no specific details on the proposed regulations. From the subject matter, it appears that neither groundwater nor surface water would be regulated.

13.8 Nuclear Safety Management (10 CFR 830)

Quality assurance requirements are promulgated for nuclear facilities in 10 CFR 830.120. Under this regulation, each DOE contractor must develop a Quality Assurance Program (QAP) and an implementation plan. The program and implementation plan must then be submitted to DOE for approval. The QAP must describe the organizational structure, functional responsibilities, levels of authority, as well as interfaces for those managing, performing, and assessing the work. Additional criteria required for the QAP include management processes, including planning, scheduling, and resource considerations [10 CFR 830.120(c)(1)(i)]. Personnel must be trained on a continuous basis and qualified to ensure capability in performing work duties. Processes to detect and prevent quality problems must also be established and implemented under quality improvement management. All quality-related information must be reviewed and the data analyzed to identify items, services, and processes that require improvement [10 CFR 830.120(c)(1)(iii)]. Additional quality assurance criteria, including documents and records, work performances, design, inspection, and management assessment are included in 10 CFR 830.120.

14. DEPARTMENT OF ENERGY ORDERS AND GUIDANCE DOCUMENTS

The Department of Energy (DOE) produces and distributes orders and guidance documents to communicate policy and procedures to its employees and contractors. The first portion of this section briefly summarizes the orders and guidance documents applicable to groundwater and surface water. The second portion of this section explains the requirements of these documents. This section addresses DOE orders and guidance documents available as of July 1, 1995. Many DOE orders are under revision and substantial modifications are expected.

14.1 Summary of Orders and Guidance Documents Applicable to Groundwater and Surface Water

A substantial number of DOE orders address requirements for both groundwater and/or surface water. For example, DOE Order 5400.1, "General Environmental Protection Program" requires effluent monitoring and environmental surveillance programs pertaining to groundwater and surface water. Additionally, this order requires the development of site-specific groundwater monitoring plans. Many DOE orders contain few requirements directly related to groundwater or surface water, and most of these requirements are general rather than specific. The DOE orders often incorporate environmental laws and regulations by reference. These orders were established to assure implementation of and compliance with those requirements by DOE operations. DOE orders with standards relating to groundwater and surface water are as follows:

- DOE Order 4300.1C, "Real Property Management"
- DOE Order 4320.1B, "Site Development Planning"
- DOE Order 4700.1, "Project Management System"
- DOE Order 5000.3B, "Occurrence Reporting and Processing of Operations Information"
- DOE Order 5400.1, "General Environmental Protection Program"
- DOE Order 5400.2A, "Environmental Compliance Issue Coordination"
- DOE Order 5400.4, "Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Requirements"
- DOE Order 5400.5, "Radiation Protection of the Public and the Environment"
- DOE Order 5440.1E, "National Environmental Policy Act (NEPA) Compliance Program"
- DOE Order 5480.1B, "Environmental, Safety, and Health Program for DOE Operations"
- DOE Order 5480.4, "Environmental Protection, Safety, and Health Protection Standards"

- DOE Order 5481.1B, "Safety Analysis and Review System"
- DOE Order 5482.1B, "Environmental, Safety, and Health Appraisal Program"
- DOE Order 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements"
- DOE Order 5500.1B, "Emergency Management System"
- DOE Order 5500.3A, "Planning and Preparedness for Operational Emergencies"
- DOE Order 5700.6C, "Quality Assurance"
- DOE Order 5820.2A, "Radioactive Waste Management"
- DOE Order 6430.1A, "General Design Criteria Manual."

The key order regarding groundwater and surface water monitoring, management, and protection is DOE Order 5400.1. This order, which is considered to contain the current DOE strategy for managing groundwater and surface water, includes specific requirements related to monitoring, waste management, corrective actions, hydrogeologic investigations, and quality assurance, quality control (QA/QC). In addition, it requires preparation of a groundwater monitoring plan and a groundwater protection management plan.

DOE Order 5400.1 establishes environmental protection program requirements, authorities, and responsibilities for DOE operations to assure compliance with applicable environmental protection laws and regulations. DOE policy states that all operations will be conducted in an environmentally sound manner. The major Federal requirements are listed in DOE Order 5400.1. The order also requires that applicable state and local standards be identified on a site-specific basis. The following three categories of environmental protection standards are imposed, where applicable to DOE:

1. Federal statutes, regulations, executive orders, and requirements
2. State and local statutes, regulations, and requirements
3. DOE directives.

DOE Order 5400.1 provides environmental protection standards mandatory for DOE operations and procedural guidance for securing exemptions from a standard. The procedures for exemption from environmental standards are outlined; however, they are not encouraged and are used in limited cases where programmatic circumstances or operational conditions may warrant a request.

DOE Order 5400.5 includes groundwater and surface water protection provisions established to address radiation protection control standards and practices for DOE operations and DOE contractors. The draft proposed rule 10 CFR 834 will replace DOE Order 5400.5, when finalized (see Chapter 13). DOE's objective is to operate facilities and conduct activities while minimizing radiation exposures to the public and the environment. In addition to limiting radiation doses to the public, additional controls on the release of liquid wastes are adopted to reduce the potential of radiological contamination of natural resources, including ground

and surface water [Ref. 4, chap. I, pg. 2, Item 5a]. The guidance document *Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance* (DOE 1991) describes the elements required in the radiological effluent monitoring and surveillance program in support of the implementation of DOE Order 5400.5 and DOE Order 5400.1.

Another key order is DOE Order 5820.2A, which establishes requirements for the management of radioactive waste, as well as components of mixed and hazardous waste management. Additional groundwater and surface water protection provisions are included in this order. DOE Order 5820.2A is currently undergoing a major revision. DOE Order 5400.4 directs the implementation of requirements of CERCLA to DOE facilities. This order requires that the policies and procedures prescribed by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) are implemented within the framework of the environmental programs established under DOE Order 5400.1.

DOE Order 5440.1E was established to assure the responsibilities and procedures under the NEPA are implemented for all DOE operations. The Environmental, Health, and Safety Program for DOE operations is established under DOE Order 5480.1B.

Additional DOE orders addressing requirements relating to groundwater and surface water protection and management are discussed in this Section. In addition to the orders, the DOE and DOE Idaho Operations Office (DOE-ID) have produced various guidance documents to implement the requirements of DOE orders and applicable Federal regulations. Important documents of this nature are listed in Table 14-1.

New regulations regarding treatment, storage, management, and disposal of various forms of radioactive, mixed, and hazardous wastes are still being proposed, and DOE orders will be revised and updated accordingly.

14.2 Requirements Under DOE Orders and Guidance Documents

DOE orders and guidance documents discuss various requirements pertaining to groundwater and surface water. These documents do not focus exclusively on groundwater and surface water issues, but are intermingled with other topics. In order to carry out DOE policies, general directions are given in DOE orders regarding the following practices:

- Siting of new facilities
- Waste management practices
- Groundwater monitoring
- Vadose zone monitoring

Table 14-1. DOE and DOE-ID guidance documents with potentially applicable groundwater and surface water-related requirements.^a

Document	Date	Title
DOE/ID-10166	September 1993	Environmental Compliance Planning Manual at the Idaho National Engineering Laboratory
EH/0173T	January 1991	Environmental Regulatory Guidance for Radiological Effluent Monitoring and Environmental Surveillance
EH-20 MEMO	August 1989	Implementation Guidance for DOE Order 5400.1, "General Environmental Protection Program"
EH-231 MEMO	January 1989	Remedial Investigation/Feasibility Study (RI/FS) Guidance
EH-23 MEMO	June 1990	Closure of Hazardous and Mixed Radioactive Waste Management Units at DOE Facilities
EH MEMO	January 1989	Corrective Action Plan, Interim Measures Guidance, National Strategy, and Model Consent Order
EH MEMO	March 1990	Applicability of Land Disposal Restrictions to RCRA and CERCLA Ground Water Treatment Reinjections

a. Does not include waste management guidance documents, dose conversion documents, executive orders, Secretary of Energy notices, DOE-ID orders, or non-DOE guidance documents.

- Surface water monitoring
- Investigations and characterizations
- Remedial and corrective actions and decontamination and decommissioning activities
- QA/QC, laboratory procedures, and statistical analysis
- Reporting requirements.

The aforementioned requirements and the applicable orders or guidance documents are described in the following sections.

14.2.1 Siting of New Facilities

Several DOE orders address siting considerations for new waste disposal sites. DOE Order 5480.1B lists siting as one of the general design factors to consider in the Environment, Safety, and Health program. General siting factors are also given in DOE Order 4320.1B, which recommends the use of a matrix to compare the relative merits of different sites. DOE Order 5820.2A provides greater detail. For new low-level radioactive waste sites, DOE policy requires consideration of hydrologic, geologic, and waste characteristics

in the facility siting process. In addition, floodplains, seismically active areas, active volcanoes, and areas prone to tornadoes should be avoided when siting facilities. DOE Order 6430.1A provides extensive criteria for siting new treatment, storage, and disposal (TSD) facilities. Areas to avoid include those areas with rich resources, critical habitats of endangered species, recharge zones for sole-source aquifers, areas with high water tables, wetlands and floodplains, watersheds for domestic water supply, seismically active areas, areas with karst topography (which have sinkholes over limestone rock), areas subject to hurricanes or volcanoes, areas subject to subsidence, as from abandoned mines, and sites traversed by buried utility lines.

Under DOE Order 6430.1A, building new TSD facilities and "special facilities" within the 500-year floodplain of a waterway shall be avoided or receive lowest siting priority. Other DOE facilities, such as wastewater treatment and disposal systems, should not be built within a 100-year floodplain. Additional factors that should be taken into account are the site topography, drainage, run-off, susceptibility to inundation due to dam failures or breaches, and the potential transport of radioactive and chemical contaminants in surface water and groundwater from the site.

DOE Order 4300.1C establishes DOE policies and procedures for the acquisition, use, inventory, and disposal of real property. During the site selection process, certain requirements are necessary, including the collection and evaluation of data for all sites under consideration. Environmental requirements include assessing the site's compliance with the NEPA, RCRA, CERCLA, Floodplain Management, and Protection of Wetlands prior to taking real property action. Sources of information on DOE responsibilities for meeting compliance with these standards are listed in DOE Order 4300.1C.

14.2.2 Waste Management Practices

One of the common waste disposal practices in the past was to place radioactive wastes in seepage basins and unlined surface impoundments to allow evaporation or seepage to attenuate the wastes. It was thought that the length of time needed for contaminants to migrate through the soil and/or rock before reaching the aquifer was sufficient to reduce activity through the radioactive decay process. This practice also relied on adsorption of contaminants during migration. These waste disposal practices are no longer permissible at DOE facilities, except under special conditions.

To prevent build-up of contamination in soil and groundwater and to protect the environment from the spread of contamination from burial trenches and pits, DOE has prohibited land disposal of most untreated radioactive wastes [DOE Order 5400.5, which became draft proposed rule 10 CFR 834 (discussed in Section 13)].

In order to mitigate the problems associated with the treatment, storage, and disposal of hazardous and radioactive waste, DOE Order 5400.1 requires the preparation and implementation of waste minimization plans to reduce both the quantity and toxicity of hazardous and radioactive wastes produced. The radioactive component of mixed waste is also subject to the waste management requirements under DOE Order 5820.2A.

Better waste management practices include the evaluation of the best available treatment technologies. Controls are imposed on liquid releases to protect resources from contamination, such as land, surface water, groundwater, and related ecosystems. Standards for liquid effluent discharges to a surface waterway are driven by DOE's "as low as reasonable achievable" (ALARA) policy. The primary objective of the ALARA policy is to minimize the potential for radiation exposure as much as practical. ALARA establishes a primary public dose limit based on the potential risk of radiation-induced cancers and genetic defects. The policy takes

into account available technologies economics in relation to benefits to the public health and safety. DOE Order 5400.5 adopted the "best available technology" (BAT) to standardize treatment levels for radioactive liquid waste streams. A surface water discharge point containing radionuclide concentrations below the derived concentration guide (DCG) reference values will not require further treatment. DCGs are screening values used to evaluate BATs for the discharges and for making dose estimates. The BAT is the required level of treatment at the point of discharge of liquid waste to surface waters at greater concentrations than DCG values in liquids. The DCG values are listed in Chapter III of DOE Order 5400.5. The BAT selection process will be implemented as follows:

- Alternative treatment technologies will be selected by an evaluation of technology, economics, and public policy considerations.
- A plan and schedule will be prepared for installation of waste treatment systems in existing facilities, as determined necessary by BAT analysis.
- Plan approval will be performed by a responsible operations office manager and updated annually. The plan must be in accordance with provisions for preparing and updating waste management plans in DOE Order 5820.2A.
- The BAT process for liquid radioactive wastes is not required where radionuclides are at a low level (i.e., the annual average concentration is less than DCG level).
- The DCG for liquid waste streams containing more than one type of radionuclide will be the sum of the fractional DCG values.
- Liquid process waste streams containing radioactive settleable solids may be released to natural waterways if the concentration of radioactive material in the solids does not exceed 5 pCi per gram above background level for alpha-emitting radionuclides, or 50 pCi per gram above background level for beta-gamma-emitting radionuclides.
- The absorbed dose to native aquatic animal organisms from radioactive wastes discharged to natural waterways will not exceed 1 rad per day. Guidance on monitoring and calculating dose for aquatic organisms is found in the DOE orders in 5400 series.
- New facilities will be designed and constructed to meet the discharge requirements as described above in the BAT process.

Liquid wastes containing concentrations greater than five times the DCG values at average monthly concentrations may be discharged into a chemical or sanitary sewerage system if the system is federally owned. However, ALARA process considerations are required. The liquid effluent will be treated by the sewerage system prior to discharge to surface water in accordance with the BAT selection process described above.

One exception to the liquid waste control requirements regards the removal of tritium from dilute waste streams. There is currently no practical technology available. As a result, process alternatives that reduce the amount of tritium entering the liquid waste streams shall be identified and evaluated in accordance with the DOE ALARA.

14.2.3 Groundwater Monitoring

Most of the specifications in DOE orders and guidance documents that specifically relate to groundwater monitoring are found in *Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance* (DOE 1991). The environmental surveillance specifications in this document can be summarized as follows:

- The design and rationale for a sampling program should be documented based on a thorough preliminary assessment of the existing environment, including the following information:
 - Sampling locations, frequencies, collection techniques, and sample handling procedures
 - Laboratory analyses to be conducted, procedures and equipment to be used, applicable detection limits, and calibration techniques
 - Written quality assurance (QA) procedures used in well drilling, sampling, sample handling, laboratory analyses, data handling, data analysis (including the use of models), and recordkeeping. Included in the written QA plan should be specifications for precise sample documentation and tracking in laboratories, consistent documentation of all analytical methods, observation of sample holding times and use of proper sample preservation techniques, separation of high-activity samples from low-activity samples to minimize cross-contamination, careful calibration of equipment, and maintenance of auditable records.
- Public, contractor, and DOE drinking water systems that might be affected by DOE operations should be monitored. Sampling should conform to the requirements of 40 CFR 141 [the Safe Drinking Water Act (SDWA) regulations].
- Groundwater monitoring requirements should be coordinated with appropriate State and Federal agencies to ensure compliance with both Federal and State regulations.
- When sampling groundwater used as drinking water, the sampler should pump the well first, then collect periodic grab samples. Unless circumstances prohibit, groundwater sampling should be done by pumping, either with a pressure air lift or with a submersible pump. In either case, the pumps should be operated for a length of time sufficient to obtain a representative sample of water in the aquifer. To approximate conditions at the tap, finished drinking water conditions may require filtering of groundwater samples to remove well-casing effects. Filtration of groundwater samples is recommended since suspended material is usually an artifact of the sampling process (well-casing particles and dirt near the water-soil interface) and is not representative of the groundwater.
- Appropriate data analysis and statistical treatment methods should be used. Outliers should not be automatically excluded. The characteristics of the effluent and the environment should be taken into account when analyzing the data. The overall accuracy of the radiologic analyses should be reported, with a specific percent confidence level and an environmental detection limit for each radionuclide.

- When predicting contaminant pathways, the following factors should be taken into account: diffusion, dispersion, absorption, capillary action, radioactive decay, characteristics of the pollutant source, nature of the geologic materials in both the saturated and unsaturated zones, and physical and chemical properties of the contaminants.
- Groundwater modeling should be used to assist in analyzing monitoring data to assess radiologic effects of radionuclide migration from leaking disposal sites and to demonstrate compliance with stated objectives. This modeling should be conducted as necessary to conform with the applicable requirements of the State government and the regional office of the Environmental Protection Agency (EPA). Surface water and groundwater modeling in support of the operation of DOE facilities should be conducted by a professional hydrogeologist or equivalent with modeling experience. This modeling should be done using site-specific data and taking into consideration the important characteristics of the site.
- Actual groundwater monitoring data should be used to assess the validity and effectiveness of models to predict the concentration of pollutants in the environment.

Several DOE directives contain some monitoring-related requirements. DOE Order 5484.1, "Environmental Protection, Safety and Health Information Reporting Requirements," provides general direction on design of monitoring programs:

Judgment regarding the extent of environmental monitoring must be exercised by the Department of Energy field organizations and contractor management based on hazard potential, quantities and concentrations of materials released, specific local public interest or concern, and extent and type of utilization of affected offsite air, land, and water.

In addition to requirements for monitoring at specific sites, DOE aims to coordinate site monitoring programs through the preparation of groundwater protection management program plans (see Section 14.2.9) to be reviewed annually and updated every three years. This requirement is found in DOE Order 5400.1.

Several DOE orders also require groundwater monitoring to determine background concentrations of contaminants. Without this information, the effect of a disposal site on groundwater cannot be adequately assessed. DOE requires the determination of background concentrations at both new and existing sites.

In DOE Order 5484.1, requirements are given for monitoring new sites, processes, and facilities:

An environmental survey shall be conducted prior to actual start up of a new site, facility, or process which has the potential for adverse environmental impact, or which will process, release, or dispose of pollutants. The survey shall establish background levels of radioactive and toxic pollutants, characterize pertinent environmental and ecological parameters, and identify potential pathways for human exposure or environmental impact.

In particular, the survey should address those radionuclides or other pollutants likely to be released and those environmental parameters likely to be affected by operation of that facility. This survey will be used by DOE as a basis for determining the nature and extent of the subsequent routine operational effluent and environmental program.

Although most of the guidance in DOE orders regarding groundwater monitoring is nonspecific, some directions are given relative to the purposes of monitoring, the design of the monitoring system, and the installation of monitoring wells.

14.2.3.1 Purposes of Monitoring. Various DOE orders list purposes and goals of groundwater monitoring programs. These include the detection of radioactivity, compliance with applicable laws, detection of contamination, and estimation of long-term effects.

Radioactivity monitoring at existing sites and some formerly used sites is required under DOE Order 5484.1:

An environmental radioactivity monitoring program shall be maintained at existing sites and, as determined on a case-by-case basis by the Director, Operational and Environmental Safety Division, at certain former sites to determine whether containment and control of releases of radioactivity from site operations are functioning as planned, and to determine the overall impact of Department of Energy operations on the environment.

DOE Order 5820.2A requires groundwater monitoring to measure migration of radionuclides and changes in disposal facility and disposal site parameters that may affect long-term site performance.

14.2.3.2 Design of Groundwater Monitoring System. The systems used to monitor groundwater quality at DOE facilities are primarily monitoring wells. DOE Order 5400.1 states that "where appropriate, groundwater monitoring programs shall be designed and implemented in accordance with 40 CFR 264, Subpart F, or 40 CFR 265, Subpart F." This would require at least one upgradient (background) well and three down-gradient wells.

Correct monitoring well location is essential for sampling results to be accurate. The DOE guidance document for radiological monitoring (DOE 1991) stipulates the use of appropriate monitoring well design and siting standards. The number and location of groundwater monitoring wells should be determined by the nature of groundwater use and the location of known and potential sources of pollution. The use of existing wells and historical data is encouraged, but it is likely that new wells will be needed. Monitoring wells must be down-gradient of the waste site if they are to intercept a contaminant plume. Wells located cross-gradient to the site are not likely to detect the contamination.

Drinking water monitoring procedures are in DOE (1991). This document states that "all drinking water systems, whether public or operated by DOE or its contractors, that are impacted or might reasonably be impacted by DOE Operations should be monitored in accordance with the monitoring frequency requirements of 40 CFR 141.26" (40 CFR 141 implements the SDWA).

DOE (1991) elaborates on this:

The sampling location for drinking water derived from groundwater sources should be at the nearest domestically used well down-gradient from the surface (crib, pond, lake, or stream) discharge point. Another well upgradient from the discharge point should be used for the control or background sample. When comparisons with control wells are conducted, the sampling stations should be located in the same hydrologic unit. If significant numbers of

shallow wells are used domestically in the vicinity of the plant site, several wells may need to be sampled to determine which (if any) are affected by surface-water discharges from the site.

14.2.3.3 Well Installation Requirements. DOE (1991) recommends the use of appropriate monitoring well construction techniques. "Quality control in well construction is essential...Wells must be installed, developed, and operated with care to prevent a new well from providing an avenue for pollutants to reach the aquifer."

14.2.4 Vadose Zone Monitoring

Detection of contamination in the unsaturated zone is the goal of vadose zone monitoring, as required by DOE Order 5820.2A. This order requires that a system of groundwater or vadose zone monitoring wells meeting RCRA requirements per 40 CFR 264 be installed, as a minimum, around clusters of liquid waste storage tanks.

For new low-level waste disposal sites, Order 5820.2A requires a monitoring program that may include groundwater monitoring and soil monitoring in both the saturated and unsaturated zones.

DOE Order 5484.1 requires the following: "Report concentrations of radioactive contaminants in water as $\mu\text{Ci/mL}$ (for uranium and thorium also use mg/L); in soil, use $\mu\text{Ci/m}^2$ or pCi/m^3 and specify the soil sample depth or profile depth. For tritium in soil, the concentration may be expressed in $\mu\text{Ci/mL}$ of soil moisture. An alternative reporting method for radioactive contaminants in soil uses $\mu\text{Ci/g}$ or pCi/g of dry weight (specify the depth and method of obtaining the dry weight)."

14.2.5 Surface Water Monitoring

Requirements and guidance for environmental monitoring programs are included in DOE Order 5400.1. The monitoring programs will focus on: (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 following activities will be included in the monitoring programs: (1) pre-operational monitoring to establish background data, (2) environmental monitoring plans, (3) radiological and non-radiological effluent monitoring and environmental surveillance, and (4) quality assurance, data verification, and laboratory certification. The monitoring of liquid effluent discharges will be performed by following standards established under the National Pollution Discharge Elimination System (NPDES), Section 402 of the Clean Water Act (CWA) (see Section 9). Where required, DOE facilities will monitor liquid effluents as required under regulation in 40 CFR Part 123 through 125, Part 129 and 130, and Part 136. NPDES permits contain specific and legally enforceable effluent limitations, and self-monitoring requirements for flow measurement and sampling. DOE facilities will also satisfy monitoring requirements established for liquid effluent monitoring under the RCRA, as amended (40 CFR Parts 260 through 280), if the discharge is determined to be a hazardous waste.

Where applicable, surface water monitoring may be required if releases of hazardous constituents have occurred to the environment. Monitoring is an integral part of remedial investigations carried out under CERCLA, in order to characterize the nature and extent of contamination. DOE Order 5400.4 establishes and implements CERCLA policies and the NCP for DOE operations.

DOE 5400.5 states that information will be obtained from radiological effluent monitoring and surveillance programs, in order for facilities to demonstrate compliance with environmental laws and regulations. Data collected from detection, response, and quantification capabilities for unplanned releases of radioactive material will be analyzed to evaluate the quality and effectiveness of the monitoring and surveillance programs. The requirements and practices for these programs are addressed in DOE orders in the 5400 series and the DOE guidance document for radiological monitoring (DOE 1991).

Again, most of the specifications in DOE orders and guidance documents that relate to surface water monitoring are found in DOE (1991). The purpose of the guidance is to specify the necessary components for effluent monitoring and environmental surveillance of radioactive materials to comply with Federal regulations and DOE policy. The regulatory guide incorporates and expands on requirements found in DOE Orders 5400.1 and 5400.5. All liquid effluent streams from DOE facilities should be assessed and quantified for any potential releases of radionuclides. The results of the assessment provide the basis for the facility's effluent monitoring plan required in DOE Order 5400.5. These results are documented in the site environmental monitoring plan, as described in DOE Order 5400.1. The effluent monitoring and environmental surveillance specifications in this guidance document can be summarized as follows:

- The design and rationale for a monitoring program should be documented based on a thorough physical and chemical characterization of the source(s), pollutant(s), sample collection system(s), treatment system(s), and final release point(s) of the effluents. The following information will be included:
 - Monitoring and sampling locations, frequencies, collection equipment and techniques, and sample handling procedures
 - Laboratory analyses, procedures, and equipment; and applicable detection limits, detection accuracy, and calibration techniques
 - Quality assurance procedures used for sampling, sample handling, laboratory analysis, data handling and analysis, and recordkeeping. The QA plan should include specifications for precise sample documentation and tracking in laboratories; consistent documentation of all analytical methods; observation of sample holding times; use of proper sample preservation techniques; use of methods to minimize cross-contamination; calibration of equipment; and maintenance of auditable records.
- Appropriate data analysis and statistical treatment methods should be used. The characteristics of the effluent and the environment should be taken into account when analyzing the data. The overall accuracy of the radiologic analyses should be reported, with a specific percent confidence level and an environmental detection limit for each radionuclide.
- Surface water and groundwater modeling should be used to assist in analyses of monitoring data to assess radiologic effects of radionuclide migration from leaking disposal sites and to demonstrate compliance with stated objectives.
- Specific criteria should be used for establishing the environmental surveillance program and documented in the environmental monitoring plan (DOE Order 5400.1). A summary of the minimum criteria for determining the need for environmental surveillance are listed as follows:

- Routine surveillance of all environmental media determined by exposure pathway analysis
- Confirmation of levels by periodic surveillance measurements
- Actual measurements on two media for each critical radionuclide/pathway combination
- Use of control data
- Detection and quantification of unplanned releases of radionuclides to the environment.
- Document overall objectives and general design criteria for environmental surveillance and monitoring programs. The environmental programs conducted at all DOE sites shall determine the following, as required by DOE Order 5400.1 and DOE Order 5400.5:
 - Compliance with all applicable environmental quality standards, public exposure limits, environmental impact statements, environmental assessments, or other official DOE documents
 - Background levels and site contributions of radioactive materials in the environment
 - Effectiveness of effluent treatment and controls in reducing effluents and emissions
 - Validity and effectiveness of models to predict the concentration of pollutants in the environment
 - Long-term buildup and prediction of environmental trends from site-released radioactive material
 - Detection and quantification of unplanned releases.

Additional objectives that should be considered when establishing environmental surveillance programs are as follows:

- Provide information to the public
- Distinguish site radiation contributions from other local sources (natural or manufactured)
- Obtain data that may be required to assess the consequences of an accident
- Identify changes in relative importance of transfer parameters.

Several DOE orders contain monitoring-related requirements. Sampling and monitoring of environmental media may be required when conducting environmental surveys and audits to appraise environmental quality, as required under DOE Order 5482.1B, "Environmental, Safety, and Health Appraisal Program." Additionally, DOE Order 5484.1, "Environmental Protection, Safety and Health Information Reporting Requirements," provides general direction on the design of monitoring programs. DOE Order 5484.1 also requires surface water monitoring to characterize pertinent environmental factors, identify potential media pathways, and determine background concentrations of contaminants at both new and existing

facilities. Without this information, the effect of a disposal site on surface water cannot be adequately assessed. Environmental monitoring to detect releases from transuranic (TRU) and low-level waste (LLW) sites is required under DOE Order 5820.2A.

When evaluating storm water management design, DOE Order 6430.1A establishes criteria for the analysis of hydrologic conditions and requires the assessment of the following:

- Character and applicability of available stream gauge data
- Cost of drainage improvements in comparison to the value of facilities to be protected
- Geographic location
- Physiographic characteristics
- Precipitation frequency data
- Drainage areas
- Soil and cover
- Run-off distribution.

The hydrologic conditions must be assessed by performing the evaluation of monitoring data in order to adequately design storm water management systems. These data include peak discharge and run-off volume estimates, rainfall intensity-duration curves, precipitation frequency, run-off/run-on potential, and flow data.

DOE Order 6430.1A also requires surface water and groundwater monitoring programs to detect changes in water quality from land application practices for the disposal of domestic wastewater effluent and sludge. This order also stipulates the assessment of background water quality for surface water and groundwater within the saturated zone of underlying aquifers.

Although most of the guidance in DOE orders regarding surface water monitoring is nonspecific, some directions are given relative to the purposes of monitoring and the design of the monitoring system.

14.2.5.1 Purposes of Monitoring. DOE Order 5820.2A requires surface water and groundwater monitoring to measure operational effluent releases, migration of radionuclides, and changes in disposal facility and disposal site parameters that may affect long-term site performance. The environmental program may include monitoring of surface soil, air, surface water, and subsurface soil and water, both saturated and unsaturated zones, as determined necessary based on facility-specific characteristics.

14.2.5.2 Design of Surface Water Monitoring Programs. Surface water sampling is performed to monitor releases of liquid effluents to streams, rivers, lakes, or ponds. These samples should be collected according to the methods, locations, and frequencies specified in DOE (1991). A monitoring system shall be established for operations and systems with potential for release to the environment, including unplanned releases, such as run-off, leaching, flooding, or resuspension. Where radioactive liquid effluents are discharged to water resources, groundwater and surface water flows will be evaluated to determine the

best sampling locations and frequencies for surface water bodies. Detailed hydrological and radiological studies will be performed to evaluate radiological doses. Representative surface water background samples should be collected routinely from rivers or streams at upstream locations from site operations. These samples provide control data for comparison with data from downstream locations. Samples should also be collected nearest the effluent discharge outfall. In addition, representative background samples from ponds or lakes should be collected routinely at locations unaffected by site operations. Other offsite sampling locations should be established for streams, ponds, and lakes at the edge of the effluent mixing zone and at the nearest downstream point of withdrawal for public uses (e.g., irrigation or drinking water). Multiple sampling points may be required to determine the mixing zone location, based on diffusion and transport studies.

14.2.6 Investigations and Characterizations

Two DOE Orders, 5820.2A and 5400.4, require hydrologic and geologic investigations as part of waste management and corrective action activities in order to characterize impacts to groundwater and surface water. In addition, DOE Order 6430.1A requires hydrogeologic investigations for TSD facilities. The DOE guidance document for radiological monitoring (DOE 1991) also contains some relevant specifications. DOE Order 5400.4 specifies the performance of multimedia investigations where required under CERCLA.

For new TRU waste facilities, DOE or its contractors must evaluate the proximity to groundwater and surface water (including floodplains) and the potential impacts on the site, as required by DOE Order 5820.2A. The same order requires that design of new low-level radioactive waste disposal facilities be based on analyses of physiographic, hydrologic, geologic, and environmental data to ensure that the policy and requirements of the order can be met.

DOE Order 5820.2A further requires that the geologic and hydrologic information gathered as part of site design activities be included in the waste management plan.

DOE (1991) recommends site investigations, stating that

Special studies, examining site-specific groundwater and surface-water flows, may be necessary to establish preferential sampling locations for ponds or lakes. Therefore, detailed hydrogeologic and radiological studies should be conducted for each site on streams, ponds, and lakes to determine the best sampling locations and frequencies to determine radiological doses.

The apparent goal in these cases is to collect groundwater information to identify points of groundwater discharge to surface water. These data will indicate the surface water sampling locations that can assess more accurately the effects of DOE operations.

Site characterization is a necessary component of the remedial investigation/feasibility study (RI/FS) process required under CERCLA. These investigations must evaluate the nature and extent of contamination from releases of hazardous or radioactive constituents to surface and subsurface soil, surface water, groundwater, and air (see Section 6). DOE Order 5400.4 gives directives for implementing the CERCLA process at DOE operations.

For new TSD facilities, DOE Order 6430.1A requires data on depth of groundwater, direction and flow rate, hydraulic conductivity, and current and projected withdrawal rates by local groundwater users.

Groundwater and surface water modeling is necessary as part of the analytical assessment in DOE (1991). The models are to be used to demonstrate disposal site compliance with stated objectives (i.e., protecting public health, safety, and the environment). Input to these models includes site-specific surface and subsurface hydrology, and waste composition. Groundwater and surface water monitoring data should also be used to validate or modify the models used in the performance assessment.

14.2.7 Remedial and Corrective Actions

When a DOE waste disposal site or operation is determined to need remedial action, corrective action, or decontamination and/or decommissioning, the following orders and guidance may apply:

- DOE Order 5400.1, establishes the environmental protection program which requires identification of contaminated areas
- DOE Order 5400.2A, deals with the coordination of significant environmental compliance issues among DOE, field operations, and environmental regulatory authorities
- DOE Order 5400.4, requires the preparation and documentation of RI/FSs under CERCLA and NEPA
- DOE Order 5440.1E, requires the implementation of NEPA and required documentation, where applicable
- DOE Order 4300.1C, addresses cleanup of contaminated sites prior to purchase by DOE and in accordance with State and Federal environmental regulations
- DOE guidance document for radiological monitoring (DOE 1991) recommends groundwater modeling to assist in assessing the radiological effects of radionuclide migration from leaking waste disposal sites
- DOE Order 5820.2A, requires the development of closure plans and plans for remedial actions at sites where they are deemed necessary and disposal of residual material according to the standards in 10 CFR 192
- DOE Order 5482.1B, requires audits by DOE Headquarters (DOE-HQ) personnel of the progress of remedial actions.

DOE Order 5400.1 requires identification of the areas that may be contaminated with hazardous substances, and identification of potential groundwater and surface water contamination sources. This may require plume delineation if the extent of contamination is not known. These data are to be reported in the groundwater management plan. This order also requires preparation of decommissioning plans for sites undergoing these activities. Groundwater and surface water monitoring is an integral part of decommissioning, where applicable.

DOE Order 5400.2A describes significant environmental compliance issues and directs how the exchange of information between responsible parties shall be handled. Coordination of actions is also addressed.

DOE policy states that DOE facilities will respond to releases and potential releases in accordance with the provisions of CERCLA and the NCP. DOE Order 5400.4 addresses the use of interagency agreements (IAGs) and Federal Facility Agreements (FFAs) to coordinate compliance actions. These actions must be managed and conducted to satisfy the requirements of both CERCLA and NEPA. The RI/FS processes for NEPA and CERCLA will be coordinated and implemented together, where appropriate. The RI/FS process requires investigations to characterize site conditions and develop and implement corrective action plans. If DOE finds natural resources, such as surface water or groundwater, have been damaged by a release from a DOE operation or activity, a Natural Resource Damage Assessment will be performed as required under 43 CFR 11.

DOE 5440.1E describes when and how to implement the Environmental Assessment (EA) and Environmental Impact Statement (EIS) process established under NEPA. The DOE will incorporate NEPA requirements early in the planning process for proposed actions. These documents are required for some remedial actions. A mitigation action plan may require preparation and implementation as part of the EIS/Record of Decision (ROD) for mitigation of environmental impacts.

If the DOE is considering purchasing a site where contamination exists, DOE Order 4300.1C addresses actions that should be taken, particularly for sites listed or having potential to be listed on the CERCLA National Priorities List. This order states that the seller should conduct the site cleanup prior to purchase by the DOE, and in accordance with State and Federal regulations. Qualified personnel should monitor the cleanup process and assure compliance. In addition, DOE Order 4300.1C states that any necessary remedial action be taken to protect human health and the environment prior to any sale of property owned by the United States.

DOE (1991) requires that contaminated soil columns, surface water drainage systems, and groundwater to which contaminated liquid discharges have been discontinued shall be managed or decontaminated pursuant to the procedures and requirements of DOE 5400.5. In addition, DOE (1991) prohibits liquid discharges (even if uncontaminated) in inactive release areas to prevent the further spread of radionuclides previously deposited. If additional liquids are placed in "inactive release areas" (i.e., in sites no longer in use but known to have released contaminants), the additional spread of radionuclides in groundwater is likely to occur.

The monitoring program in DOE Order 5820.2A is designed to detect changing trends in performance significantly in advance (of releases that exceed allowable levels) to allow application of any necessary corrective action. The order requires the heads of field organizations to provide program secretarial offices with the necessary characterization and engineering data for contaminated facilities, and to develop site-specific priorities, schedules, and costs for remedial actions at contaminated facilities. DOE Order 5820.2A also requires the development of a closure strategy for each TRU waste site, based on waste site characterization data. Closure plans for inactive low-level and hazardous waste sites are also required as part of permit applications for operation of contiguous disposal facilities.

DOE Order 5482.1B requires investigation and appraisal of environmental conditions at DOE sites. An environmental survey is performed at facilities to determine environmental conditions and to identify

environmental risk areas requiring remedial action. During remediation, an additional survey is conducted to determine the progress of the corrective/remedial action.

14.2.8 Laboratory Procedures, Statistical Analyses, Quality Assurance, and Documentation

Under DOE Order 5400.1, a QA and quality control (QC) program must be established for each element of the environmental monitoring and surveillance programs. The QA program should follow requirements specified under DOE Order 5700.6C. DOE Order 5700.6C has also been codified as 10 CFR 830.120; however, this regulation applies to nuclear facilities only (see Section 13.8). DOE Order 5400.1 also requires an annual site environmental report. The elements of the QA program should include, at a minimum, the following:

- Organizational responsibility
- Program design
- Procedures
- Field QC
- Laboratory QC
- Human factors
- Recordkeeping
- Chain-of-custody procedures
- Audits
- Performance reporting
- Independent data verification.

All DOE and DOE contractor laboratories conducting analytical work must meet appropriate certification requirements required by Federal, State, or local agencies. In addition, the environmental monitoring programs will develop an independent data verification program.

The DOE guidance document for radiological monitoring (DOE 1991) emphasizes DOE's commitment to quality in monitoring and surveillance programs. QA directions regarding sampling and analytical procedures, data processing, and reporting are given in DOE Order 5484.1. Detailed QA requirements are also presented in DOE Order 5700.6C. Requirements in these orders take precedence over requirements in all other DOE orders.

To ensure high quality, DOE (1991) recommends the use of uniform methods and performance criteria. This document specifies that laboratory procedures for radioactive samples should include

documentation of all analytical methods, precise sample and aliquot tracking, strict observation of sample holding time limits, and separation of high-activity samples from low-activity samples to minimize cross-contamination.

The use of laboratory blanks and spiked pseudo-samples is also required in DOE (1991), as part of the laboratory QA/QC procedures. Additional details are in Section 14.2.3.

To aid in the statistical analysis of sample results, DOE (1991) stipulates that precision of radionuclide analytical results be reported as a range, "a variance, a standard deviation, a standard error, and/or a confidence interval."

DOE Order 5484.1 requires groundwater and surface water monitoring data to be reported as follows:

The data shall include for each sampling station the number of samples taken with an indication of the central tendency and spread of the data. Where appropriate, this should include concentration (C) maximum and (C) minimum, the mean concentration (C Mean) per report period and two standard deviations, and the percent of the relevant effluent or environmental quality standard for each parameter. The relevant standard also should be shown and the source referenced. The minimum detection levels should be reported. Data below the minimum detection level may be expressed as being less than (<) the minimum detection value. Background levels should be subtracted from the sampling results included in this report.

These requirements are useful general guidelines for reporting groundwater and surface water monitoring data. Tables of the analytical data on the quarterly samples, with sampling dates and well numbers, may be included in appendices.

14.2.9 Reporting Requirements

Most of the reports required under DOE orders that apply to groundwater and surface water monitoring, protection, and management are specified in DOE Order 5400.1, although relevant reporting is also required in additional orders, as follows: DOE Order 4320.1, DOE Order 5400.4, DOE 5400.5, DOE Order 5440.1D, DOE Order 5484.1. The following documents are specified:

- Environmental protection implementation plans
- Environmental monitoring plans
- Annual site environmental reports
- Annual waste management plans
- Long-range environmental protection plans
- Groundwater protection management plans
- Radioactive effluent and onsite discharge data reports

- Site development plans
- Environmental survey reports
- NEPA documents
- RCRA and CERCLA documents
- Occurrence reports.

In addition, during the site selection process for DOE facilities, certain requirements are necessary, including the collection and evaluation of data for all sites under consideration. Under DOE Order 4300.1C, assessment of environmental compliance with the NEPA, RCRA, Floodplain Management, Protection of Wetlands, and CERCLA is required prior to taking real property action. Documentation and reporting of this evaluation process is required for all real property actions.

14.2.9.1 Environmental Protection Implementation Plan. DOE Order 5400.1 establishes requirements for DOE operations to develop and implement specific environmental protection implementation plans (EPIPs) for each facility or group of facilities for which they are responsible [DOE 5400.1, Chap. III, pg. 1, Item 1]. The implementation plans will include the following: (1) provide environmental goals and objectives, (2) identify strategies and timetables, (3) provide framework for the design and implementation to the programs, and (4) assign responsibilities for complying with regulatory requirements. In addition, long-range environmental protection planning will be established and implemented by the appropriate facilities and groups, as discussed in Section 14.2.9.5.

EPIPs are the broad environmental protection goals for each site. Guidance for preparation of EPIPs is given in two DOE memoranda: "Implementation Guidance for DOE Order 5400.1, General Environmental Protection Program," dated October 10, 1989, and "Implementation Guidance for DOE Order 5400.1, General Environmental Protection Program," dated August 3, 1989.

The EPIP is designed to "allow field organizations to address environmental protection programs and activities in a single, integrated document." The DOE guidance on implementation of 5400.1 specifically requires compliance with DOE Order 5400.5 and *Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance* (DOE 1991).

The EPIP for the INEL was prepared under requirements of DOE Order 5400.1. It contains summaries of the EPIPs for all DOE-ID contractors and operational organizations.

The DOE-ID Environmental Protection Program addresses the following subjects:

- Waste management
- Waste minimization
- Pollution prevention awareness
- Preoperational monitoring

- Environmental monitoring
- Environmental restoration
- Corrective action.

Waste Management. The Waste Management Program includes management of LLW, high-level waste (HLW), and TRU wastes. For the LLW program, DOE-ID provides technical support to commercial LLW facilities. Calcined HLW from reprocessing of defense spent nuclear fuel is stored at the Idaho Chemical Processing Plant (ICPP) in bins. Management of TRU waste includes tracking from the generators, waste characterization, interim storage at the Radioactive Waste Management Complex (RWMC), and eventual shipment to the Waste Isolation Pilot Plant (WIPP). DOE Order 5820.2A provides guidance for the development and maintenance of a waste management plan for each site generating, treating, storing, or disposing of DOE waste.

Waste Minimization. The Waste Minimization Program includes efforts designed to minimize both waste volume and toxicity. DOE is required by DOE orders 5480.4 and 5820.2A and by law to minimize the production of HLW, LLW, and TRU wastes, as well as minimizing production of hazardous wastes. The DOE-ID Waste Minimization Plan was issued in 1990 and includes requirements for the following:

- Characterizing waste streams at generator sites and using this information to avoid, eliminate, or reduce waste generation (waste reduction)
- Recycling
- Material substitution
- Waste treatment
- Waste volume reduction.

The emphasis in the Waste Management Plan is on radioactive, mixed, and hazardous waste, but nonhazardous and nonradioactive wastes are also addressed. The DOE-ID Waste Minimization Plan identifies the contractor organizations responsible for plan preparation, annual review, and three-year update.

The Waste Minimization Program includes efforts to avoid generation of waste, to reduce the amount of waste generated, and to replace hazardous products used with those less hazardous to the environment.

Pollution Prevention Awareness. The Pollution Prevention Awareness Program is incorporated into the DOE-ID Waste Minimization Plan. The objective is to develop an environmental protection ethic through all levels of DOE-ID and contractor organizations. Many of the requirements for an effective program are already incorporated in DOE Order 5482.1B, which requires monitoring appraisal and reporting of environmental data related to the ambient environment and ongoing operations.

Preoperational Monitoring. Prior to start-up of new sites, facilities, or processes that have a potential for significant environmental effects, preoperational monitoring is required. This includes gathering one to

two years of background data on water, soil, and air quality. Environmental studies must be consistent with NEPA compliance activities.

Environmental Monitoring. DOE Order 5400.1 requires DOE-ID to develop an Environmental Monitoring Program for the INEL site. The Environmental Monitoring Plan is discussed in Section 14.2.9.2.

Environmental Restoration. Site characterization and environmental restoration activities are underway for waste area groups (WAGs) that have had confirmed or threatened releases of hazardous constituents (see Section 15). DOE-ID negotiated and has an agreement (FFA/CO) with EPA Region X and the State of Idaho over the CERCLA IAG for the INEL. DOE-ID is also cooperating with EPA on its Superfund Innovative Technology Evaluation program and Hazardous Waste Remedial Action Program to help develop remedial alternatives.

Corrective Action. Corrective action programs are aimed at bringing the sites into compliance with DOE and external requirements. Additional information on corrective actions is presented in Sections 5 and 6 of this document.

14.2.9.2 Environmental Monitoring Plan. DOE Order 5400.1 requires, preparation of an environmental monitoring plan. DOE guidance on compliance with 5400.1 states that this plan should be consistent with the requirements of the DOE guidance document for radiological monitoring (DOE 1991). Some components of this plan were discussed earlier under monitoring requirements in Section 14.2.3 and 14.2.5. One of the key elements of the environmental monitoring plan is the groundwater monitoring plan. The groundwater monitoring plan is also a key element of the groundwater protection management plan, which is also required under DOE Order 5400.1. The groundwater protection management plan and the groundwater monitoring plan for the INEL are discussed in Section 14.2.9.6. Monitoring of liquid effluent discharges is another element of the environmental monitoring plan.

The environmental monitoring program includes both effluent monitoring and environmental surveillance. Effluent monitoring includes measuring and monitoring of effluents from DOE-ID operations and facilities. Environmental surveillance is accomplished through "measurement and monitoring of the environmental media coupled with assessment and calculation of the effects of detected effluent from DOE-ID operations on human health and the environment."

The EPIP states that a compilation of INEL environmental data is to be prepared. LITCO and the Environmental Science Research Foundation now operate their own environmental data management systems, and submittal of data by contractors to the Foundation is on a case-by-case basis. Because of this situation, when the EPIP was written, there was no integrated environmental database at the INEL that compiled all environmental monitoring data.

Environmental monitoring plans are essential ingredients of the environmental monitoring program. The plans are prepared to delineate DOE-ID contractor responsibilities and requirements for monitoring. These plans aim to coordinate environmental monitoring activities into a site-wide program. Requirements for these plans include programs to detect and report unplanned releases and other environmental occurrences before any significant environmental degradation occurs, analysis of the operations and facilities, potential pathways to the environment, existing effluent and surveillance monitoring activities, methods and procedures used for sampling, data collection, analysis, record management, and reporting. The media monitored are

ambient air, groundwater, surface water, liquid and gaseous effluents, drinking water, RCRA-regulated hazardous waste treatment, storage, and disposal facilities, CERCLA sites, and personnel in the workplace.

The INEL contractors are also responsible for monitoring radiological and nonradiological effluents for their facilities, processes, and operations. This includes the following:

- Supplying the manpower and budgetary resources necessary for carrying out monitoring and surveillance requirements including sample collection, data tracing, obtaining appropriate and useful analysis, and record maintenance
- Reviewing data on a schedule appropriate to the purpose of the data
- Maintenance of data files consistent with the requirements of applicable Federal, State, and local requirements and DOE policy
- Analyzing and evaluating data promptly to detect unusual occurrences before extensive environmental degradation occurs.

Environmental monitoring plans for both DOE-ID and DOE-ID contractors will be reviewed annually and updated every three years, to keep up with operational changes, site-specific needs, and the need for regulatory consistency.

DOE Order 5400.1 requires the development of a groundwater protection management program plan. Groundwater protection encompasses monitoring of the amount of water pumped from production wells, the use of the water and the method of conveyance to points of use, the process and waste streams, and the final fate of the wastewater and the pollutants contained therein. Additional information on the groundwater protection management plan is presented in Section 14.2.9.6.

DOE Order 5400.1 states that various entities at the INEL are responsible for environmental monitoring in different areas. The INEL Environmental Monitoring Plan is designed to coordinate these activities. The responsible entities include LITCO, Argonne National Laboratory-West, the United States Geological Survey (USGS), and the Environmental Science Research Foundation. The Naval Reactors Facility has a separate environmental monitoring plan.

The USGS monitors groundwater at the INEL and assists LITCO and DOE-ID in developing the Groundwater Monitoring Plan. Among the responsibilities of the USGS under the Federal Facility Agreement/Consent Order (FFA/CO) are groundwater monitoring to determine effects of INEL operations on groundwater quality and quantity, networks of monitoring and observation wells on and off the INEL site, and contractor wells in areas of known or suspected contamination. Specifically, the USGS:

- Monitors groundwater in the Eastern Snake River Plain Aquifer and perched groundwater zones
- Documents the geologic framework of the aquifer and overlying zones
- Assists DOE-ID and EPA in the implementation of the FFA/CO
- Prepares and publishes reports that describe hydrologic and geologic conditions at the INEL.

In addition to this monitoring, LITCO and the Foundation do additional monitoring for specific purposes.

LITCO is responsible for monitoring drinking water through a program that meets minimum Federal and State requirements for detection of bacteriological and nonradiological and radiological constituents in the INEL drinking water.

14.2.9.3 Annual Site Environmental Reports. An annual site environmental report is required under DOE Order 5400.1 and is prepared by the Environmental Science Research Foundation. The purpose of the report is to summarize environmental data to enable characterization of site environmental management performance, confirm compliance with environmental standards and requirements, and highlight significant programs and efforts. Specific content and format guidelines are included in the DOE Order. The information that should be summarized and/or listed in the report include the following: (1) environmental monitoring programs and data, (2) exposure data, (3) quality assurance data, (4) environmental permits, (5) draft EISs and EAs, and (6) significant environmental activities. Annual environmental reports will be distributed by June 1 to the Assistant Secretary for Environment, Safety, and Health (EH-1), appropriate Program Senior Officials (PSOs), the Office of Scientific and Technical Information, and the Environmental Protection Agency, and to other agencies and organizations, as appropriate.

The breadth and detail of the annual site environmental reports reflect the size and extent of the program at a particular site. Significant environmental occurrences that took place during the calendar year at each site are documented in these reports. The reports include summaries of environmental monitoring data, effluent monitoring data, USGS groundwater monitoring data, and other information. These data are compared to DOE-derived concentration guides and applicable regulations and standards from EPA and the State of Idaho to confirm compliance. Annual site environmental reports summarize existing environmental characterizations and monitoring data and highlight significant progress and efforts. These reports discuss exceedences of radionuclide and other contaminant emissions, present potential reasons for the exceedences, and list corrective actions, if any, underway or proposed to correct the problems.

14.2.9.4 Annual Waste Management Plan. Annual waste management plans are required by DOE Order 5820.2A for every DOE facility that treats, stores, or disposes of hazardous, mixed, or radioactive waste. These plans describe current waste management practices and present plans for the next fiscal year. They include site-specific geologic and hydrologic characterizations, as well as waste analyses, problems encountered with TSD facilities, and other waste management, monitoring, and compliance issues for the site. This plan is to be prepared by the head of the field organization and reviewed by the Assistant Secretary for Environment, Safety, and Health. Guidance for developing and maintaining waste management plans for DOE facilities is in DOE Order 5820.2A.

14.2.9.5 Long-Range Environmental Protection Plan. Another report required by Order 5400.1 and the EPIP is the long-range environmental protection plan. This requirement is fulfilled through the Environmental Restoration and Waste Management Five-Year Plan. The Five-Year Plan contains information about environmental restoration, waste management, and corrective actions planned and anticipated for most DOE-ID facilities. The remaining applicable facilities are addressed in the Site-Specific Plan.

14.2.9.6 Groundwater Protection Management Program Plan. Groundwater Protection Management Program Plans (GPMPs) are written, reviewed annually, and updated every three years 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 public health, and comply with environmental regulations and DOE policies.

DOE Order 5400.1 mandates the development of a GPMP. As part of the GPMP, Order 5400.1 requires a groundwater monitoring plan. The components of each, as specified in the Order, are discussed in the following sections. (Note: DOE Order 5400.1 appears to use the term "program" and "plan" interchangeably.)

Groundwater Protection Management Program. The GPMP is one of the environmental protection program plans required under DOE Order 5400.1. A GPMP must be prepared for each facility or group of facilities. One GPMP has been prepared for the activities at the INEL that are under the purview of DOE-ID. These activities include all those conducted by LITCO and the USGS. The INEL GPMP does not include those activities conducted by the Naval Reactors Program, and it includes the Argonne National Laboratory-West GPMP only as an appendix.

Chapter IV, Section 1, of DOE Order 5400.1 requires each head of field organization to prepare a separate plan of "sufficient scope and detail to reflect program significance." Required elements of the GPMP include the following:

- Documentation of the groundwater regime with respect to quantity and quality
- Design and implementation of a groundwater monitoring program to support resource management and comply with applicable environmental laws and regulations
- Development of a management program for groundwater protection and remediation, including specific SDWA, RCRA, and CERCLA actions
- Summarization and identification of areas that may be contaminated with hazardous substances
- Development of strategies for controlling sources of these contaminants
- Development of a remedial action program that is part of the site CERCLA program required by DOE Order 5400.4
- Decontamination and decommissioning, and other remedial programs contained in DOE directives.

DOE Order 5400.1 requires that this plan be reviewed annually and updated every 3 years.

The GPMP for the INEL outlines the current and proposed activities related to the protection of the Eastern Snake River Plain Aquifer. The plan discusses existing conditions within the aquifer including storage capacities, recharge and discharge areas, historic water quality, and contamination of the aquifer. It discusses types and sources of the contamination and outlines management strategies that minimize further contamination. The plan presents remediation objectives, implementation strategy, and regulatory requirements.

Chapter A.6, "Implementation," of the INEL GPMP discusses the technical studies designed to increase existing knowledge of the Eastern Snake River Plain Aquifer. That chapter is divided into subsections that discuss hydrogeologic regime analysis, sitewide monitoring, groundwater consumption, facilities and operations, waste management (divided by types of waste), environmental restoration, and contamination prevention. Each subsection provides an overview of each technical task, the regulatory requirements that drive the task, organizational responsibilities, and a program description. The GPMP is reviewed annually as required by DOE Order 5400.1.

Groundwater Monitoring Plan. DOE Order 5400.1 mandates development of a Groundwater Monitoring Plan (GMP) as a specific element of the environmental monitoring plan and the GPMP (Chapter IV, Section 9). As with the GPMP, the GMP is prepared for each site, facility, or process. One site-wide GMP has been prepared for the INEL activities that come under the direct responsibility of DOE-ID.

GMP requirements mandated by DOE Order 5400.1 include the following:

- The plan shall identify all DOE requirements and regulations applicable to groundwater protection and include a monitoring strategy.
- Monitoring shall be conducted onsite and in the vicinity of DOE facilities to
 - Determine baseline conditions of groundwater quality and quantity
 - Demonstrate compliance with and implementation of all applicable regulations and DOE orders
 - Permit the early detection of groundwater pollution or contamination
 - Provide a reporting mechanism for detected groundwater pollution or contamination
 - Identify existing and potential groundwater contamination sources and maintain surveillance of these sources
 - Provide data for decisions concerning land disposal practices and the management and protection of groundwater resources.
- Site-specific characteristics shall determine monitoring needs. Groundwater monitoring programs shall meet 40 CFR 264 and 265, Subpart F, but may require more extensive information for sites with unique problems.

The following discussion of QA and reporting requirements from DOE Order 5400.1 apply to both the GPMP and the GMP.

DOE Order 5400.1 (Chapter IV, Section 10) requires that each Environmental Monitoring Plan (EMP) establish a QA program as defined in DOE Order 5700.6C. This QA program shall include at a minimum the 11 elements specified in Section 14.2.8. DOE and DOE contractor laboratories must meet appropriate Federal, State, and local agency certification requirements.

Chapter II, Section 10, of DOE Order 5400.1 requires all DOE facilities that conduct "significant" environmental protection programs to prepare an annual site environmental report. Attachment II of the order stipulates the content for the report:

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 the results. There also should be a summary of the hydrogeology of the site, major aquifers, movement of water, potential sources of groundwater pollution, and uses of groundwater in the vicinity of the site.

14.2.9.7 Radioactive Effluent and Onsite Discharge Data Report. Radioactive effluent and onsite discharge reports are also required under DOE Order 5400.1. The reports must be submitted annually to the Waste Information Systems Branch, LITCO. These reports summarize planned and unplanned releases of radioactive materials and include descriptive and interpretive information needed to explain the data included in the reports. Additional requirements for monitoring, analyzing, and assessing the data presented in these reports are presented in the DOE guidance document for radiological monitoring (DOE 1991).

14.2.9.8 Site Development Plans. DOE Order 4320.1B requires each DOE site to compile information on site geology, hydrology, waste site locations and problems, and other water-related data (such as the extent of 500-year floodplains) to adequately plan site development. Each site must have a Site Development Plan (SDP), which is a document describing the existing conditions and proposed changes to the site. This document is prepared according to a structured format for content and organization presented in Order 4320.1B. The INEL is to have one landlord SDP plus one SDP for each "non-contiguous or uniquely separate area." The SDP is designed for use by senior managers for overall decisionmaking. In addition, a detailed technical site information report must be prepared for use by technical personnel. Use of a standard geographic information system is also required to promote maximum usefulness of existing mapped information. From these data, a master plan must be prepared and it must coordinate with the other programs at the site, including the environmental restoration/waste management plans.

14.2.9.9 Environmental Survey Reports. An environmental survey report (ESR) is issued prior to the operation of a new facility. This report is required under Order 5484.1. It must include information on the background levels of both radioactive and nonradioactive potential contaminants at the site. An annual environmental monitoring report (EMR) indicates the results of monitoring efforts for each year. This report should summarize and interpret levels of radioactivity and, as appropriate, nonradioactive pollutants in the environs of DOE sites attributable to site operations.

DOE Order 5484.1 requires the preparation of an annual EMR or an environmental survey (ES), depending on conditions at the site.

The EMR should summarize

Environmental data and information derived from routine sampling or special studies or measurements that would indicate adherence to or deviations from public safety and property protection commitments published by the Department of Energy in environmental impact statements or other official Department of Energy documents. Levels of pollutants should be placed in perspective by comparing them to applicable standards and to relevant parameters, such as background and natural radioactivity. The results of pertinent

environmental surveys conducted by other Federal, State, or local environmental protection agencies (as available) should be characterized in the report and referenced.

An annual ES is issued for sites for which an EMR is not required. In some cases, an ES is necessary under Order 5484.1. This report must be prepared annually for all sites exempted from preparing an EMR. It is less detailed and of lesser magnitude than an EMR, but it should be inclusive enough to determine the environmental impact of facility operations. No specific groundwater or surface water monitoring requirements are mentioned for ESs; however, EMRs have some specific monitoring requirements.

14.2.9.10 NEPA Documents. DOE Order 5440.1E describes DOE procedures for preparing EAs and EISs, as needed. NEPA documents may be required when certain actions are necessary, including remedial actions, siting of new facilities, and some decommissioning programs. Consideration of environmental protection requirements is a key element in the preparation of NEPA documents. These documents highlight the environmental impacts of potential actions and indicate which actions could lead to further groundwater and surface water contamination. DOE Order 4700.1 stipulates that the preparation of NEPA documents begin early in the project planning stage to avoid delaying progress of the project.

14.2.9.11 CERCLA Documents. Under DOE Order 5400.4, "CERCLA Requirements," DOE response to CERCLA requirements will involve FFAs and IAGs and will be designed to coordinate the requirements of CERCLA with those of RCRA and NEPA. In addition, the order requires that, where natural resources for which DOE is responsible have been potentially injured, DOE will prepare a Natural Resource Damage Assessment. DOE Order 5400.4 also calls for preparation of RI/FSs as needed. These documents are to be coordinated, both in their preparation and in their public review, with appropriate NEPA documents.

14.2.9.12 Occurrence Reports. DOE Order 5400.1 establishes requirements for notification and follow-up of environmental occurrences. In addition, the periodic routine reporting of significant environmental protection information is addressed. The notification standards for environmental occurrences require consistency with DOE Orders 5484.1 and 5000.3B, and the DOE orders in the 5500 series dealing with emergency management and field organizations. The EPIP also requires occurrence reports in the event of any "occurrence," as defined in 5000.3B. Any discovery of groundwater or surface water contamination is classified as an "unusual occurrence."

Specific contractor responses are required when an environmental occurrence occurs. An "environmental occurrence" is defined in DOE Order 5400.1 as "any sudden or sustained deviation from a regulated or planned performance at a DOE operation that has environmental protection and compliance significance."

As a preventive measure, DOE-ID contractors are responsible for ensuring that a system exists for the initial detection and notification of environmental occurrences associated with their facility, operations, or activities.

When an environmental occurrence takes place, discovery is usually made by contractor personnel who recognize an unusual occurrence or emergency either from differences in day-to-day operations or from trends in monitoring. In the event of an environmental occurrence, emergency response procedures are followed,

based on DOE-ID orders, RCRA Part B contingency plans, and spill prevention, control, and countermeasure plans. The aim of response procedures is to contain, control, and clean up any environmental release.

The contractor is responsible for maintaining documentation on responses to environmental occurrences. Responses must be timely, appropriate, and documented. Written follow-up reports are required. Annual summaries of environmental occurrences must also be submitted.

After a significant environmental occurrence, DOE-ID and DOE-ID contractors are responsible for assessing the environmental impact. DOE-ID Program offices and Environmental Safety and Health must be informed by the contractors of any environmental impacts associated with an environmental or unusual occurrence.

Environmental occurrences involving "significant releases" are reported to the responsible line manager who reports to others within DOE (the definition of "significant releases" depending on the type(s) and quantities of materials released). The contractor also must notify the DOE-ID Warning Communications Center immediately if a release occurs that potentially threatens onsite or offsite personnel or facilities. Within 24 hours, the contractor notifies DOE-ID verbally. Within five work days, the contractor provides written notice concerning the unusual occurrence. DOE contractors shall also notify the Headquarters Emergency Operations Center (EOC) of any significant non-routine releases of any pollutants or hazardous substances. In addition, DOE Order 5400.5 requires that DOE-HQ be notified when DOE activities have caused, or might cause, noncompliance with requirements. Field organizations are required to maintain documentation of responses to these environmental occurrences and have them available for regulatory agency inspectors, DOE auditors, and the general public.

Some environmental occurrences, such as a release of a reportable quantity of a hazardous substance, trigger CERCLA and Superfund Amendments and Reauthorization Act requirements. If these regulations are triggered, the contractor must notify the proper DOE personnel and complete a substance release report for the DOE-ID Program Office and the Environmental Protection Division before the close of business that day. The National Response Center is notified within 24 hours. Other Federal, state, and local agencies are notified through the National Response Center.

15. FEDERAL FACILITY AGREEMENT AND CONSENT ORDER FOR THE INEL

The U.S. Department of Energy (DOE), Region X of the U.S. Environmental Protection Agency (EPA), and the Idaho Department of Health and Welfare (IDHW) entered into a Federal Facility Agreement and Consent Order (FFA/CO) on December 9, 1991. The FFA/CO established a framework for developing, prioritizing, implementing, and monitoring appropriate response actions at the Idaho National Engineering Laboratory (INEL) in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Resource Conservation and Recovery Act (RCRA), and the Idaho Hazardous Waste Management Act (HWMA).

The FFA/CO was negotiated in response to the listing of the INEL on the Superfund National Priorities List (NPL) on November 21, 1989, the need to strengthen prior Corrective Action commitments made by DOE under RCRA, and the need to integrate the processes of RCRA and CERCLA with the requirements of the National Environmental Policy Act (NEPA) and DOE Orders for environmental restoration. The FFA/CO superseded the INEL RCRA Consent Order and Compliance Agreement (COCA), which had been executed in July 1987. COCA data and other findings were incorporated into the FFA/CO investigation and remediation processes.

Releases or threatened releases of hazardous substances, hazardous wastes, or radioactive materials to groundwater and surface water is addressed under the FFA/CO by applying the investigation and cleanup processes stipulated in CERCLA and the National Contingency Plan (NCP). In general, this process requires that releases and contaminant sources be identified through application of appropriate investigative and monitoring technologies. The contaminant release pathways that must be characterized under the NCP include groundwater, surface water, and air. When a release has been identified and characterized, the risk to human health and the environment is evaluated through a formal risk assessment process. Only after the risk to human health and the environment has been quantified are cleanup levels selected for contaminants in each environmental medium and release pathway.

Because the NCP does not include specific compliance requirements for groundwater and surface water investigations initiated under CERCLA, EPA policy statements, strategies, and CERCLA/RCRA guidance documents generally set the standards. For CERCLA and RCRA remedial actions, these requirements are outlined in the *Guidance for Conducting Remedial Investigations and Feasibility Studies* and through the *RCRA Groundwater Monitoring Technical Enforcement Guidance Document*. Additional groundwater and surface water cleanup standards and monitoring requirements are identified through the process of identifying applicable or relevant and appropriate requirements (ARARs) for each remedial action.

15.1 Purpose of the FFA/CO and Action Plan

The general purposes of the FFA/CO are to: (1) ensure that the environmental impacts associated with releases or threatened releases of hazardous substances at the INEL are investigated in accordance with the NCP and that appropriate response actions are undertaken and completed as necessary to protect the public health, welfare, and the environment, (2) establish a procedural framework and schedule for developing, prioritizing, implementing, and monitoring appropriate response actions at the INEL in accordance with CERCLA, RCRA, and the HWMA, (3) facilitate cooperation, exchange of information, and participation of the Parties in such actions, (4) minimize the duplication of analysis and documentation, (5) expedite the cleanup process to the maximum extent possible consistent with protection of human health and the environment, and (6) supersede the RCRA COCA.

Specifically, the objectives of this agreement are as follows:

- Identify Interim Action (IA) alternatives which are appropriate at the INEL prior to the implementation of final actions. IA alternatives shall be identified and informally proposed by the responsible parties as early as possible and prior to formal proposal. This process is designed to promote cooperation among the responsible parties in promptly identifying IA alternatives.
- Establish requirements for the performance of investigations to determine fully the nature and extent of any threat to the public health or the environment caused by any release or threatened release of hazardous substances at the INEL, and to establish requirements for the performance of studies for DOE to identify, evaluate, and select alternatives for the appropriate actions to prevent, mitigate, or abate the release or threatened release of hazardous substances at the INEL.
- Implement the selected response actions in accordance with the action plan.
- Assure compliance with applicable federal and state hazardous waste laws and regulations for matters covered in the FFA/CO and Action Plan.

15.2 CERCLA Strategy

The fundamental goal of DOE, EPA, and IDHW in implementing this agreement is that timely remedial action be emphasized. This goal recognizes that no reasonable amount of investigation can resolve all uncertainty and once remedial actions are initiated they must be able to accommodate deviations from original hypotheses. This approach encourages timely remedy selection, flexibility for remedial action, and contingencies to respond to new information discovered during investigations.

Under the FFA/CO, the environmental restoration program for the INEL, in accordance with the NCP, will proceed as follows: (1) IAs under the NCP will be used to achieve significant risk reduction quickly or to expedite completion of total site cleanup, (2) site characterization will be planned on the basis of optimizing field sampling and maximizing use of available data, and (3) treatability studies will proceed promptly to establish technologies that are appropriate for restoration of complex units.

The INEL is divided into 10 waste area groups (WAGs) in order to facilitate environmental remediation efforts. WAGs 1 through 9 generally correspond to DOE-INEL operational facilities, while WAG 10 corresponds to the overall concerns associated with the Eastern Snake River Plain Aquifer (ESRPA) and those surface and subsurface areas not included in the bounds of the facility-specific WAGs.

Groundwater quality of the ESRPA is a major concern. The ESRPA is a dynamic system that underlies the entire INEL and is not controlled by institutional boundaries. Therefore, treating the regional concerns of the ESRPA beneath the INEL as an independent operable unit (OU) within WAG 10 is logical from an environmental restoration viewpoint.

Individual WAGs (1-9), in addition to including all solid waste management units (SWMUs) and other potentially hazardous units associated with the WAG and the surface area encompassed by them, address subsurface concerns including the vadose zone, perched aquifers, and the ESRPA to the extent those concerns are specific to the WAG and its source of contamination. In addressing WAG-specific aquifer concerns, the individual WAG investigations are not intended to characterize the aquifer or extent of aquifer contamination to great distances beyond the WAG boundary but are intended to obtain adequate information to make WAG-specific remedial action decisions.

OUs have been identified under each WAG. OUs are areas identified within each WAG where remedial action may be required. Many of the OUs identified at the INEL concern groundwater remediation.

15.3 CERCLA Process Under the FFA/CO

Remedial efforts at the INEL will proceed by implementing the FFA/CO Action Plan and applying the CERCLA process, as defined in the NCP. When there is sufficient information, the Action Plan encourages and provides the necessary flexibility to reach an early determination on an OU. The determination may be that No Further Action is necessary, that an IA is appropriate, or that the OU should proceed through the Remedial Investigation/Feasibility Study (RI/FS) process to a final action. The process also provides Project Managers with the flexibility to prioritize work and organize OUs in a manner which will achieve the most benefits with the available funds. This flexibility is supported by establishing generic "tracks" or processes described in flowcharts and figures presented in the Action Plan. These "tracks" allow consistency between the scope and duration of investigations and complexity of associated documentation, and between the scope and complexity of the problems being addressed.

Under this process, each potential source area at the INEL is categorized into an OU group for investigation or remedial activities. Actions are performed as necessary to abate health or environmental concerns in accordance with the NCP. Those OUs which are determined to pose a significant but acceptable risk and have the potential to contribute to the overall cumulative risk are designated for further evaluation. The consideration of a source area's contribution to the cumulative risk will be evaluated under an appropriate RI/FS risk assessment.

15.4 Drinking Water Actions

DOE presently monitors drinking water wells in and around the INEL in accordance with Federal and State regulations. DOE will routinely make available the resulting data to project managers within the environmental restoration program for the INEL. The DOE also provides the project managers historical monitoring data for the INEL drinking water systems for which there are potential impacts to drinking water quality from hazardous substances released at the INEL. The project managers are currently reviewing the data and identifying and agreeing upon additional monitoring requirements for these systems.

In cases where drinking water monitoring results indicate the groundwater exceeds promulgated standards, the Project Managers will determine if an alternate source of water is needed and DOE will provide an alternate source of water or implement treatment or the affected system(s) as agreed upon under this activity. Any additional actions agreed upon (i.e., Interim Actions) would be carried out under other applicable provisions of the Agreement and Action Plan.

15.5 Data Quality Objectives and Risk Assessment

The collection and use of appropriate quantities and quality of data to make remedial action decisions are a major consideration in conducting CERCLA investigations. Existing data are used whenever they meet the Data Quality Objectives (DQOs) for the decision being made, or can be validated with minimal additional supporting data of higher quality. DQOs are defined as qualitative and quantitative statements that specify the quality of data required to support decisions during the remedial response process. Because decisions under CERCLA are risk or health based, DQOs should be developed under the framework of a conceptual site model relating contaminant release to potential exposure routes, contaminant toxicity, and receptors. The development of DQOs and risk assessment procedures for the RI/FS process at the INEL will follow the guidance found in CERCLA and the NCP, as well as in EPA guidance documents. Reasonable future-use

scenarios will be developed for evaluation purposes in accordance with the latest CERCLA risk assessment guidance.

16. STRATEGY FOR DETERMINING GROUNDWATER AND SURFACE WATER-RELATED REQUIREMENTS

This section discusses the first two steps of a decision-making strategy to determine which technical requirements associated with groundwater and surface water monitoring, protection, and remediation must be met at given sites to achieve regulatory compliance. This strategy involves (a) determining which Standards apply to the given site or situation, (b) determining the general groundwater and surface water requirements of those Standards, and (c) determining the technical requirements of those Standards. Section 17 addresses the third step.

It should be noted that the Standards discussed in this report represent only the requirements potentially pertinent to groundwater and surface water issues at the INEL. The summaries presented in this section and in Section 17 are based on an evaluation of available guidance documents and requirements in Standards promulgated or proposed as of July 1, 1995.

16.1 Determining which Standards Apply

The requirement to implement a particular Standard may depend on factors often referred to as regulatory "triggers." The most common triggers of environmental regulations are waste type, facility type, and activity or event. These factors can singularly or collectively trigger the applicability of Standards. These triggers are discussed in the following sections.

Once the factors that trigger environmental Standards at a particular site are identified, the decision-maker can determine the Standards and can evaluate the general requirements of the applicable Standards. Although this document provides guidance, the decision-maker should refer to the actual laws, regulations, and orders, in consultation with environmental professionals, to determine specific requirements.

The details concerning which Standard applies to each waste type and facility type are contained in the tables that accompany the text. The text provides examples of applicability and exceptions. For more details concerning individual Standards see Sections 5 through 15. Separate tables are provided for groundwater (indicated by "GW" after the table number) and surface water (indicated by "SW" after the table number) requirements. While there is considerable overlap between the groundwater and surface water tables, some of the regulations and/or requirements apply only to one or the other, or apply differently to each; therefore, separate tables have been provided for clarity. Sections 16.1.1, 16.1.2, and 16.1.3 discuss the waste types, facility types, and activities or events that trigger applicable Standards.

16.1.1 Standards Triggered by Waste Type

Some Standards are waste specific, that is, they are triggered by the presence or intended presence of a particular waste or substance. In some instances, a waste need not be present in a facility to trigger a law, regulation, or order. For example, a site where PCBs have been used or stored would trigger the applicability of the TSCA as well as DOE Order 4300.1C.

Tables 16-1GW and 16-1SW indicate which of the Standards reviewed for this report are triggered by waste type and which are not.

The following sections discuss the major waste types: hazardous, mixed, radioactive, and industrial/sanitary. Regulations that apply to all four types of waste do not always apply in the same way to all waste types, and they do not necessarily have the same requirements for all waste types.

16.1.1.1 Standards Triggered by Hazardous or Mixed Waste. Tables 16-1GW and 16-1SW show that among the regulations triggered by hazardous or mixed waste are those of the CWA; RCRA; "Rules and Standards for Hazardous Waste" (Idaho Code Title 1, Chapter 5); "Rules for the Construction and Use of Injection Wells" (Idaho Code, Title 3, Chapter 9); "Well Construction Standards and Rules" (Idaho Code, Title 3, Chapter 3); "Water Quality Standards and Wastewater Treatment Requirements" (Idaho Code, Title 1, Chapter 2); "Idaho Rules for Public Drinking Water Systems" (Idaho Code, Title 1, Chapter 8); "Wastewater-Land Application Permit Rules" (Idaho Code, Title 1, Chapter 17); and USTs. The CWA relates primarily to the operation of a facility. RCRA, most of the Idaho regulations, and UST regulations relate to both the operation and remediation of facilities.

As shown on Tables 16-1GW and 16-1SW, most of the State of Idaho regulations apply to all waste types. Most of these regulations have a general statement concerning protecting all waters within the State from contamination, including groundwater and surface water. Waters must be protected for beneficial uses including potable water supplies, recreation, wildlife habitat, and aesthetics.

The regulations implementing CERCLA are also applicable to all of the waste types listed on Tables 16-1GW and 16-1SW. CERCLA regulations contain requirements that focus more on cleanup than facility operation. The CERCLA remediation process focuses on site-specific problems and requires cleanup to be performed in compliance with ARARs; consequently, the requirements under most other regulations listed on the Tables may be applicable.

Although TSCA regulates all toxic substances, the groundwater and surface water monitoring requirements apply only to PCBs. If a toxic substance is mixed with nuclear material, the toxic substance is regulated under TSCA. TSCA requirements are often ARARs during remedial actions.

The CWA regulations apply to all waste types. Most of the requirements in the CWA apply to surface water; however, in some cases the State of Idaho has determined that State requirements to protect groundwater would be applicable under CWA actions.

The SDWA specifies maximum contaminant levels allowable in drinking water systems supplied by groundwater or surface water. Contaminants include all waste types listed on Tables 16-1GW and 16-1SW. This document does not address the surface water requirements of the SDWA, because the INEL does not obtain any drinking water from surface water sources. In addition to the SDWA, the Idaho UIC regulations protect underground sources of drinking water from contaminants. The SDWA addresses those aspects of underground injection not covered by State regulations.

The Wetlands and Floodplains regulations deal with all waste types. In general, DOE activities are not to be sited within designated wetlands. The floodplains regulations require control of run-on and run-off from any DOE activity to protect both groundwater and surface water.

Table 16-1GW. Waste types that trigger applicability of laws, regulations, agreements, DOE orders, and guidance documents (groundwater)

Law, regulation, agreement, or DOE order	Waste type			
	Hazardous	Mixed	Radioactive	Industrial/Sanitary
1 FFA/CO	a	b	c, e	a
2 RCRA Regulations (40 CFR 264 and 265)	a	b	—	—
3 CERCLA/SARA Regulations	a	a, c	c, e	a
4 TSCA - PCB Regulations (40 CFR 761)	d	—	—	—
5 SDWA Regulations	a	a	c	a
6 CWA Regulations	a	a	a	a
7 UST Regulations (40 CFR 280-281)	a	a	a	—
8 Title 1, Chapter 6, Idaho Code, "Solid Waste Management Regulations and Standards"	—	—	—	a
9 Title 39, Chapter 44, Idaho Code, "Idaho Hazardous Waste Management Act of 1983," Section 39-4401	a	b	—	—
10 Title 1, Chapter 5, Idaho Code, "Rules and Standards for Hazardous Waste"*	a	b	—	—
11 Title 3, Chapter 3, Idaho Code, "Rules for the Construction and Use of Injection Wells"*	a	f	a	a
12 Title 3, Chapter 9, Idaho Code, "Well Construction Standards Rules"*	a	a	a	a
13 Title 1, Chapter 2, Idaho Code, "Water Quality Standards and Wastewater Treatment Requirements"	a	a	a	a
14 Title 1, Chapter 3, Idaho Code, "Rules for Individual/Subsurface Sewage Disposal Systems"	—	—	—	a
15 Title 1, Chapter 17, Idaho Code, "Wastewater-Land Application Permit Rules"	a	a	a	a
16 Title 1, Chapter 8, Idaho Code, "Idaho Rules for Public Drinking Water Systems"*	a	f	a	a
17 Title 39, Chapter 1, Idaho Code, Idaho Environmental Protection and Health Act of 1972, Sections 39-101 through 39-130*	a	a	a	a
18 "Idaho Underground Injection Control Program" (40 CFR 147, Subpart N)	a	a	a	a
19 "Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes" (40 CFR 191)	—	c	c	—
20 "Licensing Requirements for Independent Storage of Spent Nuclear Fuel and High Level Radioactive Waste" (10 CFR 72)	—	—	a	—
21 "Environmental Radiation Protection Standards for Low-Level Radioactive Waste Disposal" (Draft Proposed Rule 40 CFR 193)	—	—	a	—
22 "Byproduct Material" (10 CFR 962)	—	a	—	—
23 "Naturally Occurring and Accelerator-Produced Materials" (Draft Proposed Rule 40 CFR 764)	—	—	c	—

Table 16-1GW. (continued).

	Law, regulation, agreement, or DOE order	Waste type			
		Hazardous	Mixed	Radioactive	Industrial/Sanitary
24	"Radiation Protection Criteria for Cleanup of Land and Facilities Contaminated with Residual Radioactive Materials" (Proposed Rule 40 CFR 194)	—	—	a	—
25	Radiation Protection (Draft Proposed Rule 10 CFR 834)	—	—	a	—
26	<i>Environmental Regulatory Guide on Radiological Effluent Monitoring and Environmental Surveillance</i> (DOE 1991)	—	a	a	—
27	DOE Order 4300.1C, "Real Property Management"	a, d	a	a	a
28	DOE Order 4320.1B, "Site Development Planning"	a	a	a	a
29	DOE Order 4700.1, "Project Management System"	a	a	a	a
30	DOE Order 5000.3B, "Occurrence Reporting and Processing of Operations Information"	a	a	a	a
31	DOE Order 5400.1, "General Environmental Protection Program"	a	a	a	a
32	DOE Order 5400.2A, "Environmental Compliance Issue Coordination"	a	a	a	a
33	DOE Order 5400.4, "CERCLA Requirements" (does not include SARA Title III requirements)	a	a, c	c, e	a
34	DOE Order 5400.5, "Radiation Protection of the Public and the Environment"	—	a	a	—
35	DOE Order 5440.1E, "National Environmental Policy Act Compliance Program"	a	a	a	a
36	DOE Order 5480.1B, "Environmental, Safety and Health Program for DOE Operations"	a	a	a	a
37	DOE Order 5480.4, "Environmental Protection, Safety, and Health Protection Standards"	a	a	a	a
38	DOE Order 5481.1B, "Safety Analysis and Review System"	—	—	—	—
39	DOE Order 5482.1B, "Environmental, Safety, and Health Appraisal Program"	a	a	a	a
40	DOE Order 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements"	a	a	a	a
41	DOE Order 5500.1B, "Emergency Management System"	a	a	a	a
42	DOE Order 5500.3A, "Planning and Preparedness for Operational Emergencies"	a	a	a	a
43	DOE Order 5700.6C, "Quality Assurance"	—	—	—	—
44	DOE Order 5820.2A, "Radioactive Waste Management"	a	a	a	—

Table 16-1GW. (continued).

	Law, regulation, agreement, or DOE order	Waste type			
		Hazardous	Mixed	Radioactive	Industrial/Sanitary
45	DOE Order 6430.1A, "General Design Criteria Manual"	a	a	a	a

* Items on tables that are marked include reference to the Idaho Code which authorizes the implementing regulations.

Key:

- a. Applicable.
- b. Pertains only to hazardous components of mixed waste.
- c. Does not apply to all types of radioactive wastes.
- d. Applies specifically to PCBs.
- e. Non-Federally permitted releases only, and releases over reportable quantities.
- f. Not specifically required but is implied by definition.

Table 16-1SW. Waste types that trigger applicability of laws, regulations, agreements, DOE orders, and guidance documents (surface water).

Law, regulation, agreement, or DOE order	Waste type*			
	Hazardous	Mixed	Radioactive	Industrial/sanitary
1 FFA/CO	a	b	c, e	a
2 RCRA Regulations (40 CFR 264, 265, and 270)	a	b	—	—
3 CERCLA/SARA Regulations	a	a, c	c, e	a
4 TSCA - PCB Regulations (40 CFR 761)	a	b	—	—
5 CWA Regulations	a	a	a	a
6 UST	a	a	a	a
7 Floodplain Management Executive Order 11988**	a	a	a	a
8 Wetlands Protection Executive Order 11990**	a	a	a	a
9 Title 1, Chapter 2, Idaho Code, "Water Quality Standards and Wastewater Treatment Requirements"	a	a	a	a
10 Title 1, Chapter 3, Idaho Code, "Rules for Individual/Subsurface Sewage Disposal Systems"	—	—	—	a
11 Title 1, Chapter 5, Idaho Code, "Rules and Standards for Hazardous Waste"***	a	b	—	—
12 Title 1, Chapter 6, Idaho Code, "Solid Waste Management Regulations and Standards"	—	—	—	a
13 Title 1, Chapter 17, Idaho Code, "Wastewater-Land Application Permit Rules"	a	a	a	a
14 Title 39, Chapter 1, Idaho Code, "Idaho Environmental Protection and Health Act of 1972," Sections 39-101 through 39-130	a	a	a	a
15 City of Idaho Falls Municipal Code, Chapter 1, Section 8	a	a	a	a
16 "Licensing Requirements for Independent Storage of Spent Nuclear Fuel and High Level Radioactive Waste" (10 CFR 72)	—	—	a	—
17 "Radiation Protection" (Proposed Rule 10 CFR 834)	—	a	a	—
18 "Byproduct Material" (10 CFR 962)	—	a	—	—
19 "Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes" (40 CFR 191)	—	c	c	—
20 "Environmental Radiation Protection Standards for Low-Level Radioactive Waste Disposal" (Draft Proposed Rule 40 CFR 193)	—	—	a	—

Table 16-1SW. (continued)

	Law, regulation, agreement, or DOE order	Waste type*			
		Hazardous	Mixed	Radioactive	Industrial/sanitary
21	"Radiation Protection Criteria for Cleanup of Land and Facilities Contaminated with Residual Radioactive Materials" (Proposed Rule 40 CFR 194)	—	—	a	—
22	"Naturally Occurring and Accelerator-Produced Materials" (Draft Proposed Rule 40 CFR 764)	—	—	c	—
23	<i>Environmental Regulatory Guide on Radiological Effluent Monitoring and Environmental Surveillance</i> (DOE 1991)	—	a	a	—
24	DOE Order 4300.1C, "Real Property Management"	a, d	a	a	a
25	DOE Order 4320.1B, "Site Development Planning"	a, d	a	a	a
26	DOE Order 4700.1, "Project Management System"	a	a	a	a
27	DOE Order 5000.3B, "Occurrence Reporting and Processing of Operations Information"	a	a	a	a
28	DOE Order 5400.1, "General Environmental Protection Program"	a	a	a	a
29	DOE Order 5400.2A, "Environmental Compliance Issue Coordination"	a	a	a	a
30	DOE Order 5400.4, "CERCLA Requirements" (does not include SARA Title III requirements)	a	a,c	c,e	a
31	DOE Order 5400.5, "Radiation Protection of the Public and the Environment"	—	a	a	—
32	DOE Order 5440.1E, "National Environmental Policy Act Compliance Program"	a	a	a	a
33	DOE Order 5480.1B, "Environmental, Safety and Health Program for DOE Operations"	a	a	a	a
34	DOE Order 5480.4, "Environmental Protection, Safety, and Health Protection Standards"	a	a	a	a
35	DOE Order 5481.1B, "Safety Analysis and Review System"	—	—	—	—
36	DOE Order 5482.1B, "Environmental Protection, Safety, and Health Appraisal Program"	a	a	a	a
37	DOE Order 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements"	a	a	a	a
38	DOE Order 5500.1B, "Emergency Management System"	a	a	a	a
39	DOE Order 5500.3A, "Planning and Preparedness for Operational Emergencies"	a	a	a	a
40	DOE Order 5700.6C, "Quality Assurance"	—	—	—	—

Table 16-1SW. (continued)

Law, regulation, agreement, or DOE order	Waste type *			
	Hazardous	Mixed	Radioactive	Industrial/sanitary
41 DOE Order 5820.2A, "Radioactive Waste Management"	a	a	a	—
42 DOE Order 6430.1A, "General Design Criteria Manual"	a	a	a	a

***Key:**

- a. applicable.
- b. pertains only to hazardous components of mixed waste.
- c. does not apply to all types of radioactive wastes.
- d. applies specifically to PCBs.
- e. non-Federally permitted releases only, and releases over reportable quantities.
- f. not specifically required but is implied by definition.

** Items on the tables that are marked for this standard include requirements from the implementing regulations.

Tables 16-1GW and 16-1SW illustrate that many of the regulations pertaining to hazardous wastes also apply to mixed wastes. This is due to the "Radioactive Waste: Byproduct Materials" rule (10 CFR 962), which stipulates that DOE mixed wastes are governed both by EPA and DOE. The hazardous portion of the wastes is regulated by EPA, and the radionuclides in the wastes are under DOE jurisdiction.

DOE Order 5400.4 deals with the requirements of CERCLA. This order requires compliance with CERCLA and coordination of document preparation so that the documents prepared to comply with CERCLA will also comply with RCRA and NEPA if necessary.

If PCBs are present, or if equipment containing PCBs has been used at the site, DOE Order 4300.1C, "Real Property Management," is triggered. Before purchase, improvement, or sale of Federal real property, this order requires a certification that the site complies with the requirements of 40 CFR 761 if there is any possibility that PCBs have been used, including their use in transformers.

Other DOE orders include requirements for monitoring or environmentally sound waste management practices whether the wastes are hazardous, radioactive, or mixed.

16.1.1.2 Standards Triggered by Radioactive Wastes. Regulations and orders for radioactive wastes do not apply to all types and forms of the wastes. Rather, most of the regulations and orders address specific types of radioactive wastes and materials (HLW, LLW, TRU waste, byproduct materials, and NARMs). Some regulations also relate only to commercial radioactive wastes, while others relate to commercial and defense-related wastes. Commercial nuclear wastes and wastes from power-generating reactors are regulated by the NRC (10 CFR 61). The NRC regulates generation of this waste through its licensing program. If a DOE site were to accept commercial radioactive wastes for disposal, then it would be subject to NRC regulations.

DOE spent nuclear fuel, HLW, and TRU waste are regulated under 40 CFR 191 ("Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level, and Transuranic Radioactive Wastes") and 10 CFR 60 ("Disposal of High-Level Radioactive Wastes in Geologic Repositories"). Because the INEL is not being considered as a site for a geologic repository for the disposal of HLW, 10 CFR 60 is not applicable to INEL operations and therefore is not discussed in the document.

The DOE draft proposed rule 10 CFR 834 addresses radiological releases during routine and nonroutine operations (including remedial actions). It applies to DOE facilities that generate, manage, treat, store, dispose of, package or transport HLW, LLW, TRU wastes, spent nuclear fuel, and NARMs. Although this rule is currently only proposed, there are many groundwater and surface water monitoring requirements that would be applicable to the INEL if the rule is finalized.

Radioactive wastes may also be subject to some regulations intended primarily for hazardous waste management or waste site remediation. For example, CERCLA may apply to releases of some radioactive materials but not to others. Excluded from CERCLA jurisdiction are "federally permitted releases" of "source" material (uranium and thorium), "special nuclear" material (plutonium and enriched uranium), and "byproduct" material (as defined by the AEA), if such releases are under NRC licensing requirements and applicable DOE policies, guidelines, and orders. Releases of radioactive materials from uranium ore processing sites that are subject to the Uranium Mill Tailings Radiation Control Act are also excluded.

Releases of reactor-produced radioactive materials are excluded from CERCLA regulations; however, releases of NARMs are included under CERCLA. Mixed wastes, LLW, buried TRU wastes, and residuals may also be subject to CERCLA requirements, if releases constitute a hazard sufficient to warrant inclusion on the NPL, or if the releases are part of a broader environmental hazard at an NPL site.

RCRA does not apply to radioactive wastes except for the certain situations addressed under the UST regulations (see Section 10).

16.1.1.3 Standards Triggered by Sanitary/Industrial Wastes. Most of the standards addressed in this document include requirements pertaining to industrial/sanitary waste. Those that don't are RCRA, TSCA, and State, Federal, and DOE Orders pertaining to radioactive and mixed wastes.

As shown on Tables 16-1GW and 16-1SW, the regulations that contain the majority of the requirements pertaining to industrial/sanitary wastes at the INEL are the CWA, the City of Idaho Falls Municipal Code, and several sections of the Idaho Code.

The CWA addresses all waste types on the tables, including industrial/sanitary. The INEL was required under the CWA to obtain two NPDES general permits for storm water discharges: (1) one permit for stormwater run-off from areas associated with industrial activities; and (2) one permit for storm water run-off from areas associated with industrial activities.

The City of Idaho Falls Municipal Code is pertinent only to INEL facilities that are located in Idaho Falls. Although the City of Idaho Falls is the responsible party for meeting CWA sewage treatment plant regulations for industrial discharges from their plant, those users designated as industrial users must comply with pretreatment requirements.

Idaho "Water Quality Standards and Wastewater Treatment Requirements" (Title 1, Chapter 2), Idaho "Rules for Individual/Subsurface Sewage Disposal Systems" (Title 1, Chapter 3), Idaho "Solid Waste Management Regulations and Standards" (Title 1, Chapter 6), and the Idaho "Wastewater-Land Application Permit Rules" (Title 1, Chapter 17) are all applicable to INEL activities involving industrial and/or sanitary wastes. Some of these regulations contain overlapping requirements. For example, Title 1, Chapter 2 contains a subsection addressing land application of wastewater. This Title contains specific requirements concerning land application of wastewater, as well as referencing Title 1, Chapter 17.

16.1.2 Standards Triggered by Facility Types

Some of the standards discussed in this report are triggered by the presence or operation of specific facility types. Examples of facility types are seepage basins, USTs, and container storage facilities for hazardous waste.

Tables 16-2GW and 16-2SW indicate which of the standards reviewed for this report are triggered by facility type. The types of facilities involved are radioactive, hazardous, and mixed waste TSD facilities; dry wells; injection wells; and municipal landfills. Facilities not expected to directly impact groundwater and surface water, such as sewer lines, and waste compaction facilities that do not generate liquid effluent, are not included in these tables.

Tables 16-2GW and 16-2SW illustrate several concepts: (a) certain regulations apply, regardless of the type of facility, (b) UST and UIC regulations deal with specific facility types, (c) some regulations apply only during certain events and are not facility specific, (d) some regulations apply either to hazardous and mixed waste facilities, or to mixed and radioactive waste facilities, and (e) most of the regulations that apply to industrial/sanitary facilities also apply to other facility types.

16.1.3 Standards Triggered by Activities or Situations

Some regulations are triggered by particular activities or situations, including the following:

- Leaks, spills, overflows, and other releases of hazardous wastes, hazardous substances, or radioactive materials or wastes
- Planned or ongoing remediation, decontamination, and/or decommissioning activities
- Violations of environmental regulations or agreements, exceedence of permit limitations, and situations that are a significant hazard to humans or the environment.

16.1.3.1 Leaks, Spills, and Other Releases. A number of regulations and DOE orders go into effect at a site if a leak, spill, overfill, or other release of certain substances occurs.

A release to surface water in excess of permitted limits, whether the substance released is hazardous or radioactive, triggers applicability of the CWA and the Idaho "Water Quality Standards and Wastewater Treatment Requirements." Response to releases under the CWA will be different depending on which section of the Act the release falls under (see Section 9 for details). State of Idaho regulations that implement the Idaho Hazardous Waste Management Act and the Idaho Environmental Protection and Health Act may also apply.

If a CERCLA hazardous substance is released to the environment, and if the amount of substance released exceeds the RQ of the material as listed in 40 CFR 302.4, then the release triggers the requirements for CERCLA and for DOE Order 5400.4. The CERCLA definition of hazardous substances includes an extensive list of radionuclides.

Any release of a hazardous or radioactive substance to the Idaho Falls POTW through a drain triggers the City of Idaho Falls Municipal Code, Chapter 1, Section 8. In addition, a release of any substance that adversely affects POTW operations triggers the municipal code.

Also triggered by a release of a hazardous or radioactive substance are DOE Orders 5400.1, 5000.3B, and 5484.1. DOE Orders 5400.1, "General Environmental Protection Program," and 5000.3B, "Occurrence Reporting and Processing of Operations Information," require notification and follow-up of environmental occurrences. An "environmental occurrence" is any nonroutine release of any pollutant or hazardous substance. Discovery of groundwater or surface water contamination is classified as an environmental occurrence. In the event of accidental releases that may result in a significant effect on the public or the offsite environment, or any discovery of significant radioactive or nonradioactive contamination in the onsite or offsite environment attributable to current or past DOE operations, DOE Order 5484.1 becomes applicable. This order, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements,"

Table 16-2GW. Facility types that trigger applicability of laws, regulations, agreements, DOE orders, and guidance documents (groundwater).

Law, regulation, agreement, or DOE order	Hazardous, mixed, or radioactive waste facility															
	Seepage basin**	Shallow Injection well	Deep Injection well	Industrial landfill	Municipal landfill	Burial trench	Open burn area	Land treatment	Waste pile	Open tank	Above ground tank	Under ground tank	Under ground vault	Sump	Container storage unit	Wastewater treatment and disposal facility
1. FFA/CO	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
2. RCRA Regulations (40 CFR 264 and 256)	a	a	a	a	a	a	a	a	a	a	a	b	a	a	a	a
3. CERCLA/SARA Regulations	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
4. TSCA - PCB Regulations (40 CFR 761)	—	—	a	d	—	—	—	—	—	—	—	—	—	—	—	—
5. SDWA Regulations	—	—	a	—	—	—	—	—	—	—	—	—	—	—	—	—
6. CWA Regulations	a	a	—	a	a	a	a	a	a	a	a	a	—	—	a	a
7. UST Regulations (40 CFR 280-281)	—	—	—	—	—	—	—	—	—	—	—	a, b	a	—	—	—
8. Title 1, Chapter 6, Idaho Code, "Solid Waste Management Regulations and Standards"	—	—	—	—	a	—	—	—	—	—	—	—	—	—	—	—
9. Title 39, Chapter 44, Idaho Code, "Idaho Hazardous Waste Management Act of 1983," Section 39-4401	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
10. Title 1, Chapter 5, Idaho Code, "Rules and Standards for Hazardous Waste"***	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	—
11. Title 3, Chapter 3, Idaho Code, "Rules for the Construction and Use of Injection Wells" Section 42-3902***	—	—	a, j	—	—	—	—	—	—	—	—	—	—	—	—	—
12. Title 3, Chapter 9, Idaho Code, "Well Construction Standards Rules"****	—	a	a	—	—	—	—	—	—	—	—	—	—	—	—	—
13. Title 1, Chapter 2, Idaho Code, "Water Quality Standards and Wastewater Treatment Requirements"	—	a	a	—	—	—	—	a	—	—	a	a	—	—	—	a
14. Title 1, Chapter 3, Idaho Code, "Rules for Individual/Subsurface Sewage Disposal Systems"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	a
15. Title 1, Chapter 17, Idaho Code, "Wastewater-Land Application Permit Rules"	a	—	—	—	—	—	—	a	—	—	—	—	—	—	—	a
16. Title 1, Chapter 8, Idaho Code, "Idaho Rules for Public Drinking Water Systems"****	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
17. Title 39, Chapter 1, Idaho Code, "Idaho Environmental Protection and Health Act of 1972," Sections 39-101 through 39-130****	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table 16-2GW. (continued).

Law, regulation, agreement, or DOE order	Hazardous, mixed, or radioactive waste facility															
	Seepage basin**	Shallow injection well	Deep injection well	Industrial landfill	Municipal landfill	Burial trench	Open burn area	Land treatment	Waste pile	Open tank	Above ground tank	Under ground tank	Under ground vault	Sump	Container storage unit	Wastewater treatment and disposal facility
18. "Idaho Underground Injection Control Program" (40 CFR 147, Subpart N)	—	—	a	—	—	—	—	—	—	—	—	—	—	—	—	—
19. "Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes" (40 CFR 191)	k, n	k, n	k, n	k, n	k, n	k, n	k, n	k, n	k, n	n	k, n	k, n	k, n	k, n	k, n	—
20. "Licensing Requirements for Independent Storage of Spent Nuclear Fuel and High Level Radioactive Waste" (10 CFR 72)	—	—	—	—	—	—	—	—	—	—	—	—	a	—	a	—
21. "Environmental Protection Standards for Management and Land Disposal of Low-Level Radioactive Waste" (Draft Proposed Rule 40 CFR 193)	—	—	l	l	l	l	—	—	—	—	l	l	l	—	l	—
22. "Byproduct Material" (10 CFR 962)	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	—
23. "Naturally Occurring and Accelerator-Produced Materials" (Draft Proposed Rule 40 CFR 764)	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	—
24. "Radiation Protection Criteria for Cleanup of Land and Facilities Contaminated with Residual Radioactive Materials" (Proposed Rule 40 CFR 194)	p	p	p	p	p	p	p	p	p	p	p	p	p	p	p	—
25. "Radiation Protection" (Draft Proposed Rule 10 CFR 834)	a	—	a	—	—	a	—	—	—	—	a	a	a	a	a	—
26. <i>Environmental Regulatory Guide on Radiological Effluent Monitoring and Environmental Surveillance</i> (DOE 1991)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
27. DOE Order 4300.1C, "Real Property Management"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
28. DOE Order 4320.1B, "Site Development Planning"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
29. DOE Order 4700.1, "Project Management System"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
30. DOE Order 5000.3B, "Occurrence Reporting and Processing of Operations Information"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
31. DOE Order 5400.1, "General Environmental Protection Program"	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a

Table 16-2GW. (continued).

Law, regulation, agreement, or DOE order	Hazardous, mixed, or radioactive waste facility															
	Seepage basin**	Shallow injection well	Deep injection well	Industrial landfill	Municipal landfill	Burial trench	Open burn area	Land treatment	Waste pile	Open tank	Above ground tank	Under ground tank	Under ground vault	Sump	Container storage unit	Wastewater treatment and disposal facility
31. DOE Order 5400.1, "General Environmental Protection Program"	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
32. DOE Order 5400.2A, "Environmental Compliance Issue Coordination"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
33. DOE Order 5400.4, "CERCLA Requirements" (does not include SARA Title III requirements)	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
34. DOE Order 5400.5, "Radiation Protection of the Public and the Environment"	a	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
35. DOE Order 5440.1E, "National Environmental Policy Act Compliance Program"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
36. DOE Order 5480.1B, "Environmental, Safety and Health Program for DOE Operations"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
37. DOE Order 5480.4, "Environmental Protection, Safety, and Health Protection Standards"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
38. DOE Order 5481.1B, "Safety Analysis and Review System"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
39. DOE Order 5482.1B, "Environmental, Safety, and Health Appraisal Program"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
40. DOE Order 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
41. DOE Order 5500.1B, "Emergency Management System"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
42. DOE Order 5500.3A, "Planning and Preparedness for Operational Emergencies"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
43. DOE Order 5700.6C, "Quality Assurance"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
44. DOE Order 5820.2A, "Radioactive Waste Management"	l	—	—	—	—	a	—	—	—	—	—	—	—	—	—	—

Table 16-2GW. (continued).

Law, regulation, agreement, or DOE order	Hazardous, mixed, or radioactive waste facility															
	Seepage basin**	Shallow injection well	Deep injection well	Industrial landfill	Municipal landfill	Burial trench	Open burn area	Land treatment	Waste pile	Open tank	Above ground tank	Under ground tank	Under ground vault	Sump	Container storage unit	Wastewater treatment and disposal facility
45. DOE Order 6430.1A, "General Design Criteria Manual"	g, h	g	g	g	g	g	g	g, m	g	g	g, h	g, h	g	g	g	g,h

*Key:

- a. Generally applicable requirements.
- b. Regulated under the underground storage tank regulations of RCRA (40 CFR 280-281).
- c. Applies if facility has discharged contaminants to the environment and site is placed on the National Priorities List.
- d. Applies if PCBs or PCB derivatives are present or indicated to be present.
- e. Runoff from facilities is regulated through nonpoint source pollution limits, which primarily relate to sediment loads and biological oxygen demand.
- f. Applies only if radionuclides are present in the wastes. Includes mixed wastes.
- g. Applies to all DOE facilities.
- h. Facility specifically mentioned in this law, regulation, agreement, or DOE Order.
- i. Affects LLW disposal in this facility type.
- j. Prohibits injection of radioactive wastes.
- k. Prohibits disposal of high-level, spent nuclear, and transuranic wastes in these facilities under the Nuclear Waste Policy Act.
- l. Applies to "pits."
- m. Applies to land application of sewage effluent only.
- n. Applies to management and storage of certain radioactive wastes at any DOE facility not regulated by NRC or an Agreement State.
- o. Applies to NARMs at facilities licensed by NRC or Agreement States and to DOE-authorized LLW disposal facilities.
- p. Applies to residual radioactive materials at facilities licensed by NRC or Agreement States, to DOE-owned or used sites, and to other sites.

* * Includes cribs, ditches, and pits.

*** Items on tables that are marked for the Idaho Code include requirements from the implementing regulations.

Table 16-2SW. Facility types that trigger applicability of laws, regulations, agreements, DOE orders, and guidance documents (surface water).

Law, regulation, agreement, or DOE order	Hazardous, mixed, radioactive, or industrial/sanitary waste facility*															
	Seepage basin**	Shallow injection well	Deep injection well	Industrial landfill	Municipal landfill	Burial trench	Open burn area	Land treatment	Waste pile	Open tank	Above ground tank	Under ground tank	Under ground vault	Sump	Container storage unit	Wastewater treatment and disposal facility
1 FFA/CO	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
2 RCRA Regulations (40 CFR 264, 265, and 270)	a	a	a	a	a	a	a	a	a	a	a	b	a	a	a	a
3 CERCLA/SARA Regulations	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
4 TSCA — PCB Regulations (40 CFR 761)	a	—	—	d,a,h	a	a	—	—	—	—	—	—	—	—	—	—
5 CWA Regulations	a	a	—	a	a	a	a	a	a	a	a	a	—	—	a	a
6 UST	—	—	—	—	—	—	—	—	—	—	—	a,b	a	—	—	—
7 Floodplain Management Executive Order 11988***	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
8 Wetlands Protection Executive Order 11990***	—	—	—	a	a	a	—	a	a	—	—	—	—	—	—	a
9 Title 1, Chapter 2, Idaho Code, "Water Quality Standards and Wastewater Treatment Requirements"	—	a	a	—	—	—	—	a	—	—	a	a	—	—	—	a
10 Title 1, Chapter 3, Idaho Code, "Rules for Individual/Subsurface Sewage Disposal Systems"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	a
11 Title 1, Chapter 5, Idaho Code, "Rules and Standards for Hazardous Waste"***	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	—
12 Title 1, Chapter 6, Idaho Code, "Solid Waste Management Regulations and Standards"	—	—	—	—	a	—	—	—	—	—	—	—	—	—	—	—
13 Title 1, Chapter 17, Idaho Code, "Wastewater—Land Application Permit Rules"	a	—	—	—	—	—	—	a	—	—	—	—	—	—	—	a
14 Title 39, Chapter 1, Idaho Code, "Idaho Environmental Protection and Health Act of 1972," Sections 39—101 through 39—130	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15 City of Idaho Falls Municipal Code, Chapter 1, Section 8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	a
16 "Licensing Requirements for Independent Storage of Spent Nuclear Fuel and High Level Radioactive Waste" (10 CFR 72)	—	—	—	—	—	—	—	—	—	—	—	—	a	—	a	—
17 "Radiation Protection" (Proposed Rule 10 CFR 834)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
18 "Byproduct Material" (10 CFR 962)	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	—

Table 16-2SW. (continued)

Law, regulation, agreement, or DOE order	Hazardous, mixed, radioactive, or industrial/sanitary waste facility*															
	Seepage basin**	Shallow injection well	Deep injection well	Industrial landfill	Municipal landfill	Burial trench	Open burn area	Land treatment	Waste pile	Open tank	Above ground tank	Under ground tank	Under ground vault	Sump	Container storage unit	Wastewater treatment and disposal facility
19 "Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes" (40 CFR 191)	k,n	k,n	k,n	k,n	k,n	k,n	k,n	k,n	k,n	k,n	k,n	k,n	k,n	k,n	k,n	—
20 "Environmental Radiation Protection Standards for Low-Level Radioactive Waste Disposal" (Draft Proposed Rule 40 CFR 193)	—	—	i	i	i	i	—	—	—	—	i	i	i	—	i	—
21 "Radiation Protection Criteria for Cleanup of Land and Facilities Contaminated with Residual Radioactive Materials" (Proposed Rule 40 CFR 194)	p	p	p	p	p	p	p	p	p	p	p	p	p	p	p	—
22 "Naturally Occurring and Accelerator-Produced Materials" (Draft Proposed Rule 40 CFR 764)	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	—
23 <i>Environmental Regulatory Guide on Radiological Effluent Monitoring and Environmental Surveillance</i> (DOE 1991)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
24 DOE Order 4300.1C, "Real Property Management"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
25 DOE Order 4320.1B, "Site Development Planning"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
26 DOE Order 4700.1, "Project Management System"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
27 DOE Order 5000.3B, "Occurrence Reporting and Processing of Operations Information"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
28 DOE Order 5400.1, "General Environmental Protection Program"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
29 DOE Order 5400.2A, "Environmental Compliance Issue Coordination"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
30 DOE Order 5400.4, "CERCLA Requirements" (does not apply to SARA Title III requirements)	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
31 DOE Order 5400.5, "Radiation Protection of the Public and the Environment"	a	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
32 DOE Order 5440.1E, "National Environmental Policy Act Compliance Program"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
33 DOE Order 5480.1B, "Environmental, Safety and Health Program for DOE Operations"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table 16-2SW. (continued)

Law, regulation, agreement, or DOE order	Hazardous, mixed, radioactive, or industrial/sanitary waste facility*															Wastewater treatment and disposal facility
	Seepage basin**	Shallow injection well	Deep injection well	Industrial landfill	Municipal landfill	Burial trench	Open burn area	Land treatment	Waste pile	Open tank	Above ground tank	Under ground tank	Under ground vault	Sump	Container storage unit	
34 DOE Order 5480.4, "Environmental Protection, Safety, and Health Protection Standards"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
35 DOE Order 5481.1B, "Safety Analysis and Review System"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
36 DOE Order 5482.1B, "Environmental Protection, Safety, and Health Appraisal Program"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
37 DOE Order 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
38 DOE Order 5500.1B, "Emergency Management System"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
39 DOE Order 5500.3A, "Planning and Preparedness for Operational Emergencies"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
40 DOE Order 5700.6C, "Quality Assurance"	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
41 DOE Order 5820.2A, "Radioactive Waste Management"	i	—	—	—	—	a	—	—	—	—	—	—	—	—	—	—
42 DOE Order 6430.1A, "General Design Criteria Manual"	g,h	g	g	g	g	g	g	g,m	g	g	g,h	g,h	g	g	g	g,h

Key:

- a. Generally applicable requirements.
- b. Regulated under the underground storage tank regulations of RCRA (40 CFR 280—281).
- c. Applies if facility has discharged contaminants to the environment and site is placed on the National Priorities List.
- d. Applies if PCBs or PCB derivatives are present or indicated to be present.
- e. Runoff from facilities is regulated through nonpoint source pollution limits, which primarily relate to sediment loads and biological oxygen demand.
- f. Applies only if radionuclides are present in the wastes. Includes mixed wastes.
- g. Applies to all DOE facilities.
- h. Facility specifically mentioned in this law, regulation, agreement, or DOE Order.
- i. Affects LLW disposal in this facility type.
- j. Prohibits injection of radioactive wastes.
- k. Prohibits disposal of high-level, spent nuclear, and transuranic wastes in these facilities under the Nuclear Waste Policy Act.
- l. Applies to "pits."
- m. Applies to land application of sewage effluent only.
- n. Applies to management and storage of certain radioactive wastes at any DOE facility not regulated by NRC or an Agreement State.
- o. Applies to NARMs at facilities licensed by NRC or Agreement States and to DOE—authorized LLW disposal facilities.
- p. Applies to residual radioactive materials at facilities licensed by NRC or Agreement States, to DOE—owned or used sites, and to other sites.

** Includes cribs, ditches, and pits.

*** Items on the tables that are marked for this standard include requirements from the implementing regulations.

Table 16-3GW. General requirements for compliance with applicable laws, regulations, agreements, DOE orders, and guidance documents (groundwater).

Law, regulation, agreement or DOE order	Requirement*													
	Aquifer character-ization	Background water quality	Ground-water monitor-ing	Vadose zone monitoring	Ground-water modeling	Reporting	Remedial/corrective actions	Plume character-istics	Cleanup standards	Sample plan	QA/QC	Release control procedures	Siting restrictions	Closure/D&D
1 FFA/CO	f	c, f	f	f	—	f, b	f	f	c, f	f	f	c, f	f	f
2 RCRA Regulations (40 CFR 264 and 265)	b	b	b	b	—	b	b	b	b	b	b	b	b	b
3 CERCLA/SARA Regulations	a	c	a	a	—	b	b	a	c	b	b	c	b	—
4 TSCA - PCB Regulations (40 CFR 761)	—	b	b	b	—	b	—	b	b	—	a	b	—	—
5 SDWA Regulations	—	b	b	—	—	b	a	—	b	b	—	—	b	a
6 CWA Regulations	—	—	b, c	—	—	b	b, c	—	—	—	—	—	—	—
7 UST Regulations (40 CFR 280-281)	a	a	b	b	—	b	b	a	—	—	—	b	—	—
8 Title I, Chapter 6, Idaho Code, "Solid Waste Management Regulations and Standards"	a	a	—	—	—	a	—	—	—	—	—	—	a	a
9 Title 39, Chapter 44, Idaho Code, "Idaho Hazardous Waste Management Act of 1983," Section 39-4401	—	—	—	—	—	b	—	—	—	—	—	—	—	—
10 Title 1, Chapter 5, Idaho Code, "Rules and Standards for Hazardous Waste"***	b	b	b	b	—	b	b	b	b	b	b	b	b	b
11 Title 3 Chapter 3, Idaho Code, "Rules for the Construction and Use of Injection Wells," Section 42-3902**	a	—	a	—	—	a	—	—	—	—	—	—	b	a
12 Title 3, Chapter 9, Idaho Code, "Well Construction Standards Rules"***	—	—	—	—	—	a	—	—	—	—	—	—	—	—
13 Title 1, Chapter 2, Idaho Code, "Water Quality Standards and Wastewater Treatment Requirements"	—	b	b	—	—	b	—	—	—	—	—	—	a	—

Table 16-3GW. (continued).

Law, regulation, agreement or DOE order	Requirement *													
	Aquifer character- ization	Background water quality	Ground- water monitor- ing	Vadose zone monitoring	Ground- water modeling	Reporting	Remedial/ corrective actions	Plume character- istics	Cleanup standards	Sample plan	QA/ QC	Release control procedures	Siting restrictions	Closure/ D&D
14 Title 1, Chapter 3, Idaho Code, "Rules for Individual/Subsurface Sewage Disposal Systems"	a	a	a	—	—	—	—	—	—	—	—	—	a	—
15 Title 1, Chapter 17, Idaho Code, "Wastewater-Land Application Permit Rules"	a	g	a	—	—	a	—	—	—	—	—	—	—	—
16 Title 1, Chapter 8, Idaho Code, "Idaho Rules for Public Drinking Water Systems" * *	—	b	b	—	—	b	a	—	a	a	—	—	a	—
17 Title 39, Chapter 1, Idaho Code, "Idaho Environmental Protection and Health Act of 1972," Sections 39-101 through 39- 130 * *	—	—	—	—	—	a	—	—	—	—	—	—	—	—
18 "Idaho Underground Injection Control Program" (40 CFR 147, Subpart N)	a	—	a	—	—	a	—	—	—	—	—	—	b	a
19 "Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High- Level and Transuranic Radioactive Wastes" (40 CFR 191)	a	a	a	—	d	—	—	—	—	—	a	e	e	—
20 "Licensing Requirements for Independent Storage of Spent Nuclear Fuel and High Level Radioactive Waste" (10 CFR 72)	a	a	a	—	d	b	—	—	—	—	—	—	—	—
21 "Environmental Radiation Protection Standards for Low- Level Radioactive Waste Disposal" (Draft Proposed Rule 40 CFR 193)	a	a	a	—	d	—	—	—	—	—	—	a	a	a
22 "Byproduct Material" (10 CFR 962)	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table 16-3GW. (continued).

Law, regulation, agreement or DOE order	Requirement*													
	Aquifer character- ization	Background water quality	Ground- water monitor- ing	Vadose zone monitoring	Ground- water modeling	Reporting	Remedial/ corrective actions	Plume character- istics	Cleanup standards	Sample plan	QA/ QC	Release control procedures	Siting restrictions	Closure/ D&D
23 "Naturally Occurring and Accelerator-Produced Materials" (Draft Proposed Rule 40 CFR 764)	—	—	—	—	—	—	—	—	—	—	—	—	—	—
24 "Radiation Protection Criteria for Cleanup of Land and Facilities Contaminated with Residual Radioactive Materials" (Proposed Rule 40 CFR 194)	—	—	—	—	—	—	a	—	—	—	—	—	—	a
25 "Radiation Protection" (Proposed Rule 10 CFR 834)	a	a	a	a	a	a	—	—	—	a	a	a	a	—
26 <i>Environmental Regulatory Guide on Radiological Effluent Monitoring and Environmental Surveillance</i> (DOE 1991)	b	b	b	b, d	b	a	a	—	—	b	b	—	—	—
27 DOE Order 4300.1C, "Real Property Management"	a	—	—	—	—	b	a	—	—	—	—	—	b	a
28 DOE Order 4320.1B, "Site Development Planning"	—	a	—	—	—	—	—	—	—	—	—	—	b	—
29 DOE Order 4700.1, "Project Management System"	—	—	—	—	—	—	—	—	—	—	—	—	—	—
30 DOE Order 5000.3B, "Occurrence Reporting and Processing of Operations Information"	—	—	—	—	—	b	b	—	—	—	—	a	—	—
31 DOE Order 5400.1, "General Environmental Protection Program"	b	b	b	—	—	b	b	b	—	a	a	a	—	a
32 DOE Order 5400.2A, "Environmental Compliance Issue Coordination"	—	—	—	—	—	b, e	—	—	—	—	—	—	—	—

Table 16-3GW. (continued).

Law, regulation, agreement or DOE order	Requirement*													
	Aquifer character- ization	Background water quality	Ground- water monitor- ing	Vadose zone monitoring	Ground- water modeling	Reporting	Remedial/ corrective actions	Plume character- istics	Cleanup standards	Sample plan	QA/ QC	Release control procedures	Siting restrictions	Closure/ D&D
33 DOE Order 5400.4, "CERCLA Requirements" (does not include SARA Title III requirements)	f	—	f	—	—	f	f	f	f	f	f	f	f	—
34 DOE Order 5400.5, "Radiation Protection of the Public and the Environment"	—	b	a	—	a	b	f	—	—	—	a	a	—	—
35 DOE Order 5440.1E, "National Environmental Policy Act Compliance Program"	—	—	—	—	—	b, f	a, f	—	—	—	—	—	a, f	a, f
36 DOE Order 5480.1B, "Environmental, Safety, and Health Program for DOE Operations"	—	—	—	—	—	b	a	—	—	—	—	—	a	—
37 DOE Order 5480.4, "Environmental Protection, Safety, and Health Protection Standards"	—	—	—	—	—	—	—	—	—	—	—	—	—	—
38 DOE Order 5481.1B, "Safety Analysis and Review System"	—	—	a	—	—	b	a	—	—	—	—	a	b	—
39 DOE Order 5482.1B, "Environmental, Safety, and Health Appraisal Program"	—	—	a	—	—	a	a	—	—	—	—	—	—	—
40 DOE Order 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements"	—	a	a	—	—	b	a	—	—	—	a	—	—	—
41 DOE Order 5500.1B, "Emergency Management System"	—	—	—	—	—	b	a	—	—	—	—	—	—	—
42 DOE Order 5500.3A, "Planning and Preparedness for Operational Emergencies"	—	—	—	—	—	b	—	—	—	—	—	—	—	—

Table 16-3GW. (continued).

Law, regulation, agreement or DOE order	Requirement*													
	Aquifer character- ization	Background water quality	Ground- water monitor- ing	Vadose zone monitoring	Ground- water modeling	Reporting	Remedial/ corrective actions	Plume character- istics	Cleanup standards	Sample plan	QA/ QC	Release control procedures	Siting restrictions	Closure/ D&D
43 DOE Order 5700.6C, "Quality Assurance"	—	—	—	—	—	—	—	—	—	b	b	—	—	—
44 DOE Order 5820.2A, "Radioactive Waste Management"	b	b	b	b	d	b	b	a	—	—	b	—	b	b
45 DOE Order 6430.1A, "General Design Criteria Manual"	b	b	b	e	a	—	—	—	—	—	—	b	b	a

*Key:

- a. Requirements listed but no specific details given.
- b. Requirements listed and specific details given.
- c. CERCLA/SARA provides for adoption of ARARs promulgated under Federal/State law, including media quality standards, criteria/guidelines for site-specific acceptable risk based remedial objectives for cleanup standards, whichever is more stringent; or cleanup standards for RCRA.
- d. Conducted to project migration of radionuclides, to assess site performance, and to estimate radioactive doses.
- e. Required during management and storage of high-level wastes or TRU wastes.
- f. Required by reference to an applicable law or regulation.
- g. Guidelines for Land Application of Municipal and Industrial Wastewater (IDHW).

* Items on tables that are marked for the Idaho Code include requirements from the implementing regulations.

Table 16-3SW. General requirements for compliance with applicable laws, regulations, agreements, DOE orders, and guidance documents (surface water).

Law, regulation, agreement, or DOE order	Requirement*											
	Surface water characterization	Background water quality/ standards	Surface water monitoring	Surface water modeling	Record keeping and reporting	Remedial/ corrective actions	Discharge limitations	Cleanup standards	Sampling/ monitoring plans	QA/QC	Siting restrictions	Closure/ D&D
1 FFA/CO	f	c,f	f	—	b,f	f	c,f	c,f	f	f	f	f
2 RCRA Regulations (40 CFR 264, 265, and 270)	b	b	b	—	b	b	b	b	b	b	b	b
3 CERCLA/SARA Regulations	a	c	a	—	b	b	c	c	b	b	b	b
4 TSCA — PCB Regulations (40 CFR 761)	a	—	a	—	—	—	—	—	a	—	a	—
5 CWA Regulations	—	a	a	—	b	—	b	—	a	—	b	b
6 UST	a	a	b	—	b	b	—	—	—	—	—	—
7 Floodplain Management Executive Order 11988*	—	—	—	—	a	—	—	—	—	—	a	—
8 Wetlands Protection Executive Order 11990*	—	—	—	—	a	a	—	—	—	—	a	—
9 Title 1, Chapter 2, Idaho Code, "Water Quality Standards and Wastewater Treatment Requirements"	—	—	—	—	a	—	—	a	—	—	a	—
10 Title 1, Chapter 3, Idaho Code, "Rules for Individual/Subsurface Sewage Disposal Systems"	—	—	—	—	—	—	b	—	—	—	a	a
11 Title 1, Chapter 5, Idaho Code, "Rules and Standards for Hazardous Waste"***	b	b	b	—	b	b	b	b	b	b	b	b
12 Title 1, Chapter 6, Idaho Code, "Solid Waste Management Regulations and Standards"	—	—	—	—	a	—	—	—	—	—	a	a
13 Title 1, Chapter 17, Idaho Code, "Wastewater—Land Application Permit Rules"	—	—	—	—	—	—	—	—	—	—	—	—
14 Title 39, Chapter 1, Idaho Code, "Idaho Environmental Protection and Health Act of 1972," Sections 39—101 through 39—130	—	—	—	—	a	—	—	—	—	—	—	—
15 City of Idaho Falls Municipal Code, Chapter 1, Section 8	—	—	—	—	a	—	a	—	a	—	—	—

Table 16-3SW. (continued)

Law, regulation, agreement, or DOE order	Requirement*											
	Surface water characterization	Background water quality/ standards	Surface water moni- toring	Surface water modeling	Record keeping and reporting	Remedial/ corrective actions	Discharge limitations	Cleanup standards	Sampling/ monitoring plans	QA/QC	Siting restrictions	Closure/ D&D
16 "Licensing Requirements for Independent Storage of Spent Nuclear Fuel and High Level Radioactive Wastes" (10 CFR 72)	a	a	a	d	b	—	a	—	—	a	a	—
17 "Radiation Protection" (Proposed Rule 10 CFR 834)	a	a	a	a	a	—	a	—	a	a	a	—
18 "Byproduct Material" (10 CFR 962)	—	—	—	—	—	—	—	—	—	—	—	—
19 "Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High—Level and Transuranic Radioactive Wastes" (40 CFR 191)	a	a	a	—	d	—	b	b	—	a	e	—
20 "Environmental Radiation Protection Standards for Low—Level Radioactive Waste Disposal" (Draft Proposed Rule 40 CFR 193)	a	a	a	d	—	—	—	—	—	—	a	a
21 "Radiation Protection Criteria for Cleanup of Land and Facilities Contaminated with Residual Radioactive Materials" (Proposed Rule 40 CFR 194)	—	—	—	—	—	a	—	—	—	—	—	a
22 "Naturally Occurring and Accelerator—Produced Materials" (Draft Proposed Rule 40 CFR 764)	—	—	—	—	—	—	—	—	—	—	—	—
23 <i>Environmental Regulatory Guide on Radiological Effluent Monitoring and Environmental Surveillance</i> (DOE 1991)	b	b	b	b	a	a	b	—	b	b	—	—
24 DOE Order 4300.1C, "Real Property Management"	a	—	—	—	b	a	—	—	—	—	b	a
25 DOE Order 4320.1B, "Site Development Planning"	—	a	—	—	—	—	—	—	—	—	b	—
26 DOE Order 4700.1, "Project Management System"	—	—	—	—	—	—	—	—	—	—	—	—
27 DOE Order 5000.3B, "Occurrence Reporting and Processing of Operations Information"	—	—	—	—	b	b	a	—	—	—	—	—

Table 16-3SW. (continued)

Law, regulation, agreement, or DOE order	Requirement*											
	Surface water characterization	Background water quality/ standards	Surface water moni- toring	Surface water modelling	Record keeping and reporting	Remedial/ corrective actions	Discharge limitations	Cleanup standards	Sampling/ monitoring plans	QA/QC	Siting restrictions	Closure/ D&D
28 DOE Order 5400.1, "General Environmental Protection Program"	b	b	b	—	b	b	a	—	a	a	—	a
29 DOE Order 5400.2A, "Environmental Compliance Issue Coordination"	—	—	—	—	b,e	—	—	—	—	—	—	—
30 DOE Order 5400.4, "CERCLA Requirements" (does not include SARA Title III Requirements)	f	c	f	—	f	f	c	c	f	f	f	—
31 DOE Order 5400.5, "Radiation Protection of the Public and the Environment"	—	b	a	a	b	f	a	—	—	a	—	—
32 DOE Order 5440.1E, "National Environmental Policy Act Compliance Program"	—	—	—	—	b,f	a,f	—	—	—	—	a,f	a,f
33 DOE Order 5480.1B, "Environmental, Safety and Health Program for DOE Operations"	—	—	—	—	b	a	—	—	—	—	—	—
34 DOE Order 5480.4, "Environmental Protection, Safety, and Health Protection Standards"	—	—	—	—	—	—	—	—	—	—	—	—
35 DOE Order 5481.1B, "Safety Analysis and Review System"	—	—	—	—	b	—	—	—	—	—	—	—
36 DOE Order 5482.1B, "Environmental Protection, Safety, and Health Appraisal Program"	—	—	a	—	a	a	—	—	—	—	—	—
37 DOE Order 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements"	—	a	a	—	b	a	—	—	—	a	—	—
38 DOE Order 5500.1B, "Emergency Management System"	—	—	—	—	b	a	—	—	—	—	—	—
39 DOE Order 5500.3A, "Planning and Preparedness for Operational Emergencies"	—	—	—	—	b	—	—	—	—	—	—	—
40 DOE Order 5700.6C, "Quality Assurance"	—	—	—	—	—	—	—	—	b	b	—	—
41 DOE Order 5820.2A, "Radioactive Waste Management"	b	b	b	d	b	b	—	—	—	a	b	b

Table 16-3SW. (continued)

Law, regulation, agreement, or DOE order	Requirement*											
	Surface water characterization	Background water quality/ standards	Surface water moni- toring	Surface water modeling	Record keeping and reporting	Remedial/ corrective actions	Discharge limitations	Cleanup standards	Sampling/ monitoring plans	QA/QC	Siting restrictions	Closure/ D&D
42 DOE Order 6430.1A, "General Design Criteria Manual"	b	b	b	a	—	—	b	—	—	—	b	a

*Key:

- a. Requirements listed but no specific details given.
- b. Requirements listed and specific details given.
- c. CERCLA/SARA provides for adoption of ARARs promulgated under Federal/State law, including media quality standards, criteria/guidelines for site—specific acceptable risk based remedial objectives for cleanup standards, whichever is more stringent; or cleanup standards for RCRA.
- d. Conducted to project migration of radionuclides, to assess site performance, and to estimate radioactive doses.
- e. Required during management and storage of high—level wastes or TRU wastes.
- f. Required by reference to an applicable law or regulation.
- g. Guidelines for Land Application of Municipal and Industrial Wastewater (IDHW).

* * Items on the tables that are marked for this standard include requirements from the implementing regulations.

16.2 Determining the General Requirements of Applicable Laws, Regulations, or Orders

Once the applicable laws, regulations, and DOE orders have been identified, it is necessary to determine the general requirements for complying with each regulation and order. Determining these requirements is the second step in the decision-making strategy referred to earlier in this section.

Tables 16-3GW and 16-3SW summarize the general groundwater and surface water-related requirements for compliance with applicable Standards. Specifics on these requirements are given in Section 17. These tables indicate several important points. First, there are a number of water-related requirements besides monitoring that may serve to protect, manage, or remediate contaminated groundwater and surface water. Second, it is evident that the most comprehensive requirements are found in RCRA regulations, the Idaho regulations that mirror RCRA requirements, and in CERCLA.

Each requirement listed in Tables 16-3GW and 16-3SW is found in at least one DOE order and most of the requirements within these orders apply to surface water as well as groundwater. Most of the specific groundwater and surface water protection requirements are presented in DOE Order 5400.1. This order includes requirements for the development of an Environmental Monitoring Plan (EMP), which includes both groundwater and surface water requirements; however, the EMP specifies the development of a separate groundwater monitoring plan by each DOE operations office.

The requirements presented in Tables 16-3GW and 16-3SW are explained in more detail in Section 17. For a more thorough review of particular Standards, refer to the applicable sections of this report.

The decision-maker should keep in mind that the Standards are subject to revision and updates. Although this is a "living document" and as such will be updated, it will not always be current. The decision-maker should review the actual laws, regulations, and orders in consultation with an environmental professional.

17. DETERMINING THE TECHNICAL REQUIREMENTS OF GROUNDWATER AND SURFACE WATER MONITORING, PROTECTION, AND REMEDIATION

Section 16 explained the first two steps in a three-step strategy for determining which technical requirements associated with groundwater and surface water monitoring, protection, and remediation must be met at a given site to achieve regulatory compliance. The first steps were to determine (a) which standards apply to a given waste type, site, or situation, and (b) the general groundwater and surface water requirements associated with those Standards.

This section presents the third step, which is to identify the specific technical requirements related to groundwater and surface water monitoring, protection, management, and remediation found in various Standards.

Not all of the requirements listed in the tables in this section relate to all kinds of wastes and all kinds of facilities. Information on the types of wastes and facilities to which the various Standards apply is provided in Section 16. The tables in this section expand on most of the topics addressed in the Section 16 tables, with the exception of two items on the groundwater tables not applicable to these tables: vadose zone monitoring and release control procedures.

Rather than present all of the details of the groundwater and surface water-related requirements, this section is structured to generally indicate which requirements relate to a particular facility or situation and to direct the reader to the tables and the locations in this document in which more detailed information is presented.

This section is a compilation of requirements from the previous sections in this report on specific Standards. It summarizes the components of the requirements pertaining to groundwater and surface water protection, management, and remediation. These components are as follows:

- Monitoring, sampling, and characterization
- Protection measures and standards
- Siting restrictions
- Reporting requirements
- Site investigations
- Data analysis requirements
- Remedial measures and cleanup standards.

17.1 Summary of Technical Groundwater and Surface Water Monitoring Requirements

Table 17-1GW shows the technical requirements for groundwater monitoring systems associated with the laws, regulations, agreements, orders, and guidance documents reviewed for this report. Table 17-1SW shows the technical requirements for surface water monitoring systems. Both tables also illustrate which Standards do not contain specific monitoring requirements and which of these contain monitoring requirements only through reference to another regulation.

17.1.1 Standards with Specific Monitoring Requirements

Few Standards include specific requirements for the design, construction, or operation of groundwater monitoring systems and sampling programs. Standards that do provide detailed technical monitoring specifications are discussed below in Section 17.1.1.1 for groundwater-related requirements and Section 17.1.1.2 for surface water-related requirements.

17.1.1.1 Specific Groundwater Monitoring Requirements. The following Standards provide detailed technical groundwater monitoring specifications: RCRA, USTs, TSCA, UIC, Idaho "Solid Waste Management Regulations and Standards," the Idaho "Hazardous Waste Management Act of 1983," Idaho "Rules and Standards for Hazardous Waste," Idaho "Water Quality Standards and Wastewater Treatment Requirements," and the "Idaho Rules for Public Drinking Water Systems."

RCRA requirements for groundwater monitoring programs are the most detailed of all the regulations. These include detection monitoring, compliance monitoring, and corrective action (see Section 5). In addition, several guidance documents are available which provide detailed technical guidance for the design, construction, and operation of monitoring and sampling programs. These documents are also discussed in Section 5.

Regulations controlling installation and use of USTs are described in Section 10. These regulations require a leak detection system to provide the owner/operator with early warning of leaks. If the UST is used to store a substance that is not miscible in water and the substance will float on the water surface if a leak occurs, and if the UST is located where the water table is within 20 ft of the land surface, then groundwater monitoring can be used for leak detection. The UST groundwater monitoring requirements are detailed in Section 10.4. Other leak detection measures are required at USTs that do not meet these criteria. The depth to water at the INEL is greater than 20 ft, except where perched water occurs; therefore, other measures generally apply to USTs at the INEL.

Groundwater monitoring requirements under TSCA include criteria for siting of chemical waste disposal facilities, stipulations for well number, design and placement, requirements for vadose zone monitoring, and specifications for groundwater sampling. These are discussed in Section 7.3.

The Idaho "Rules for the Construction and Use of Injection Wells" (Title 3, Chapter 3) prohibits underground injection of hazardous and radioactive materials into or above a drinking water source. For UIC facilities, groundwater monitoring requirements may be specified in a facility permit if it is determined that the well may be adversely affecting an underground source of drinking water or is injecting a contaminant that

Table 17-1GW. Technical groundwater monitoring requirements.

Law, regulation, agreement, or DOE order	Requirement*									Comments (b)**
	Groundwater monitoring program	Groundwater monitoring system design	Well number and placement	Well construction	Operation and maintenance	Groundwater sampling	Sampling frequency	Sampling techniques	Laboratory/ data analysis	
1 FFA/CO	b	b	b	b	b	b	b	b	a	3
2 RCRA Regulations (40 CFR 264 and 265) (e)	a	a	a	a	a	a	a	a	a	—
3 CERCLA/SARA Regulations	c	c	c	c	c	c	c	c	c	—
4 TSCA - PCB Regulations (40 CFR 761) (e)	c	a	a	—	—	a	a	a	a	—
5 SDWA Regulations (e)	a	c	—	a	a	a	a	a	a	—
6 CWA Regulations (e)	d	c	—	—	—	d	—	—	—	—
7 UST Regulations (40 CFR 280-281) (e)	c	—	—	a, c	a	c	—	—	c	—
8 Title I, Chapter 6, Idaho Code, "Solid Waste Management Regulations and Standards" (e)	—	—	—	—	a	—	—	—	—	—
9 Title 39, Chapter 44, Idaho Code, "Idaho Hazardous Waste Management Act of 1983," Section 39-4401 (e)	b	—	—	—	—	—	—	—	—	10
10 Title 1, Chapter 5, Idaho Code, "Rules and Standards for Hazardous Waste"*** (e)	b	b	b	b	b	b	b	b	b	2
11 Title 3, Chapter 3, Idaho Code, "Rules for the Construction and Use of Injection Wells," Section 42-3902*** (e)	c	—	—	a	—	c	c	a	a	—
12 Title 3, Chapter 9, Idaho Code, "Well Construction Standards Rules"*(e)	—	—	—	f	—	—	—	—	—	—
13 Title 1, Chapter 2, Idaho Code, "Water Quality Standards and Wastewater Treatment Requirements" (e)	b, c	—	—	—	—	c	b	—	—	15
14 Title 1, Chapter 3, Idaho Code, "Rules for Individual/Subsurface Sewage Disposal Systems"	a	—	—	—	a	a	—	—	—	—
15 Title 1, Chapter 17, Idaho Code, "Wastewater-Land Application Permit Rules"	f, b(13)	c, f	f	f	a	c	c, b(13)	c	c	—
16 Title 1, Chapter 8, Idaho Code, "Idaho Rules for Public Drinking Water Systems"*** (e)	a	—	—	a	a	a	a	a	a	—

Table 17-1GW. (continued)

Law, regulation, agreement, or DOE order	Requirement*									
	Groundwater monitoring program	Groundwater monitoring system design	Well number and placement	Well construction	Operation and maintenance	Groundwater sampling	Sampling frequency	Sampling techniques	Laboratory/ data analysis	Comments (b) * "
17 Title 39, Chapter 1, Idaho Code, "Idaho Environmental Protection and Health Act of 1972," Sections 39-101 through 39-130 * * * (e)	—	—	—	—	—	—	—	—	—	—
18 "Idaho Underground Injection Control Program" (40 CFR 147, Subpart N) (e)	c	—	—	a	—	c	c	c	c	—
19 "Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes" (Proposed Rule 40 CFR 191)	a	c	—	—	—	c	c	c	c	—
20 "Licensing Requirements for Independent Storage of Spent Nuclear Fuel and High Level Radioactive Waste" (10 CFR 72)	a	a	a	a	a	a	—	—	—	—
21 "Environmental Radiation Protection Standards for Low-Level Radioactive Waste Disposal" (Draft Proposed Rule 40 CFR 193)	c	—	—	—	—	a	—	—	—	—
22 "Byproduct Material" (10 CFR 962)	—	—	—	—	—	—	—	—	—	—
23 "Naturally Occurring and Accelerator-Produced Materials" (Draft Proposed Rule 40 CFR 764)	b	—	—	—	—	b	—	—	—	18
24 "Radiation Protection Criteria for Cleanup of Land and Facilities Contaminated with Residual Radioactive Materials" (Proposed Rule 40 CFR 194)	—	—	—	—	—	—	—	—	—	—
25 "Radiation Protection" (Proposed Rule 10 CFR 834)	a	—	—	—	—	a	—	—	—	—
26 <i>Environmental Regulatory Guide on Radiological Effluent Monitoring and Environmental Surveillance</i> (DOE 1991)	a	a	a	a	—	a	a	a	a	—

Table 17-1GW. (continued)

Law, regulation, agreement, or DOE order	Requirement*									
	Groundwater monitoring program	Groundwater monitoring system design	Well number and placement	Well construction	Operation and maintenance	Groundwater sampling	Sampling frequency	Sampling techniques	Laboratory/ data analysis	Comments (b) **
27 DOE Order 4300.1C, "Real Property Management"	—	—	—	—	—	—	—	—	—	—
28 DOE Order 4320.1B, "Site Development Planning"	—	—	—	—	—	—	—	—	—	—
29 DOE Order 4700.1, "Project Management System"	—	—	—	—	—	—	—	—	—	—
30 DOE Order 5000.3B, "Occurrence Reporting and Processing of Operations Information"	—	—	—	—	—	—	—	—	—	—
31 DOE Order 5400.1, "General Environmental Protection Program"	a, b	b	b	b	a	a	a	a	a	2
32 DOE Order 5400.2A, "Environmental Compliance Issue Coordination"	—	—	—	—	—	—	—	—	—	—
33 DOE Order 5400.4, "CERCLA Requirements" (does not include SARA Title III requirements)	b	b	b	b	b	b	b	b	b	3
34 DOE Order 5400.5, "Radiation Protection of the Public and the Environment"	a	—	—	—	—	—	—	—	—	—
35 DOE Order 5440.1E, "National Environmental Policy Act Compliance Program"	—	—	—	—	—	—	—	—	—	—
36 DOE Order 5480.1B, "Environmental, Safety and Health Program for DOE Operations"	—	—	—	—	—	—	—	—	—	—
37 DOE Order 5480.4, "Environmental Protection, Safety, and Health Protection Standards"	—	—	—	—	—	—	—	—	—	—
38 DOE Order 5481.1B, "Safety Analysis and Review System"	—	—	—	—	—	—	—	—	—	—
39 DOE Order 5482.1B, "Environmental, Safety, and Health Appraisal Program"	a	—	—	—	—	c	—	—	c	—

Table 17-1GW. (continued)

Law, regulation, agreement, or DOE order	Requirement*									Comments (b)**
	Groundwater monitoring program	Groundwater monitoring system design	Well number and placement	Well construction	Operation and maintenance	Groundwater sampling	Sampling frequency	Sampling techniques	Laboratory/ data analysis	
40 DOE Order 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements"	—	—	—	—	—	—	—	—	—	—
41 DOE Order 5500.1B, "Emergency Management System"	—	—	—	—	—	—	—	—	—	—
42 DOE Order 5500.3A, "Planning and Preparedness for Operational Emergencies"	—	—	—	—	—	—	—	—	—	—
43 DOE Order 5700.6C, "Quality Assurance"	—	—	—	—	—	—	—	—	a	—
44 DOE Order 5820.2A, "Radioactive Waste Management"	a	—	—	—	—	a	—	—	—	—
45 DOE Order 6430.1A, "General Design Criteria Manual"	a	—	—	—	—	—	—	—	—	—

*Key:

- a. Required explicitly.
- b. Required by reference to another regulation (number in comments column of the regulation being referenced is from this table).
- c. Required under certain circumstances only.
- d. Clean Water Act groundwater monitoring requirements are established on a case-by-case basis.
- e. ARARs under CERCLA.
- f. Guidelines for Land Application of Municipal and Industrial Wastewater.

**This column lists the number of the law, regulation, agreement, or DOE order (as assigned in the table) that is implied or referenced for a given requirement.

*** Items on tables that are marked for the Idaho Code include requirements from the implementing regulations.

Table 17-1SW. Technical surface water monitoring requirements.

Law, regulation, agreement, or DOE order	Requirement*								Comments (b)**
	Surface water monitoring program	Surface water monitoring system design	Number and location of monitoring stations	Operation and maintenance	Surface water sampling	Sampling frequency	Sampling techniques	Laboratory/ data analysis	
1 FFA/CO	b	b	b	b	b	b	b	a	3
2 RCRA Regulations (40 CFR 264, 265, and 270)	a	c	c	a	d	a	a	a	—
3 CERCLA/SARA Regulations	c	c	c	c	c	c	c	c	—
4 TSCA - PCB Regulations (40 CFR 761)	a	—	—	a	a	a	a	a	—
5 CWA Regulations	a	c	a	a	d	a	a	a	—
6 UST	c	—	—	c	c	—	—	c	—
7 Floodplain Management Executive Order 11988***	—	—	—	—	—	—	—	—	—
8 Wetlands Protection Executive Order 11990***	—	—	—	—	—	—	—	—	—
9 Title 1, Chapter 2, Idaho Code, "Water Quality Standards and Wastewater Treatment Requirements"	c	—	—	—	c	—	—	—	—
10 Title 1, Chapter 3, Idaho Code, "Rules for Individual/Subsurface Sewage Disposal Systems"	—	—	—	a	—	—	—	—	—
11 Title 1, Chapter 5, Idaho Code, "Rules and Standards for Hazardous Waste"***	a	a	a	a	a	a	a	a	—
12 Title 1, Chapter 6, Idaho Code, "Solid Waste Management Regulations and Standards"	—	—	—	a	—	—	—	—	—
13 Title 1, Chapter 17, Idaho Code, "Wastewater-Land Application Permit Rules"	—	—	—	—	—	—	—	—	—
14 Title 39, Chapter 1, Idaho Code, "Idaho Environmental Protection and Health Act of 1972," Sections 39-101 through 39-130	—	—	—	—	—	—	—	—	—
15 City of Idaho Falls Municipal Code, Chapter 1, Section 8	—	—	—	—	—	—	—	—	—

Table 17-1SW. (continued)

Law, regulation, agreement, or DOE order	Requirement *								Comments (b) **
	Surface water monitoring program	Surface water monitoring system design	Number and location of monitoring stations	Operation and maintenance	Surface water sampling	Sampling frequency	Sampling techniques	Laboratory/ data analysis	
16 "Licensing Requirements for Independent Storage of Spent Nuclear Fuel and High Level Radioactive Wastes" (10 CFR 72)	a	—	—	—	a	—	—	—	—
17 "Radiation Protection" (Proposed Rule 10 CFR 834)	a	—	—	—	a	—	—	—	—
18 "Byproduct Material" (10 CFR 962)	—	—	—	—	—	—	—	—	—
19 "Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes" (40 CFR 191)	a	c	—	—	c	c	c	c	—
20 "Environmental Radiation Protection Standards for Low-Level Radioactive Waste Disposal" (Draft Proposed Rule 40 CFR 193)	c	—	—	—	a	—	—	—	—
21 "Radiation Protection Criteria for Cleanup of Land and Facilities Contaminated with Residual Radioactive Materials" (Proposed Rule 40 CFR 194)	—	—	—	—	—	—	—	—	—
22 "Naturally Occurring and Accelerator-Produced Materials" (Draft Proposed Rule 40 CFR 764)	b	—	—	—	b	—	—	—	18
23 <i>Environmental Regulatory Guide on Radiological Effluent Monitoring and Environmental Surveillance</i> (DOE 1991)	a	a	a	—	a	a	a	a	—
24 DOE Order 4300.1C, "Real Property Management"	—	—	—	—	—	—	—	—	—
25 DOE Order 4320.1B, "Site Development Planning"	—	—	—	—	—	—	—	—	—
26 DOE Order 4700.1, "Project Management System"	—	—	—	—	—	—	—	—	—
27 DOE Order 5000.3B, "Occurrence Reporting and Processing of Operations Information"	—	—	—	—	—	—	—	—	—

Table 17-1SW. (continued)

Law, regulation, agreement, or DOE order	Requirement*								Comments (b) * *
	Surface water monitoring program	Surface water monitoring system design	Number and location of monitoring stations	Operation and maintenance	Surface water sampling	Sampling frequency	Sampling techniques	Laboratory/ data analysis	
28 DOE Order 5400.1, "General Environmental Protection Program"	a,b	b	b	a	a	a	a	a	2
29 DOE Order 5400.2A, "Environmental Compliance Issue Coordination"	—	—	—	—	—	—	—	—	—
30 DOE Order 5400.4, "CERCLA Requirements" (does not include SARA Title III Requirements)	b	b	b	b	b	b	b	b	3
31 DOE Order 5400.5, "Radiation Protection of the Public and the Environment"	a	—	—	—	—	—	—	—	—
32 DOE Order 5440.1E, "National Environmental Policy Act Compliance Program"	—	—	—	—	—	—	—	—	—
33 DOE Order 5480.1B, "Environmental, Safety and Health Program for DOE Operations"	—	—	—	—	—	—	—	—	—
34 DOE Order 5480.4, "Environmental Protection, Safety, and Health Protection Standards"	—	—	—	—	—	—	—	—	—
35 DOE Order 5481.1B, "Safety Analysis and Review System"	—	—	—	—	—	—	—	—	—
36 DOE Order 5482.1B, "Environmental Protection, Safety, and Health Appraisal Program"	a	—	—	—	c	—	—	c	—
37 DOE Order 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements"	—	—	—	—	—	—	—	—	—
38 DOE Order 5500.1B, "Emergency Management System"	—	—	—	—	—	—	—	—	—
39 DOE Order 5500.3A, "Planning and Preparedness for Operational Emergencies"	—	—	—	—	—	—	—	—	—
40 DOE Order 5700.6C, "Quality Assurance"	—	—	—	—	—	—	—	a	—

Table 17-1SW. (continued)

Law, regulation, agreement, or DOE order	Requirement*								Comments (b)**
	Surface water monitoring program	Surface water monitoring system design	Number and location of monitoring stations	Operation and maintenance	Surface water sampling	Sampling frequency	Sampling techniques	Laboratory/data analysis	
41 DOE Order 5820.2A, "Radioactive Waste Management"	a	—	—	—	a	—	—	—	—
42 DOE Order 6430.1A, "General Design Criteria Manual"	a	—	—	—	—	—	—	—	—

*Key:

- a. Required explicitly.
- b. Required by reference to another regulation (number in comments column of the regulation being referenced is from this table).
- c. Required under certain circumstances only.
- d. Clean Water Act surface water monitoring requirements are established on a case-by-case basis.
- e. ARARs under CERCLA.
- f. Required by reference to the Idaho Department of Water Resources Rules and Regulations.
- g. Guidelines for Land Application of Municipal and Industrial Wastewater.

** This column lists the number of the law, regulation, agreement, or DOE order (as assigned in the table) that is implied or referenced for a given requirement.

*** Items on the tables that are marked for this standard include requirements from the implementing regulations.

could have an unacceptable effect on the quality of the groundwater of the State. If injection wells are to be used for injection beneath the deepest underground source of drinking water at a site, groundwater monitoring may also be a permit specification. Additional information on the State of Idaho UIC program is provided in Section 12.5.

The Idaho Hazardous Waste Management Act, Title 39, Chapter 44, directs the Idaho Board of Health and Welfare to promulgate rule that are consistent with RCRA regulations. The Idaho regulations implementing the Act are the "Rules and Standards for Hazardous Waste," Title 1, Chapter 5. These rules adopt RCRA regulations including groundwater monitoring requirements. The State requirements are discussed in Section 12.3.

Most of the Idaho "Water Quality Standards and Wastewater Treatment Requirements" address protection of State water for agricultural and recreational use. However, certain aspects of these requirements are applicable to the INEL. The requirements address point and nonpoint sources of pollution, as well as land application of wastewater. The requirements define "person" as including Federal agencies and "pollutant" as including chemical and radioactive materials. Two sections of the requirements address groundwater monitoring directly. The first section discusses nonpoint sources of pollution and states that if water quality monitoring by the IDHW shows contamination, then "best management practices" will be evaluated and modified as necessary. The second section applies to land application of wastewaters. This section contains specific monitoring requirements; however, it refers the reader to the Idaho "Wastewater-Land Application Permit Rules," which state that facilities may be excluded from permit requirements when "adequately covered by other laws." This regulation also requires spill abatement and cleanup. Proper cleanup response may require groundwater monitoring. Additional information is provided in Section 12.6.

The Idaho "Wastewater-Land Application Permit Rules" discuss permitting requirements for both municipal and industrial wastewater. Permit applications require inclusion of the hydrogeologic characteristics of the facility site, which implies the need for aquifer characterization and sampling. The regulations require the owner of the facility to operate and maintain all monitoring systems used to achieve compliance with the permit and to keep monitoring records to determine conformance with permit requirements. Most of the detailed groundwater monitoring discussion can be found in a supplemental IDHW document entitled *Guidelines for Land Application of Municipal and Industrial Wastewater* (1994). These regulations are discussed in Section 12.8.

The "Idaho Rules for Public Drinking Water Systems" apply to each "public water system," defined in the regulations as a "drinking water system which actually serves or is intended to serve ... at least twenty-five (25) individuals daily at least sixty (60) days out of the year." The monitoring requirements in these regulations apply only to production wells and associated distribution systems. Monitoring/sampling is required to be performed within the drinking water system, which includes wells and all connecting systems. The State requirements, which adopt the requirements of the SDWA, address constituents to monitor for, frequency of sampling, sample analysis, and location and construction of the production wells. The location requirement specifies that the well be at least 50 ft from the nearest source of contamination. Additional information is provided in Section 12.6.

17.1.1.2 Specific Surface Water Monitoring Requirements. The following standards provide detailed technical surface water monitoring specifications: CWA, TSCA, RCRA, Idaho "Rules and Standards for Hazardous Waste," and Idaho "Water Quality Standards and Wastewater Treatment Requirements."

The CWA requirements for surface water monitoring are the most detailed of all the regulations. The surface water protection programs implemented under the CWA include specific monitoring requirements for point source discharge limitations (volume and concentrations) and point source storm water discharges from industrial activities, including stipulations on parameter selection, specifications on sampling location, frequency and techniques, and requirements on analytical methods (see Section 9.3.1).

TSCA surface water monitoring requirements generally correspond with groundwater requirements. However, some requirements specifically address surface water monitoring. Technical areas applicable to surface water include criteria for siting chemical waste disposal facilities, stipulations for sampling frequency and duration, and requirements for surface water sampling methods and analytical procedures (see Section 7.4).

The Idaho "Rules and Standards for Hazardous Waste" adopt RCRA regulations, including surface water monitoring requirements implemented during corrective action.

The Idaho "Water Quality Standards and Wastewater Treatment Requirements" provide numerical limits for a variety of contaminants in groundwater or surface water. The title does not discuss surface water monitoring; however, to ensure the numerical limits are not exceeded, surface water monitoring would need to be performed.

17.1.2 Regulations and Orders with General Groundwater Monitoring Requirements

Although some regulations have specific groundwater and surface water monitoring requirements, most do not. Those regulations that do not contain specific requirements may provide performance standards associated with groundwater and surface water monitoring, refer to other regulations that have detailed requirements, or contain implied requirements. General standards identified in regulations for groundwater and surface water are discussed below in Sections 17.1.2.1 and 17.1.2.2, respectively.

17.1.2.1 General Groundwater Monitoring Requirements. The following regulations and orders provide performance standards associated with groundwater monitoring: CERCLA/SARA, DOE Order 5400.1, DOE Order 5820.2A, DOE Order 6430.1A, DOE Order 5482.1B, and DOE Order 5400.5.

Under CERCLA/SARA, the regulations may require that DOE conduct groundwater monitoring in response to a release of a hazardous substance as defined by CERCLA. The regulations do not specify the type of groundwater monitoring system that should be implemented. However, the EPA guidance document on preparation of RI/FSs provides general details on groundwater monitoring (EPA 1988c).

Under CERCLA/SARA regulations, remediation at CERCLA sites must meet ARARs. In situations where groundwater monitoring is necessary, RCRA or other requirements may be ARARs. In addition, RCRA sites located within a CERCLA multiple-source site are still required to comply with the RCRA groundwater requirements. The use of ARARs is discussed in Section 6.2.

DOE orders tend to use performance standards rather than technical specifications related to groundwater. Of these orders, DOE Order 5400.1, "General Environmental Protection Program," contains the most groundwater-related requirements. The requirements provide performance standards rather than list specific methods or procedures. For example, DOE Order 5400.1 requires the use of consistent procedures for uniform performance in the groundwater sampling program. Information on background water quality

is required, but the procedures for obtaining that information are not specified. The personnel responsible for groundwater protection are required under this order to compare the concentrations of various constituents found in groundwater around the facility to the concentrations found in background water samples and water quality standards.

Although DOE Order 5400.1 does not specify how the groundwater monitoring system is to be designed, it does require groundwater monitoring plans, the reporting of the number and placement of the wells, and other aspects of the groundwater monitoring program. This allows evaluation of the program by other DOE elements. DOE Order 5400.1 is described further in Section 14.

Requirements for groundwater monitoring are also found in several other DOE orders. DOE Order 5820.2A requires environmental monitoring to detect releases from buried TRU and high-level waste sites. DOE Order 6430.1A requires monitoring for leak detection at tank sites and at special facilities. The DOE guidance document for radiological monitoring (DOE 1991) stipulates monitoring procedures for monitoring of all drinking water that is impacted or might reasonably be impacted by DOE operations, addresses construction and siting of new wells, and specifies drinking water sampling frequency, procedures, and locations. In addition, DOE Order 5482.1B requires monitoring and sampling activities while performing environmental surveys as part of the Environment, Safety and Health appraisal program. DOE Order 5400.5 states that monitoring information will be obtained and evaluated from radiological effluent monitoring and surveillance programs in order to determine the effectiveness of the monitoring and surveillance programs, and demonstrate compliance with environmental laws and regulations. DOE orders and selected guidance documents are discussed in Section 14.

Many of the DOE orders incorporate technical requirements by referencing RCRA, CERCLA, the CWA, and the SDWA. The State of Idaho also adds groundwater monitoring requirements by reference to RCRA. The Idaho regulations do not actually define the technical specifications for groundwater monitoring systems. Instead, the State of Idaho incorporates technical groundwater monitoring specifications by reference to RCRA. Therefore, the INEL site is subject to RCRA regulations directly, by inference, and by reference.

17.1.2.2 General Surface Water Monitoring Requirements. The following regulations and orders provide performance standards associated with surface water monitoring: CERCLA/SARA, DOE Order 5400.1, DOE Order 5820.2A, DOE Order 6430.1A, DOE Order 5400.5, DOE Order 5484.1, and DOE Order 5482.1B.

The DOE may be required to conduct surface water monitoring in response to a release of a hazardous substance as defined under CERCLA/SARA and the NCP. The regulations do not specify the type of surface water monitoring programs that should be implemented. However, the EPA guidance document on preparation of RI/FSs provides general information on surface water monitoring.

Under CERCLA/SARA regulations, remediation at CERCLA sites must meet ARARs. In situations where surface water monitoring is required, the CWA, RCRA, or other requirements may be ARARs. These ARARs include water quality standards, discharge limitations, and monitoring programs which may require implementation as part of the CERCLA process at a site that has been listed on the NPL. The use of ARARs is discussed in Section 6.2.

DOE orders tend to use performance standards rather than technical specifications relating to surface water. Of these orders, DOE Order 5400.1, "General Environmental Protection Program," contains the most

surface water-related requirements. The requirements provide performance standards rather than list specific methods or procedures. For example, DOE Order 5400.1 requires the use of consistent procedures for uniform performance in the surface water sampling and monitoring program. Information on background water quality is required, but the procedures for obtaining that information are not specified. Surface water sampling must be performed at fixed stations to characterize physical and chemical properties for water quality assessment. The order states that ambient water quality monitoring will be performed to confirm compliance with the CWA.

Although DOE Order 5400.1 does not specify how the surface water monitoring system is to be designed, it does require environmental monitoring plans and the reporting of the number and placement of monitoring stations, the type and frequency of sampling performed, sample analysis methods, and other aspects of the surface water monitoring program. This allows evaluation of the program by other DOE elements. DOE Order 5400.1 is described further in Section 14.

Requirements for surface water monitoring are also found in several other DOE orders. DOE Order 5820.2A requires environmental monitoring to detect releases from TRU and low-level waste sites. DOE Order 6430.1A requires monitoring of land application practices to detect changes in water quality. DOE Order 5400.5 states that data collected from radiological effluent monitoring programs will be analyzed to evaluate the quality and effectiveness of the monitoring program. In addition, DOE Order 5482.1B requires sampling and monitoring of media while conducting environmental surveys as part of the Environmental, Safety, and Health Program. DOE Order 5484.1 provides general direction on the design of monitoring programs, including requirements for determining background concentrations, identifying contaminant pathways, and characterizing environmental factors. Many of the DOE orders incorporate technical requirements by referencing RCRA, CERCLA, and the CWA. DOE orders and selected guidance documents are discussed in Section 14.

17.2 Summary of Protection Measures and Standards

To avoid the need for future corrective actions, many regulations contain provisions for groundwater and surface water protection. These provisions include physical measures such as waste site liners and run-on/run-off control systems that help isolate the site from the groundwater and surface water. Table 17-2GW shows which of the Standards reviewed for this report contain groundwater protection measures and standards. Table 17-2SW shows which of the laws, regulations, agreements, and orders reviewed for this report contain surface water protection measures and standards. Regulations

that provide protection measures and standards are discussed below in Section 17.2.1 for groundwater-related requirements and Section 17.2.2 for surface water-related requirements.

17.2.1 Groundwater Protection Measures and Standards

UST regulations require measures to detect leaks before the loss of product or waste becomes extensive. Other groundwater protection programs can require the use of BAT treatment techniques for all waste streams. The secondary containment requirements of DOE Order 6430.1A are detailed and apply to numerous facilities. These should be consulted in greater detail when determining the requirements for a particular facility. BAT is required for DOE waste management activities under DOE Orders 5400.1 and 5400.5. DCGs are also listed under DOE Order 5400.5. Although not listed in the table, run-off controls are

listed in DOE Order 5480.7, "Fire Protection," which requires control of contaminated run-off from fire-fighting activities. This order is not listed in the series of summary tables because it contains only this requirement relative to groundwater issues. DOE order requirements are discussed in Section 14.

17.2.2 Surface Water Protection Measures and Standards

The CWA is the primary regulation stipulating protection measures and standards for surface water. The goal of the CWA is to control and eliminate water pollution by focusing on source areas of pollutants and preventing harmful discharges to receiving surface waters. Four major programs under the CWA have been developed to assure the protection and improvement of water quality: (1) NPDES, (2) National Pretreatment Program, (3) Sewage Sludge Management Program, and (4) Spill Prevention Program (see Section 9.3).

The NPDES program contains specific discharge limitations for direct discharges from industrial facilities and sanitary wastewaters. Best Management Practices, such as run-off/run-on controls must be implemented to prevent point source storm water discharges from industrial and construction activities from discharging pollutants to waters of the U.S. via storm water run-off (see Section 9.3.1.1). The regulatory requirements for pretreatment of wastewater prior to discharge to a POTW prevents the introduction of pollutants that will interfere with the facility's operation (see Section 9.3.1.2). The Sewage Sludge Management Program was developed to establish standards for the use and disposal of sludge for the protection of water resources (see Section 9.3.1.3). The Spill Prevention Program establishes procedures and methods to prevent the discharge of oil and hazardous substances into navigable waters (see Section 9.3.1.4).

RCRA requires design and operation standards to prevent surface water run-on and the generation of run-off from RCRA-regulated waste management units to adjacent surface water (see Section 5.7). TSCA also requires surface water run-on/run-off controls for chemical landfills to prevent release of contaminants during storm events (see Section 7.4).

The Idaho "Wastewater-Land Application Permit Rules" do not contain any surface water monitoring requirements. The rules do require run-on and run-off controls, and that all surface waters within 1/4 mile of the facility be identified on the facility topographic map. Specific permit conditions would be established based on inherent hazards at each facility including the proximity of the site to surface water. In addition, reporting is necessary when any noncompliance issue that endangers public health or the environment is discovered (see Section 12.8).

Some DOE orders require protection measures and standards for DOE operations. DOE Order 5400.1 and 5400.5 require BATs for DOE waste management activities. These treatment techniques must be evaluated for all waste streams. DOE Order 5820.2A establishes policies for the management of radioactive wastes in a manner that assures environmental protection. Secondary containment systems must provide physical isolation of wastes from the environment. Waste handling facilities must also be designed and operated to minimize run-on/run-off and ultimately control releases to the environment. The secondary containment requirements of DOE Order 6430.1A are detailed and apply to numerous facilities (see Section 14).

Table 17-2GW. Groundwater protection measures and standards.

Law, regulation, agreement, or DOE order	Requirements*			
	Secondary containment*	Run-on/run-off prevention***	Pollution abatement or best available technology use	Cleanup standards/concentration limits
1 FFA/CO	c(3), d	c(3), d	c(3), d	c(3), d
2 RCRA (40 CFR 264 and 265)	a	a	a	a
3 CERCLA/SARA Regulations	d	d	d	d
4 TSCA - PCB Regulations (40 CFR 761)	a	—	—	a
5 SDWA Regulations	—	a	—	a
6 CWA Regulations	a	—	a	a
7 UST Regulations (40 CFR 280-281)	—	—	a	—
8 Title I, Chapter 6, Idaho Code, "Solid Waste Management Regulations and Standards"	—	a	—	—
9 Title 39, Chapter 44, Idaho Code, "Idaho Hazardous Waste Management Act of 1983," Section 39-4401	—	—	—	—
10 Title 1, Chapter 5, Idaho Code, "Rules and Standards for Hazardous Waste"*****	c(2)	c(2)	c(2)	c(2)
11 Title 3, Chapter 3, Idaho Code, "Rules for the Construction and Use of Injection Wells," Section 42-3902*****	—	—	—	a
12 Title 3, Chapter 9, Idaho Code, "Well Construction Standards Rules"*****	—	—	—	—
13 Title 1, Chapter 2, Idaho Code, "Water Quality Standards and Wastewater Treatment Requirements"	a	a	a	a****
14 Title 1, Chapter 3, Idaho Code, "Rules for Individual/Subsurface Sewage Disposal Systems"	—	—	—	—
15 Title 1, Chapter 17, Idaho Code, "Wastewater-Land Application Permit Rules"	—	—	—	a
16 Title 1, Chapter 8, Idaho Code, "Idaho Rules for Public Drinking Water Systems"*****	—	a	—	a
17 Title 39, Chapter 1, Idaho Code, "Idaho Environmental Protection and Health Act of 1972," Sections 39-101 through 39-130*****	—	—	—	—
18 "Idaho Underground Injection Control Program" (40 CFR 147, Subpart N)	—	—	—	a
19 "Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes" (40 CFR 191)	a	b	—	a

Table 17-2GW. (continued)

Law, regulation, agreement, or DOE order	Requirements*			
	Secondary containment*	Run-on/run-off prevention***	Pollution abatement or best available technology use	Cleanup standards/concentration limits
20 "Licensing Requirements for Independent Storage of Spent Nuclear Fuel and High Level Radioactive Waste" (10 CFR 72)	—	a	—	a
21 "Environmental Radiation Protection Standards for Low-Level Radioactive Waste" (Draft Proposed Rule 40 CFR 193)	—	a	a	—
22 "Byproduct Material" (10 CFR 962)	—	—	—	—
23 "Naturally Occurring and Accelerator-Produced Materials" (Draft Proposed Rule 40 CFR 764)	—	—	—	—
24 "Radiation Protection Criteria for Cleanup of Land and Facilities Contaminated with Residual Radioactive Materials" (Proposed Rule 40 CFR 194)	—	—	—	—
25 "Radiation Protection" (Proposed Rule 10 CFR 834)	—	—	a	a
26 <i>Environmental Regulatory Guidance on Radiological Effluent Monitoring and Environmental Surveillance</i> (DOE 1991)	—	—	a	a
27 DOE Order 4300.1C, "Real Property Management"	—	—	—	—
28 DOE Order 4320.1B, "Site Development Planning"	—	—	—	—
29 DOE Order 4700.1, "Project Management System"	—	—	—	—
30 DOE Order 5000.3B, "Occurrence Reporting and Processing of Operations Information"	—	—	—	—
31 DOE Order 5400.1, "General Environmental Protection Program"	—	—	a	—
32 DOE Order 5400.2A, "Environmental Compliance Issue Coordination"	—	—	—	—
33 DOE Order 5400.4, "CERCLA Requirements" (does not include SARA requirements)	—	—	—	—
34 DOE Order 5400.5, "Radiation Protection of the Public and the Environment"	—	—	a	a
35 DOE Order 5440.1E, "National Environmental Policy Act Compliance Program"	—	—	—	—
36 DOE Order 5480.1B, "Environmental, Safety and Health Program for DOE Operations"	—	—	—	—

Table 17-2GW. (continued)

Law, regulation, agreement, or DOE order	Requirements*			
	Secondary containment*	Run-on/run-off prevention***	Pollution abatement or best available technology use	Cleanup standards/concentration limits
37 DOE Order 5480.4, "Environmental Protection, Safety, and Health Protection Standards"	—	—	—	—
38 DOE Order 5481.1B, "Safety Analysis and Review System"	—	—	—	—
39 DOE Order 5482.1B, "Environmental, Safety and Health Appraisal Program"	—	—	—	—
40 DOE Order 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements"	—	—	—	—
41 DOE Order 5500.1B, "Emergency Management System"	—	—	—	—
42 DOE Order 5500.3A, "Planning and Preparedness for Operational Emergencies"	—	—	—	—
43 DOE Order 5700.6C, "Quality Assurance"	—	—	—	—
44 DOE Order 5820.2A, "Radioactive Waste Management"	a	a	—	—
45 DOE Order 6430.1A, "General Design Criteria Manual"	a	a	a	a

*Key:

- a. Required explicitly.
- b. Implied.
- c. Required by reference to another regulation (number refers to the regulation numbers from this table).
- d. Required under certain circumstances only.

** Includes engineered barriers and secondary containment or tanks, leachate, and liners.

*** Not applicable to all waste management units under RCRA.

**** Water quality standards.

***** Items on tables that are marked for the Idaho Code include requirements from the implementing regulations.

Table 17-2SW. Surface water protection measures and standards.

Law, regulation, agreement, or DOE order	Requirement*			
	Secondary contain-ment**	Run-on/run-off prevention***	Pollution abatement or best available technology use	Discharge concentration limits
1 FFA/CO	d,c(3)	d,c(3)	d,c(3)	d,c(3)
2 RCRA Regulations (40 CFR 264, 265, and 270)	a	a	a	a
3 CERCLA/SARA Regulations	d	d	d	d
4 TSCA - PCB Regulations (40 CFR 761)	—	a	a	—
5 CWA Regulations	a	a	a	a
6 UST	—	—	a	—
7 Floodplain Management Executive Order 11988*****	—	a	—	—
8 Wetlands Protection Executive Order 11990*****	—	—	—	—
9 Title 1, Chapter 2, Idaho Code, "Water Quality Standards and Wastewater Treatment Requirements"	a	a	a	a
10 Title 1, Chapter 3, Idaho Code, "Rules for Individual/Subsurface Sewage Disposal Systems"	—	—	—	—
11 Title 1, Chapter 5, Idaho Code, "Rules and Standards for Hazardous Waste"*****	a	a	a	a
12 Title 1, Chapter 6, Idaho Code, "Solid Waste Management Regulations and Standards"	—	a	—	—
13 Title 1, Chapter 17, Idaho Code, "Wastewater-Land Application Permit Rules"	—	b	—	—
14 Title 39, Chapter 1, Idaho Code, "Idaho Environmental Protection and Health Act of 1972," Sections 39-101 through 39-130	—	—	—	—
15 City of Idaho Falls Municipal Code, Chapter 1, Section 8	—	—	—	a
16 "Licensing Requirements for Independent Storage of Spent Nuclear Fuel and High Level Radioactive Wastes" (10 CFR 72)	—	a	—	a
17 "Radiation Protection" (Proposed Rule 10 CFR 834)	—	a	a	a
18 "Byproduct Material" (10 CFR 962)	—	—	—	—
19 "Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes" (40 CFR 191)	a	b	—	a
20 "Environmental Radiation Protection Standards for Low-Level Radioactive Waste Disposal" (Draft Proposed Rule 40 CFR 193)	—	a	a	—

Table 17-2SW. (continued)

Law, regulation, agreement, or DOE order	Requirement*			
	Secondary contain-ment**	Run-on/run-off prevention***	Pollution abatement or best available technology use	Discharge concentration limits
21 "Radiation Protection Criteria for Cleanup of Land and Facilities Contaminated with Residual Radioactive Materials" (Proposed Rule 40 CFR 194)	—	—	—	—
22 "Naturally Occurring and Accelerator-Produced Materials" (Draft Proposed Rule 40 CFR 764)	—	—	—	—
23 <i>Environmental Regulatory Guide on Radiological Effluent Monitoring and Environmental Surveillance</i> (DOE 1991)	—	a	a	a
24 DOE Order 4300.1C, "Real Property Management"	—	—	—	—
25 DOE Order 4320.1B, "Site Development Planning"	—	—	—	—
26 DOE Order 4700.1, "Project Management System"	—	—	—	—
27 DOE Order 5000.3B, "Occurrence Reporting and Processing of Operations Information"	—	—	—	—
28 DOE Order 5400.1, "General Environmental Protection Program"	—	—	a	—
29 DOE Order 5400.2A, "Environmental Compliance Issue Coordination"	—	—	—	—
30 DOE Order 5400.4, "CERCLA Requirements" (does not include SARA Title III Requirements)	—	—	—	d
31 DOE Order 5400.5, "Radiation Protection of the Public and the Environment"	—	—	a	a
32 DOE Order 5440.1E, "National Environmental Policy Act Compliance Program"	—	—	—	—
33 DOE Order 5480.1B, "Environmental, Safety and Health Program for DOE Operations"	—	—	—	—
34 DOE Order 5480.4, "Environmental Protection, Safety, and Health Protection Standards"	—	—	—	—
35 DOE Order 5481.1B, "Safety Analysis and Review System"	—	—	—	—
36 DOE Order 5482.1B, "Environmental Protection, Safety, and Health Appraisal Program"	—	—	—	—
37 DOE Order 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements"	—	—	—	—

Table 17-2SW. (continued)

Law, regulation, agreement, or DOE order	Requirement*			
	Secondary contain-ment**	Run-on/run-off prevention***	Pollution abatement or best available technology use	Discharge concentration limits
38 DOE Order 5500.1B, "Emergency Management System"	—	—	—	—
39 DOE Order 5500.3A, "Planning and Preparedness for Operational Emergencies"	—	—	—	—
40 DOE Order 5700.6C, "Quality Assurance"	—	—	—	—
41 DOE Order 5820.2A, "Radioactive Waste Management"	a	a	—	—
42 DOE Order 6430.1A, "General Design Criteria Manual"	a	a	a	a

***Key:**

- a. Required explicitly.
- b. Implied.
- c. Required by reference to another regulation (number refers to the regulation numbers from this table).
- d. Required under certain circumstances only.

** Includes engineered barriers and secondary containment or tanks, leachate, and liners.

*** Not applicable to all waste management units under RCRA.

**** Water quality standards.

***** Items on the tables that are marked for this standard include requirements from the implementing regulations.

17.3 Summary of Siting Restrictions

To protect groundwater and surface water from contamination, some regulations include siting restrictions for hazardous and/or radioactive TSD facilities. Tables 17-3GW and 17-3SW show which of the standards reviewed for this report contain siting and use restrictions. In general, the regulations prohibit or restrict siting of waste disposal sites in areas where high water tables are likely, such as floodplains and wetlands, potential mining areas, and active seismic zones. Regulations that provide siting restrictions are discussed below in Section 17.3.1 for groundwater-related requirements and Section 17.3.2 for surface water-related requirements.

17.3.1 Siting Restrictions Relating to Groundwater

In addition to the siting restrictions shown in Table 17-3GW, the TSCA restricts siting of disposal sites for PCB wastes in groundwater recharge areas, shorelines, and areas hydraulically connected with flowing water.

Some DOE orders also contain siting restrictions. The most detailed restrictions are listed in DOE Order 6430.1A, "General Design Criteria," which prohibits siting of TSD facilities and special facilities in the following areas: critical habitats of endangered species, recharge zones for sole-source aquifers, wetlands, 500-year floodplains, watersheds for domestic water supply, seismically active areas, areas with rich resources, areas with high water tables, areas subject to subsidence, areas with karst topography (where sinkholes are evident), and areas subject to dam failures or breaches, hurricanes, or volcanoes. Some of these siting restrictions are repeated in DOE Orders 4320.1B and 5820.2A. Under DOE Order 4300.1C, collection and evaluation of environmental data is required during the site selection process. Further information on siting restrictions in DOE orders is found in Section 14.2.1.

17.3.2 Siting Restrictions Relating to Surface Water

The CWA includes specific requirements regarding the discharge of dredged or fill materials in floodplains and wetlands. Permitting and restrictions for these actions are addressed in Section 404 of the CWA. Siting restrictions for domestic sewage sludge disposal sites are specified in 40 CFR 503, as established by the CWA. In addition to the restrictions shown on Table 17-3SW, TSCA restricts siting of disposal facilities for PCB wastes in groundwater recharge areas, shorelines, and areas hydraulically connected with flowing water.

Several DOE orders address siting considerations. The orders that contain siting considerations for groundwater-related restrictions generally apply to surface water-related restrictions (see Section 17.3.1).

Table 17-3GW. Siting and use restrictions (groundwater).

Law, regulation, agreement, or DOE order	Restriction*			
	Rich resource areas*	High water tables	Active seismic zones	Land disposal restrictions
1 FFA/CO	—	d(3)	—	d(3)
2 RCRA (40 CFR 264 and 265)	—	a	a	a
3 CERCLA/SARA Regulations	—	—	—	a
4 TSCA - PCB Regulations (40 CFR 761)	—	a	—	a
5 SDWA Regulations	—	—	—	—
6 CWA Regulations	—	—	—	—
7 UST Regulations (40 CFR 280-281)	—	—	—	—
8 Title I, Chapter 6, "Idaho Code, Solid Waste Management Regulations and Standards"	a	—	—	b
9 Title 39, Chapter 44, Idaho Code, "Idaho Hazardous Waste Management Act of 1983," Section 39-4401	—	—	—	—
10 Title 1, Chapter 5, Idaho Code, "Rules and Standards for Hazardous Waste"***	—	d(2)	d(2)	d(2)
11 Title 3, Chapter 3, Idaho Code, "Rules for the Construction and Use of Injection Wells," Section 42-3902***	a	—	—	—
12 Title 3, Chapter 9, Idaho Code, "Well Construction Standards Rules"***	a	a	—	—
13 Title 1, Chapter 2, Idaho Code, "Water Quality Standards and Wastewater Treatment Requirements"	a	—	—	—
14 Title 1, Chapter 3, Idaho Code, "Rules for Individual/Subsurface Sewage Disposal Systems"	a	a	—	—
15 Title 1, Chapter 17, Idaho Code, "Wastewater-Land Application Permit Rules"	—	—	—	—
16 Title 1, Chapter 8, Idaho Code, "Idaho Rules for Public Drinking Water Systems"***	—	—	—	—
17 Title 39, Chapter 1, Idaho Code, "Idaho Environmental Protection and Health Act of 1972," Sections 39-101 through 39-130***	—	—	—	—
18 "Idaho Underground Injection Control Program" (40 CFR 147, Subpart N)	a	—	—	—
19 "Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes" (40 CFR 191)	a	a	a	—
20 "Licensing Requirements for Independent Storage of Spent Nuclear Fuel and High Level Radioactive Waste" (10 CFR 72)	—	—	a	—
21 "Environmental Radiation Protection Standards for Low-Level Radioactive Waste Disposal" (Draft Proposed Rule 40 CFR 193)	a	b	—	—

Table 17-3GW. (continued)

Law, regulation, agreement, or DOE order	Restriction*			
	Rich resource areas*	High water tables	Active seismic zones	Land disposal restrictions
22 "Byproduct Material" (10 CFR 962)	—	—	—	—
23 "Naturally Occurring and Accelerator-Produced Materials" (Draft Proposed Rule 40 CFR 764)	a	—	—	c
24 "Radiation Protection Criteria for Cleanup of Land and Facilities Contaminated with Residual Radioactive Materials" (Proposed Rule 40 CFR 194)	—	—	—	—
25 Radiation Protection (Proposed Rule 10 CFR 834)	—	—	—	—
26 <i>Environmental Regulatory Guide on Radiological Effluent Monitoring and Environmental Surveillance</i> (DOE 1991).	—	a	—	—
27 DOE Order 4300.1C, "Real Property Management"	—	—	—	—
28 DOE Order 4320.1B, "Site Development Planning"	—	a	a	—
29 DOE Order 4700.1, "Project Management System"	—	—	—	—
30 DOE Order 5000.3B, "Occurrence Reporting and Processing of Operations Information"	—	—	—	—
31 DOE Order 5400.1, "General Environmental Protection Program"	—	—	—	—
32 DOE Order 5400.2A, "Environmental Compliance Issue Coordination"	—	—	—	—
33 DOE Order 5400.4, "CERCLA Requirements" (does not include SARA Title III requirements)	—	—	—	—
34 DOE Order 5400.5, "Radiation Protection of the Public and the Environment"	—	—	—	a
35 DOE Order 5440.1E, "National Environmental Policy Act Compliance Program"	—	—	—	—
36 DOE Order 5480.1B, "Environmental, Safety and Health Program for DOE Operations"	—	—	—	—
37 DOE Order 5480.4, "Environmental Protection, Safety, and Health Protection Standards"	—	—	—	—
38 DOE Order 5481.1B, "Safety Analysis and Review System"	—	—	—	—
39 DOE Order 5482.1B, "Environmental, Safety, and Health Appraisal Program"	—	—	—	—
40 DOE Order 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements"	—	—	—	—
41 DOE Order 5500.1B, "Emergency Management System"	—	—	—	—
42 DOE Order 5500.3A, "Planning and Preparedness for Operational Emergencies"	—	—	—	—

Table 17-3GW. (continued)

Law, regulation, agreement, or DOE order	Restriction*			
	Rich resource areas*	High water tables	Active seismic zones	Land disposal restrictions
43 DOE Order 5700.6C, "Quality Assurance"	—	—	—	—
44 DOE Order 5820.2A, "Radioactive Waste Management"	—	a	a	—
45 DOE Order 6430.1A, "General Design Criteria Manual"	a	a	a	—

*Key:

- a. Required explicitly.
- b. Implied.
- c. Applies only to Greater-than-Class C wastes in shallow burial sites.
- d. Required by reference to another regulation (number refers to the regulation numbers from this table).

** Rich resource areas include water resources preserved for beneficial use.

*** Items on tables that are marked for the Idaho Code include requirements from the implementing regulations.

Table 17-3SW. Siting and use restrictions (surface water).

Law, regulation, agreement, or DOE order	Restrictions*				
	Rich resource areas**	Floodplains	Active seismic zones	Land disposal restrictions	Wetlands
1 FFA/CO	—	d(3)	—	d(3)	—
2 RCRA Regulations (40 CFR 264, 265, and 270)	—	a	a	a	—
3 CERCLA/SARA Regulations	—	d(2)	—	d(2)	—
4 TSCA - PCB Regulations (40 CFR 761)	—	a	—	—	a
5 CWA Regulations	a	a	a	a	a
6 UST	—	—	—	—	—
7 Floodplain Management Executive Order 11988***	—	a	—	—	—
8 Wetlands Protection Executive Order 11990***	—	—	—	—	a
9 Title 1, Chapter 2, Idaho Code, "Water Quality Standards and Wastewater Treatment Requirements"	a	—	—	—	—
10 Title 1, Chapter 3, Idaho Code, "Rules for Individual/Subsurface Sewage Disposal Systems"	a	—	—	—	—
11 Title 1, Chapter 5, Idaho Code, "Rules and Standards for Hazardous Waste"****	—	a	a	a	—
12 Title 1, Chapter 6, Idaho Code, "Solid Waste Management Regulations and Standards"	a	—	—	—	a
13 Title 1, Chapter 17, Idaho Code, "Wastewater-Land Application Permit Rules"	—	—	—	—	—
14 Title 39, Chapter 1, Idaho Code, "Idaho Environmental Protection and Health Act of 1972," Sections 39-101 through 39-130	—	—	—	—	—
15 City of Idaho Falls Municipal Code, Chapter 1, Section 8	—	—	—	—	—
16 "Licensing Requirements for Independent Storage of Spent Nuclear Fuel and High Level Radioactive Wastes" (10 CFR 72)	—	—	a	—	—
17 "Radiation Protection" (Proposed Rule 10 CFR 834)	—	—	—	—	—
18 "Byproduct Material" (10 CFR 962)	—	—	—	—	—
19 "Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes" (40 CFR 191)	a	a	a	—	a
20 "Environmental Radiation Protection Standards for Low-Level Radioactive Waste Disposal" (Draft Proposed Rule 40 CFR 193)	a	b	b	—	b

Table 17-3SW. (continued)

Law, regulation, agreement, or DOE order	Restrictions*				
	Rich resource areas**	Floodplains	Active seismic zones	Land disposal restrictions	Wetlands
21 "Radiation Protection Criteria for Cleanup of Land and Facilities Contaminated with Residual Radioactive Materials" (Proposed Rule 40 CFR 194)	—	—	—	—	—
22 "Naturally Occurring and Accelerator-Produced Materials: (Draft Proposed Rule 40 CFR 764)	a	—	—	c	—
23 <i>Environmental Regulatory Guide on Radiological Effluent Monitoring and Environmental Surveillance</i> (DOE 1991)	—	—	—	—	—
24 DOE Order 4300.1C, "Real Property Management"	—	—	—	—	—
25 DOE Order 4320.1B, "Site Development Planning"	—	a	a	—	a
26 DOE Order 4700.1, "Project Management System"	—	—	—	—	—
27 DOE Order 5000.3B, "Occurrence Reporting and Processing of Operations"	—	—	—	—	—
28 DOE Order 5400.1, "General Environmental Protection Program"	—	—	—	—	—
29 DOE Order 5400.2A, "Environmental Compliance Issue Coordination"	—	—	—	—	—
30 DOE Order 5400.4, "CERCLA Requirements" (does not include SARA Title III Requirements)	—	—	—	—	—
31 DOE Order 5400.5, "Radiation Protection of the Public and the Environment"	—	—	—	a	—
32 DOE Order 5440.1E, "National Environmental Policy Act Compliance Program"	—	—	—	—	—
33 DOE Order 5480.1B, "Environmental, Safety and Health Program for DOE Operations"	—	—	—	—	—
34 DOE Order 5480.4, "Environmental Protection, Safety, and Health Protection Standards"	—	—	—	—	—
35 DOE Order 5481.1B, "Safety Analysis and Review System"	—	—	—	—	—
36 DOE Order 5482.1B, "Environmental Protection, Safety, and Health Appraisal Program"	—	—	—	—	—
37 DOE Order 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements"	—	—	—	—	—

Table 17-3SW. (continued)

Law, regulation, agreement, or DOE order	Restrictions*				
	Rich resource areas**	Floodplains	Active seismic zones	Land disposal restrictions	Wetlands
38 DOE Order 5500.1B, "Emergency Management System"	—	—	—	—	—
39 DOE Order 5500.3A, "Planning and Preparedness for Operational Emergencies"	—	—	—	—	—
40 DOE Order 5700.6C, "Quality Assurance"	—	—	—	—	—
41 DOE Order 5820.2A, "Radioactive Waste Management"	—	—	a	—	—
42 DOE Order 6430.1A, "General Design Criteria Manual"	a	a	a	—	a

*Key:

- a. Required explicitly.
- b. Implied.
- c. Applies only to Greater-than-Class C wastes in shallow burial sites.
- d. Required by reference to another regulation (number refers to the regulation numbers from this table).

** Rich resources include water resources preserved for beneficial use.

*** Items on the tables that are marked for this standard include requirements from the implementing regulations.

17.4 Summary of Reporting Requirements

The types of required paperwork related to groundwater and surface water include records of monitoring data, QC programs, site closure procedures, various plans, summaries, and appraisals, and reports of incidents of releases and exceedences. Tables 17-4GW and 17-4SW illustrate which of the standards reviewed for this report contain requirements for plans, procedures, and reports and which do not.

A number of regulations specify reports required for compliance. Among the reports related to groundwater issues are the following:

- Protection management plans and quality assessment plans
- Monitoring and sampling plans
- Site characterizations and preoperational assessments
- QA/QC plans
- Remedial action plans
- NEPA documents
- Closure plans.

Other plans required under various regulations and orders indirectly relate to groundwater and surface water. These include waste management plans, waste analysis plans, and contingency plans. Summaries of the regulatory requirements associated with these documents are presented below.

It is important to note that a moratorium has been issued by the Secretary of Energy on the destruction of records useful for epidemiologic or health studies. For water resources records, this includes all environmental monitoring records, spill records, and unplanned release records. These records may not be destroyed, regardless of the records retention dates specified in Federal regulations, DOE orders or policies, or other regulatory requirements or guidance.

17.4.1 Recordkeeping Requirements for Groundwater

Under the regulations implementing RCRA (40 CFR 265.94), owner/operators must keep records of all groundwater sample analyses, static water level measurements, and potentiometric surface evaluations during the assessment program (see Section 5.4). Reports of the first year's groundwater quality parameter background determinations must be submitted to EPA within 15 days of completion of each quarterly analysis. Concentration and statistical analyses of the indicator parameters must be provided no later than March 1 of each year. The owner/operators must also submit by March 1 of each year the results of the evaluation of the potentiometric surface and, if appropriate, a description of the owner/operator's response to that evaluation. These records must be maintained during the active life of the TSD facility and, for disposal units, throughout the post-closure period.

Table 17-4GW. Plans, procedures, and reports required (groundwater).

Law, regulation, agreement, or DOE order	Requirement*				
	Groundwater sampling and/or analysis plan	QA/QC plan	Written site closure or D&D plan	Remediation plans	Spills and/or exceedence reports
1 FFA/CO	b,d(3)	b,d(3)	b,d(3)	b,d(3)	b,d(3)
2 RCRA (40 CFR 264 and 265)	a	a	a	b	a
3 CERCLA/SARA Regulations	b	b	a	b	a
4 TSCA - PCB Regulations (40 CFR 761)	—	—	b	—	a
5 SDWA Regulations	a	—	b	b	a
6 CWA Regulations	—	—	—	—	a
7 UST Regulations (40 CFR 280-281)	—	—	b	a	a
8 Title I, Chapter 6, Idaho Code, "Solid Waste Management Regulations and Standards"	—	—	c	—	—
9 Title 39, Chapter 44, Idaho Code, "Idaho Hazardous Waste Management Act of 1983," Section 39-4401	a	a	—	—	b
10 Title 1, Chapter 5, Idaho Code, "Rules and Standards for Hazardous Waste"***	d(2)	d(2)	d(2)	b, d(2)	d(2)
11 Title 3, Chapter 3, Idaho Code, "Rules for the Construction and Use of Injection Wells," Section 42-3902**	a	—	c	—	—
12 Title 3, Chapter 9, Idaho Code, "Well Construction Standards Rules"***	—	—	—	—	—
13 Title 1, Chapter 2, Idaho Code, "Water Quality Standards and Wastewater Treatment Requirements"	a, c	—	—	—	a
14 Title 1, Chapter 3, Idaho Code, "Rules for Individual/Subsurface Sewage Disposal Systems"	c	c	—	—	—
15 Title 1, Chapter 17, Idaho Code, "Wastewater-Land Application Permit Rules"	b	c	—	—	a
16 Title 1, Chapter 8, Idaho Code, "Idaho Rules for Public Drinking Water Systems"***	a	b	—	—	b
17 Title 39, Chapter 1, Idaho Code, "Idaho Environmental Protection and Health Act of 1972," Sections 39-101 through 39-130**	—	—	—	—	—
18 "Idaho Underground Injection Control Program" (40 CFR 147, Subpart N)	a	—	c	—	b
19 "Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Waste" (40 CFR 191)	a	a	a	c	a
20 "Licensing Requirements for Independent Storage of Spent Nuclear Fuel and High Level Radioactive Waste" (10 CFR 72)	a	a	—	—	a

Table 17-4GW. (continued).

Law, regulation, agreement, or DOE order	Requirement*				
	Groundwater sampling and/or analysis plan	QA/QC plan	Written site closure or D&D plan	Remediation plans	Spills and/or exceedence reports
21 "Environmental Radiation Protection Standards for Low-Level Radioactive Waste Disposal" (Draft Proposed Rule 40 CFR 193)	—	—	—	—	—
22 "Byproduct Material" (10 CFR 962)	—	—	—	—	—
23 "Naturally Occurring and Accelerator-Produced Materials" (Draft Proposed Rule 40 CFR 764)	—	—	—	—	—
24 "Radiation Protection Criteria for Cleanup of Land and Facilities Contaminated with Residual Radioactive Materials" (40 CFR 194)	—	—	—	c	—
25 "Radiation Protection" (Proposed Rule 10 CFR 834)	a	a	—	—	a
26 <i>Environmental Regulatory Guide on Radiological Effluent Monitoring and Environmental Surveillance</i> (DOE 1991)	a	a	—	—	—
27 DOE Order 4300.1C, "Real Property Management"	—	—	—	—	—
28 DOE Order 4320.1B, "Site Development Planning"	—	—	—	—	—
29 DOE Order 4700.1, "Project Management System"	—	—	a	—	—
30 DOE Order 5000.3B, "Occurrence Reporting and Processing of Operations Information"	—	—	—	—	a
31 DOE Order 5400.1, "General Environmental Protection Program"	a	a	a	a	a
32 DOE Order 5400.2A, "Environmental Compliance Issue Coordination"	—	—	—	—	—
33 DOE Order 5400.4, "CERCLA Requirements" (does not include SARA Title III requirements)	d(3)	—	—	d(3)	—
34 DOE Order 5400.5, "Radiation Protection of the Public and the Environment"	a	—	a	—	—
35 DOE Order 5440.1E, "National Environmental Policy Act Compliance Program"	—	—	—	—	—
36 DOE Order 5480.1B, "Environmental, Safety and Health Program for DOE Operations"	—	—	—	—	—
37 DOE Order 5480.4, "Environmental Protection, Safety, and Health Protection Standards"	—	—	—	—	—
38 DOE Order 5481.1B, "Safety Analysis and Review System"	—	—	—	—	—

Table 17-4GW. (continued).

Law, regulation, agreement, or DOE order	Requirement*				
	Groundwater sampling and/or analysis plan	QA/QC plan	Written site closure or D&D plan	Remediation plans	Spills and/or exceedence reports
39 DOE Order 5482.1B, "Environmental, Safety, and Health Appraisal Program"	—	—	—	—	—
40 DOE Order 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements"	—	a	—	—	—
41 DOE Order 5500.1B, "Emergency Management System"	—	—	—	—	b
42 DOE Order 5500.3A, "Planning and Preparedness for Operational Emergencies"	—	—	—	—	b
43 DOE Order 5700.6C, "Quality Assurance"	—	a	—	—	—
44 DOE Order 5820.2A, "Radioactive Waste Management"	c	a	a	—	—
45 DOE Order 6430.1A, "General Design Criteria Manual"	c	—	—	—	—

*Key:

- a. Required explicitly.
- b. Required under certain circumstances only.
- c. Implied.
- d. Required by reference to another regulation (number refers to the regulation numbers from this table).

** Items on tables that are marked for the Idaho Code include requirements from the implementing regulations.

Table 17-4SW. Plans, procedures, and reports required (surface water).

Law, regulation, agreement, or DOE order	Requirement*				
	Surface water sampling and/or analysis plan	QA/QC plan	Written site closure or D&D plan	Remediation plans	Spills bypass and/or exceedence reports
1 FFA/CO	b,d(3)	b,d(3)	b,d(3)	b,d(3)	b,d(3)
2 RCRA Regulations (40 CFR 264, 265, and 270)	b	a	a	b	a
3 CERCLA/SARA Regulations	b	b	a	b	a
4 TSCA - PCB Regulations (40 CFR 761)	a	—	a	—	—
5 CWA Regulations	a	c	b	—	a
6 UST	—	—	b	a	a
7 Floodplain Management Executive Order 11988*	—	—	—	—	—
8 Wetlands Protection Executive Order 11990*	—	—	—	a	—
9 Title 1, Chapter 2, Idaho Code, "Water Quality Standards and Wastewater Treatment Requirements"	b	—	—	—	b
10 Title 1, Chapter 3, Idaho Code, "Rules for Individual/Subsurface Sewage Disposal Systems"	—	—	—	—	c
11 Title 1, Chapter 5, Idaho Code, "Rules and Standards for Hazardous Waste" **	b	a	a	b	a
12 Title 1, Chapter 6, Idaho Code, "Solid Waste Management Regulations and Standards"	—	—	c	—	—
13 Title 1, Chapter 17, Idaho Code, "Wastewater-Land Application Permit Rules"	—	—	—	—	a
14 Title 39, Chapter 1, Idaho Code, "Idaho Environmental Protection and Health Act of 1972," Sections 39-101 through 39-130	—	—	—	—	—
15 City of Idaho Falls Municipal Code, Chapter 1, Section 8	—	—	—	—	a
16 "Licensing Requirements for Independent Storage of Spent Nuclear Fuel and High Level Radioactive Wastes" (10 CFR 72)	a	a	—	—	a
17 "Radiation Protection" (Proposed Rule 10 CFR 834)	a	a	—	—	a
18 "Byproduct Material" (10 CFR 962)	—	—	—	—	—
19 "Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Waste" (40 CFR 191)	a	a	a	c	a
20 "Environmental Radiation Protection Standards for Low-Level Radioactive Waste Disposal" (Draft Proposed Rule 40 CFR 193)	—	—	—	—	—

Table 17-4SW. (continued)

	Law, regulation, agreement, or DOE order	Requirement*				
		Surface water sampling and/or analysis plan	QA/QC plan	Written site closure or D&D plan	Remediation plans	Spills bypass and/or exceedence reports
21	"Radiation Protection Criteria for Cleanup of Land and Facilities Contaminated with Residual Radioactive Materials" (Proposed Rule 40 CFR 194)	—	—	—	c	—
22	"Naturally Occurring and Accelerator-Produced Materials" (Draft Proposed Rule 40 CFR 764)	—	—	—	—	—
23	<i>Environmental Regulatory Guidance on Radiological Effluent Monitoring and Environmental Surveillance</i> (DOE 1991)	a	a	—	—	—
24	DOE Order 4300.1C, "Real Property Management"	—	—	—	—	—
25	DOE Order 4320.1B, "Site Development Planning"	—	—	—	—	—
26	DOE Order 4700.1, "Project Management System"	—	—	a	—	—
27	DOE Order 5000.3B, "Occurrence Reporting and Processing of Operations Information"	—	—	—	—	a
28	DOE Order 5400.1, "General Environmental Protection Program"	a	a	a	a	a
29	DOE Order 5400.2A, "Environmental Compliance Issue Coordination"	—	—	—	—	—
30	DOE Order 5400.4, "CERCLA Requirements" (does not include SARA Title III Requirements)	d(3)	—	—	d(3)	—
31	DOE Order 5400.5, "Radiation Protection of the Public and the Environment"	a	—	a	—	—
32	DOE Order 5440.1D, "National Environmental Policy Act Compliance Program"	—	—	—	—	—
33	DOE Order 5480.1B, "Environmental, Safety and Health Program for DOE Operations"	—	—	—	—	—
34	DOE Order 5480.4, "Environmental Protection, Safety, and Health Protection Standards"	—	—	—	—	—
35	DOE Order 5481.1B, "Safety Analysis and Review System"	—	—	—	—	—
36	DOE Order 5482.1B, "Environmental Protection, Safety, and Health Appraisal Program"	—	—	—	—	—
37	DOE Order 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements"	—	a	—	—	—

Table 17-4SW. (continued)

Law, regulation, agreement, or DOE order	Requirement*				
	Surface water sampling and/or analysis plan	QA/QC plan	Written site closure or D&D plan	Remediation plans	Spills bypass and/or exceedence reports
38 DOE Order 5500.1B, "Emergency Management System"	—	—	—	—	b
39 DOE Order 5500.3A, "Planning and Preparedness for Operational Emergencies"	—	—	—	—	b
40 DOE Order 5700.6C, "Quality Assurance"	—	a	—	—	—
41 DOE Order 5820.2A, "Radioactive Waste Management"	c	a	a	—	—
42 DOE Order 6430.1A, "General Design Criteria Manual"	c	—	—	—	—

*Key:

- a. Required explicitly.
- b. Required under certain circumstances only.
- c. Implied.
- d. Required by reference to another regulation (number refers to the regulation numbers from this table).

** Items on the tables that are marked for this standard include requirements from the implementing regulations.

DOE Order 5400.1 requires preparation of annual site environmental reports, which include reported effluent releases and groundwater monitoring data (see Section 14.2). These data include releases of both hazardous and radioactive constituents.

17.4.2 Recordkeeping Requirements for Surface Water

NPDES permits for direct discharges under CWA require permitted facilities to self-monitor for the parameters specified in the permit. The data obtained from the self-monitoring process is entered onto a Discharge Monitoring Report and submitted to EPA Region X. The Discharge Monitoring Report must be submitted to EPA even if there is no discharge from the permitted outfall during the monitoring period. NPDES stormwater permits are also required for point source storm water discharges from industrial and construction activities. These activities require monitoring, site inspections, recordkeeping, and reporting (see Section 9.3).

Recordkeeping requirements for DOE operations are primarily found in DOE Order 5400.1. This order requires the maintenance of records for environmental occurrences, effluent releases, and site environmental monitoring activities. Annual site environmental reports must summarize these data and be submitted to the DOE and the EPA by June 1 of each year.

17.4.3 Report Submittal Requirements for Groundwater

RCRA regulations require the preparation of plans that describe how groundwater will be remediated and protected in the event of contamination from the facility. Under 40 CFR 265.93 and 264.100, owner/operators must prepare an outline of a groundwater quality assessment program describing the approach that will be taken if statistically significant contamination is detected in down-gradient wells. The outline must reflect the owner or operator's willingness and ability to respond immediately to groundwater contamination by determining the extent of contamination, the rate of contaminant migration, and the concentrations of the hazardous constituents in the groundwater.

Groundwater monitoring plans are required under regulations and DOE orders (see Section 14.2). As part of the environmental monitoring plan required under DOE Order 5400.1, a groundwater monitoring plan must be prepared. This plan is part of both the environmental monitoring program and the groundwater protection management program. For this groundwater monitoring plan, RCRA standards are cited as applying.

Site characterizations are required under regulations or orders for the following: RCRA, CERCLA, USTs, State of Idaho, and DOE Orders 6430.1A and 5400.1. Preoperational assessments of environmental quality are required under DOE Orders 5400.1 and 5484.1. The collection and analysis of these data are to be consistent with the requirements for NEPA documents.

QA/QC plans are required under Idaho "Hazardous Waste Management Act" regulations, RCRA regulations, CERCLA regulations, and DOE orders, particularly 5400.1 and 5700.6C.

If groundwater contamination is present, RCRA and CERCLA regulations require additional plans, such as a facility investigation under RCRA or an RI/FS under CERCLA. Additional details on remediation procedures under CERCLA are given in Section 6.1.3. RCRA corrective actions are addressed in Section 5.8.

When a Federal action has a potential for significant environmental impact, NEPA requires the preparation of an EA or an EIS. DOE Order 4700.1, "Project Management," stipulates that the preparation of NEPA documents begins early in the project to avoid delaying the progress of the project. Other DOE orders that relate to NEPA documents are DOE Order 5440.1E, which requires compliance with NEPA, DOE Order 5820.2A, which requires NEPA documentation related to closure of buried TRU waste sites, and DOE Order 6430.1A, which requires NEPA documentation for new DOE facilities.

Documents such as RI/FSs associated with CERCLA cleanups must be released for public review and comment. If an EIS or EA is required at a particular site, the EIS or EA is also subject to public review. RCRA studies, such as RFIs, are not subject to public review. Other reports, such as environmental summaries, waste management plans, and groundwater management plans required under DOE orders, are primarily for internal use.

17.4.4 Report Submittal Requirements for Surface Water

RCRA regulations require the preparation of plans that describe how surface water will be remediated and protected in the event of contamination at a site. The corrective action process for SWMUs may require an RFI to evaluate the need for further action and/or a CMS to clean up released hazardous constituents to any environmental media. Detailed reporting is required as part of this process to document plans and activities. A site-specific RFI workplan that covers all sampling activities and strategies is required to evaluate the nature, extent, and rate of migration of releases. The necessary project and field documentation, final reports, QA/QC plans, and health and safety plans are examples of the types of reports required during an investigation. Documents such as RI/FSs associated with CERCLA are also required for remediation activities.

Environmental protection implementation plans are required under DOE Order 5400.1 to provide environmental goals, identify strategies, provide design and implementation frameworks, and assign responsibilities. These plans address environmentally-related activities and programs at DOE operations, including waste management, preoperational monitoring, environment monitoring and restoration (including surface water), and corrective action. DOE Order 5400.5 and the DOE (1991) guidance document require sampling and analysis plans. QA/QC plans are required under the Idaho Hazardous Waste Management Act regulations, RCRA regulations, CERCLA regulations, and DOE orders, particularly DOE Orders 5400.1 and 5700.6C.

Environmental survey reports are required prior to the operation of a new facility under DOE Order 5484.1.

When a federal action has a significant potential for environmental impact, NEPA requires the preparation of an EA and EIS, as specified under DOE Order 5440.1E.

Documents, plans, and reports may also be required under the CWA, TSCA, additional DOE orders, and State of Idaho regulations, where applicable. In general, the reporting requirements discussed in Section 17.4.3 also apply to surface water-related issues. For additional information, refer to the appropriate sections within this document.

17.4.5 Incident Reports for Groundwater

Spills, leaks, overfillings of tanks, permit violations including exceedences of acceptable contaminant levels, and other incidents must be reported quickly under several regulations and orders. As shown on Table 17-4GW these include RCRA regulations, Idaho "Hazardous Waste Management Act" regulations, SDWA, "Idaho Rules for Public Drinking Water Systems," DOE Order 5400.1, and DOE Order 5000.3B, "Occurrence Reporting and Processing of Operations Information." DOE Orders 5480.6 and 5480.5 ("Safety of Nuclear Facilities" and "Safety of DOE-Owned Nuclear Reactors," respectively) address notifications required after occurrences, which can include spills, leaks, and other releases of radioactive material. Orders 5480.6 and 5480.5 are not listed in the tables because these are the only groundwater-related requirements in them.

Spills of hazardous substances must be reported under CERCLA and, if the spill involves navigable water, regulations under the CWA are also triggered. Under CERCLA regulations, releases of contaminants do not have to be reported unless they meet or exceed a certain amount, called the RQ. The RQ is lower for the most-hazardous materials and wastes, and higher for the least hazardous. Releases of certain radionuclides must also be reported if the RQ for that radionuclide is exceeded. Additional information on RQs is presented in Section 6.

17.4.6 Incident Reports for Surface Water

Reports required under several regulations and orders for environmental incidents such as spills, leaks; and other releases, would require notification and reporting for surface water-related occurrences (Table 17-4SW). Additional information relating to surface water incident reporting is presented in Section 17.4.5 and appropriate sections within this document.

17.5 Summary of Site Investigations Requirements

Many environmental regulations and orders require some site-specific hydrologic and geologic data. Site investigations are performed to provide these data, and may be required either before a site is used or during an investigation for possible contamination. The types of information desired from these investigations and the required level of detail vary among the different regulations. Tables 17-5GW and 17-5SW show which of the Standards reviewed for this report require geologic and hydrologic investigations. Regulations requiring site investigations for groundwater and surface water are discussed below in Sections 17.5.1 and 17.5.2, respectively.

17.5.1 Hydrogeologic Investigations

Some regulations require the collection of hydrogeologic data prior to startup or permitting. An example is RCRA regulations. For RCRA sites, the information gathered during the owner/operator's initial hydrogeologic investigation will form the basis for any further subsurface work. Additional subsurface investigations may be required for corrective actions. The RCRA site owner/operator should refer to chapters one, three, four, and six of the *RCRA Ground-Water Monitoring Technical Enforcement Guidance Document* (EPA 1986a) for guidance in conducting hydrogeologic contamination assessments under RCRA regulations (40 CFR 264 and 265).

Table 17-5GW. Geologic and hydrologic investigations and information required (groundwater).

Law, regulation, agreement, or DOE order	Requirement*				
	Site geology	Site hydrology	Aquifer characterization	Background groundwater quality	Data for groundwater model
1 FFA/CO	a	a	c	a	—
2 RCRA (40 CFR 264 and 265)	a	a	a	a	—
3 CERCLA/SARA Regulations	c	c	c	c	—
4 TSCA - PCB Regulations (40 CFR 761)	—	a	—	—	—
5 SDWA Regulations	—	—	—	—	—
6 CWA Regulations	—	—	—	—	—
7 UST Regulations (40 CFR 280-281)	c	c	c	c	c
8 Title I, Chapter 6, Idaho Code, "Solid Waste Management Regulations and Standards"	b	b	—	—	—
9 Title 39, Chapter 44, Idaho Code, "Idaho Hazardous Waste Management Act of 1983," Section 39-4401	—	—	—	—	—
10 Title 1, Chapter 5, Idaho Code, "Rules and Standards for Hazardous Waste"***	d(2)	d(2)	d(2)	d(2)	—
11 Title 3, Chapter 3, Idaho Code, "Rules for the Construction and Use of Injection Wells," Section 42-3902**	a	a	a	—	—
12 Title 3, Chapter 9, Idaho Code, "Well Construction Standards Rules"***	—	—	—	—	—
13 Title 1, Chapter 2, Idaho Code, "Water Quality Standards and Wastewater Treatment Requirements"	c, d(15)	c, d(15)	—	c, d(15)	—
14 Title 1, Chapter 3, Idaho Code, "Rules for Individual/Subsurface Sewage Disposal Systems"	a	a	—	—	—
15 Title 1, Chapter 17, Idaho Code, "Wastewater-Land Application Permit Rules"	a	a	b, e	e	—
16 Title 1, Chapter 8, Idaho Code, "Idaho Rules for Public Drinking Water Systems"*	b	b	a	b	—
17 Title 39, Chapter 1, Idaho Code, "Idaho Environmental Protection and Health Act of 1972," Sections 39-101 through 39-130**	—	—	—	—	—
18 "Idaho Underground Injection Control Program" (40 CFR 147, Subpart N)	c	c	c	b	—

Table 17-5GW. (continued).

Law, regulation, agreement, or DOE order	Requirement*				
	Site geology	Site hydrology	Aquifer characterization	Background groundwater quality	Data for groundwater model
19 "Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes" (40 CFR 191)	a	a	a	a	a
20 "Licensing Requirements for Independent Storage of Spent Nuclear Fuel and High Level Radioactive Waste" (10 CFR 72)	b	a	a	a	a
21 "Environmental Radiation Protection Standards for Low-Level Radioactive Waste Disposal" (Draft Proposed Rule 40 CFR 193)	c	c	c	c	—
22 "Byproduct Material" (10 CFR 962)	—	—	—	—	—
23 "Naturally Occurring and Accelerator-Produced Materials" (Draft Proposed Rule 40 CFR 764)	—	—	—	—	—
24 "Radiation Protection Criteria for Cleanup of Land and Facilities Contaminated with Residual Radioactive Materials" (Proposed Rule 40 CFR 194)	—	—	—	—	—
25 "Radiation Protection" (Proposed Rule 10 CFR 834)	b	a	a	a	a
26 <i>Environmental Regulatory Guide on Radiological Effluent Monitoring and Environmental Surveillance</i> (DOE 1991).	a	a	a	a	a
27 DOE Order 4300.1C, "Real Property Management"	—	—	—	—	—
28 DOE Order 4320.1B, "Site Development Planning"	a	a	—	a	—
29 DOE Order 4700.1, "Project Management System"	—	—	—	—	—
30 DOE Order 5000.3B, "Occurrence Reporting and Processing of Operations Information"	—	—	—	b	—
31 DOE Order 5400.1, "General Environmental Protection Program"	a	a	a	a	c
32 DOE Order 5400.2A, "Environmental Compliance Issue Coordination"	—	—	—	—	—

Table 17-5GW. (continued).

Law, regulation, agreement, or DOE order	Requirement*				
	Site geology	Site hydrology	Aquifer characterization	Background groundwater quality	Data for groundwater model
33 DOE Order 5400.4, "CERCLA Requirements" (does not include SARA Title III requirements)	c,d(3)	c,d(3)	c,d(3)	c,d(3)	c,d(3)
34 DOE Order 5400.5, "Radiation Protection of the Public and the Environment"	b	b	b	a	a
35 DOE Order 5440.1E, "National Environmental Policy Act Compliance Program"	—	—	—	—	—
36 DOE Order 5480.1B, "Environmental, Safety and Health Program for DOE Operations"	—	—	—	—	—
37 DOE Order 5480.4, "Environmental Protection, Safety, and Health Protection Standards"	—	—	—	—	—
38 DOE Order 5481.1B, "Safety Analysis and Review System"	—	—	—	—	—
39 DOE Order 5482.1B, "Environmental, Safety, and Health Appraisal Program"	—	—	—	—	—
40 DOE Order 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements"	—	—	—	a	—
41 DOE Order 5500.1B, "Emergency Management System"	—	—	—	—	—
42 DOE Order 5500.3A, "Planning and Preparedness for Operational Emergencies"	—	—	—	—	—
43 DOE Order 5700.6C, "Quality Assurance"	—	—	—	—	—
44 DOE Order 5820.2A, "Radioactive Waste Management"	a	a	a	a	a
45 DOE Order 6430.1A, "General Design Criteria Manual"	a	a	b	b	b6

*Key:

- a. Required explicitly.
- b. Implied.
- c. Required under certain circumstances only.
- d. Required by reference to another regulation (number refers to the regulation number from this table).
- e. Guidelines for Land Application of Municipal and Industrial Wastewater.

** Items on tables that are marked for the Idaho Code include requirements from the implementing regulations.

Table 17-5SW. Geologic and hydrologic investigations and information required (surface water).

Law, regulation, agreement, or DOE order	Requirement*				
	Site geology	Site hydrology	Surface water character- ization	Background surface water quality	Data for surface water model
1 FFA/CO	c,d(3)	c,d(3)	c,d(3)	c,d(3)	-
2 RCRA Regulations (40 CFR 264, 265, and 270)	a	a	c	a	-
3 CERCLA/SARA Regulations	c	c	c	c	-
4 TSCA - PCB Regulations (40 CFR 761)	-	a	a	-	-
5 CWA Regulations	a	-	a	a	-
6 UST	-	a	a	a	-
7 Floodplain Management Executive Order 11988**	-	-	-	-	-
8 Wetlands Protection Executive Order 11990**	-	b	-	-	-
9 Title 1, Chapter 2, Idaho Code, "Water Quality Standards and Wastewater Treatment Requirements"	-	c	c	-	-
10 Title 1, Chapter 3, Idaho Code, "Rules for Individual/Subsurface Sewage Disposal Systems"	a	a	-	-	-
11 Title 1, Chapter 5, Idaho Code, "Rules and Standards for Hazardous Waste"***	a	a	c	a	-
12 Title 1, Chapter 6, Idaho Code, "Solid Waste Management Regulations and Standards"	b	b	-	-	-
13 Title 1, Chapter 17, Idaho Code, "Wastewater-Land Application Permit Rules"	-	-	-	-	-
14 Title 39, Chapter 1, Idaho Code, "Idaho Environmental Protection and Health Act of 1972," Sections 39-101 through 39-130	-	-	-	-	-
15 City of Idaho Falls Municipal Code, Chapter 1, Section 8	-	-	-	-	-
16 "Licensing Requirements for Independent Storage of Spent Nuclear Fuel and High Level Radioactive Wastes" (10 CFR 72)	b	a	a	a	a
17 "Radiation Protection" (Proposed Rule 10 CFR 834)	-	a	a	a	a
18 "Byproduct Material" (10 CFR 962)	-	-	-	-	-

Table 17-5SW. (continued)

Law, regulation, agreement, or DOE order	Requirement*				
	Site geology	Site hydrology	Surface water character- ization	Background surface water quality	Data for surface water model
19 "Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes" (40 CFR 191)	-	a	a	a	-
20 "Environmental Radiation Protection Standards for Low-Level Radioactive Waste Disposal" (Draft Proposed Rule 40 CFR 193)	-	a	a	a	a
21 "Radiation Protection Criteria for Cleanup of Land and Facilities Contaminated with Residual Radioactive Materials" (Proposed Rule 40 CFR 194)	-	-	-	-	-
22 "Naturally Occurring and Accelerator-Produced Materials" (Draft Proposed Rule 40 CFR 764)	-	-	-	-	-
23 <i>Environmental Regulatory Guide on Radiological Effluent Monitoring and Environmental Surveillance</i> (DOE 1991)	a	a	a	a	a
24 DOE Order 4300.1C, "Real Property Management"	-	-	-	-	-
25 DOE Order 4320.1B, "Site Development Planning"	a	a	-	a	-
26 DOE Order 4700.1, "Project Management System"	-	-	-	-	-
27 DOE Order 5000.3B, "Occurrence Reporting and Processing of Operations Information"	-	-	-	-	-
28 DOE Order 5400.1, "General Environmental Protection Program"	a	a	a	a	c
29 DOE Order 5400.2A, "Environmental Compliance Issue Coordination"	-	-	-	-	-
30 DOE Order 5400.4, "CERCLA Requirements" (does not include SARA Title III Requirements)	c,d(3)	c,d(3)	c,d(3)	c,d(3)	c,d(3)
31 DOE Order 5400.5, "Radiation Protection of the Public and the Environment"	b	b	b	a	a

Table 17-5SW. (continued)

Law, regulation, agreement, or DOE order	Requirement*				
	Site geology	Site hydrology	Surface water character- ization	Background surface water quality	Data for surface water model
32 DOE Order 5440.1E, "National Environmental Policy Act Compliance Program"	-	-	-	-	-
33 DOE Order 5480.1B, "Environmental, Safety and Health Program for DOE Operations"	-	-	-	-	-
34 DOE Order 5480.4, "Environmental Protection, Safety, and Health Protection Standards"	-	-	-	-	-
35 DOE Order 5481.1B, "Safety Analysis and Review System"	-	-	-	-	-
36 DOE Order 5482.1B, "Environmental Protection, Safety, and Health Appraisal Program"	-	-	-	-	-
37 DOE Order 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements"	-	-	-	-	-
38 DOE Order 5500.1B, "Emergency Management System"	-	-	-	-	-
39 DOE Order 5500.3A, "Planning and Preparedness for Operational Emergencies"	-	-	-	-	-
40 DOE Order 5700.6C, "Quality Assurance"	-	-	-	-	-
41 DOE Order 5820.2A, "Radioactive Waste Management"	a	a	a	a	b
42 DOE Order 6430.1A, "General Design Criteria Manual"	a	a	a	a	b

*Key:

- a. Required explicitly.
- b. Implied.
- c. Required under certain circumstances only.
- d. Required by reference to another regulation (number refers to the regulation number from this table).
- e. Guidelines for Land Application of Municipal and Industrial Wastewater.

** Items on the tables that are marked for this standard include requirements from the implementing regulations.

Although many regulations do not specify the exact types of hydrogeologic information required, they may require modeling of groundwater movement, contaminant transport, radionuclide transport, and/or radionuclide dose levels in groundwater. To accurately model these subsurface groundwater scenarios, extensive site-specific hydrogeologic information must be obtained. Thus, although a regulation may not specifically require hydrogeologic investigations, if it requires groundwater modeling, the hydrogeologic investigation is an implied prerequisite.

The DOE orders that require preoperational assessment of groundwater quality at new facilities include 5400.1 and 6430.1A. The assessment must continue for at least one year, but preferably for two years, to record seasonal variations.

17.5.2 Surface Hydrologic Investigations

Some regulations require the collection of hydrologic data prior to startup or during operations. For example, TSCA requires landfills that receive PCBs to sample prior to commencing operations to establish a water quality baseline. In addition, the EPA may require sampling of certain surface water courses during operations and after final closure of the disposal area in order to monitor and characterize water quality (see Section 7.4). Site characterization is also specifically required for cleanup actions under RCRA and CERCLA.

DOE Order 5820.2A requires that radioactive waste disposal facilities perform investigations, including the analyses of physiographic, hydrologic, geologic, and environmental data. These investigations are necessary as part of site design activities.

Although many regulations do not specify the exact types of hydrologic information required, modeling may be required to assess site-specific surface and subsurface hydrology, contaminant transport and/or dose levels. Even though a regulation may not specifically require hydrologic investigations, if hydrologic modeling is required, the hydrologic investigation is an implied prerequisite. DOE Order 5400.5 does specify routine environmental monitoring and hydrologic modeling to assess environmental transport and provide analytical models for dose evaluation. Surface water monitoring programs and characterization must also be implemented to detect changes in water quality from land application methods, as required under DOE 6430.1A. In addition, the DOE (1991) guidance for effluent monitoring recommends site investigations for streams, ponds, and lakes as part of an assessment of groundwater and surface water flow in order to characterize groundwater discharge and recharge areas (see Section 16.2.6).

17.5.3 Remedial Investigations for Groundwater and Surface Water

Site characterizations can also be required if the groundwater and/or surface water at a facility becomes contaminated. Groundwater or surface water is considered contaminated once contaminant levels exceed certain action levels. These action levels are contaminant concentrations in groundwater and surface water that cannot be exceeded without requiring an investigation to determine the extent of contamination and the need for corrective action.

CERCLA regulations require preliminary assessments and site investigations to determine the nature and extent of contamination. EPA provides guidance for CERCLA actions in *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (EPA 1988e). Additional directions are provided in *Guidance on Remedial Actions for Contaminated Ground-Water at Superfund Sites* (EPA 1988c).

If an investigation provides evidence of actual contamination, an RI is required under CERCLA, which is similar to an RFI under RCRA. During the RI, the assessment of groundwater and surface water contamination focuses on specific contaminants of concern. The goal is to characterize the nature, extent, and rate of migration of hazardous constituents from existing and future releases to all environmental media.

Under RCRA regulations, owners or operators of TSD facilities are required to perform investigations if groundwater and surface water contamination occurs under either interim status or permitted status. Guidance for developing corrective action plans under RCRA is provided in an Office of Solid Waste directive, *RCRA Corrective Action Plan* (EPA 1988f). If the RCRA site is a permitted facility and contamination occurs, the owner/operator must submit an RFI work plan that describes the approach used to determine the extent of contamination. Under RCRA, the owner/operator must also determine the rate of movement and the concentrations of all constituents in the zone(s) of contamination. This investigation may include the construction of additional monitoring wells and monitoring stations if necessary to define the limits of contamination.

The requirements for remedial investigations listed in DOE Order 5400.4 are not as detailed as those found in CERCLA regulations. However, DOE Order 5400.4 requires implementation of CERCLA at all DOE facilities, where applicable. DOE Order 5400.1 requires that the areas contaminated with hazardous substances be identified and reported in the groundwater management plan. The known and potential sources of groundwater contamination must also be identified in this plan. To provide this information, an investigation similar in scope to a CERCLA investigation must be conducted. Remediation of radioactively-contaminated sites is addressed in DOE Order 5820.2A, which discusses closure of buried TRU waste and LLW sites. DOE Order 4300.1C addresses actions that should be taken prior to any sale or purchase of U.S. owned property when sites are listed or have the potential to be listed on the CERCLA National Priorities List.

Once the contamination assessment has been completed, the data must be analyzed and a remedial response or corrective action must be planned. The following sections discuss the analysis of data from the remedial investigations and the types of remedial responses required.

17.6 Summary of Data Analysis Requirements

Geologic and hydrologic investigations and groundwater and surface water monitoring can generate a great deal of information about the site. These data are of little use, however, unless they are carefully analyzed and evaluated to determine if the monitoring program is functioning as designed and if the site is in regulatory compliance. Some regulations require extensive data analysis, while others do not. Tables 17-6GW and 17-6SW show which of the Standards reviewed for this report contain data analysis and evaluation requirements. Analytical requirements include the following:

- Statistical analysis of contaminant levels
- Risk, dose, or performance assessments
- Hydrologic modeling
- Radionuclide transport and decay modeling (if radionuclides are present).

Regulations requiring data analysis for groundwater- and surface water-related activities are discussed below in Sections 17.6.1 and 17.6.2, respectively.

17.6.1 Statistical Analyses of Groundwater Data

As previously stated, groundwater monitoring programs under RCRA regulations require statistical analyses of the data collected. The requirements vary depending on whether the data are collected at interim status or permitted facilities. EPA has prepared a guidance document on the specific protocols for appropriate use of the various statistical methods, *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities -- Interim Final Guidance* (1989b).

In general, if the owners or operators of RCRA sites are monitoring under a detection program, they must statistically compare data collected in downgradient or compliance point wells to data collected in upgradient wells that show the background water quality. If the owners or operators have determined that groundwater contamination exists, statistical analyses must be used to determine if the levels of contamination have increased. Similar requirements are presented in DOE Order 5400.1.

The operator of an interim status facility must collect samples and perform the statistical analyses required under 40 CFR 265.93 for each well in the groundwater monitoring system at the frequency specified in 40 CFR 265.92.

The operator of a permitted facility may use one of four methods specified in 40 CFR 264.97(h), or the operator may use his own statistical method to evaluate the monitoring results, as long as it complies with the performance standards in 40 CFR 264.97(i). The statistical method to be used will be specified in the permit. The background analytical data for the statistical analyses must be documented in the operating record.

Recommended procedures for statistical analysis of monitoring data are given in the DOE guidance document for radiological monitoring (DOE 1991). This guidance document contains an entire section on data analysis and statistical evaluations.

TSCA requires post-cleanup sampling to verify the level of cleanup. Any statistically valid sampling scheme (random or grid) may be used (40 CFR 761.130). However, the sampling area must be the greater of (1) an area equal to the area cleaned plus a 1-ft boundary or (2) an area 20 percent larger than the original area of contamination. The sampling scheme must be based on a 95 percent confidence level and must include calculations for expected variability due to analytical error.

17.6.2 Statistical Analysis of Surface Water Data

Statistical analysis of monitoring data is required as part of radiological effluent monitoring and environmental surveillance programs at DOE operations required under DOE Order 5400.1. Recommended procedures for performing radiological analyses are given in the DOE guidance document for radiological monitoring (DOE 1991). This guidance document contains an entire section on data analysis and statistical evaluations.

Table 17-6GW. Requirements for data analysis and evaluation (groundwater).

Law, regulation, agreement, or DOE order	Requirement*			
	Statistical analysis	Risk or dose agreement**	Hydrogeologic modeling	Project radiologic transport
1 FFA/CO	c(3),d	c(3),d	—	—
2 RCRA (40 CFR 264 and 265)	a	d	—	—
3 CERCLA/SARA Regulations	—	a	—	—
4 TSCA - PCB Regulations (40 CFR 761)	d	—	—	—
5 SDWA Regulations	—	—	—	—
6 CWA Regulations	—	—	—	—
7 UST Regulations (40 CFR 280-281)	—	—	—	—
8 Title 1, Chapter 6, Idaho Code, "Solid Waste Management Regulations and Standards"	—	—	—	—
9 Title 39, Chapter 44, Idaho Code, "Idaho Hazardous Waste Management Act of 1983," Section 39-4401	—	—	—	—
10 Title 1, Chapter 5, Idaho Code, "Rules and Standards Hazardous Waste"***	c(2)	d, c(2)	—	—
11 Title 3, Chapter 3, Idaho Code, "Rules for the Construction and Use of Injection Wells," Section 42-3902***	—	—	—	—
12 Title 3, Chapter 9, Idaho Code, "Well Construction Standards Rules"***	—	—	—	—
13 Title 1, Chapter 2, Idaho Code, "Water Quality Standards and Wastewater Treatment Requirements"	—	—	—	—
14 Title 1, Chapter 3, Idaho Code, "Rules for Individual/Subsurface Sewage Disposal Systems"	—	—	—	—
15 Title 1, Chapter 17, Idaho Code, "Wastewater-Land Application Permit Rules"	—	—	—	—
16 Title 1, Chapter 8, Idaho Code, "Idaho Rules for Public Drinking Water Systems"***	—	a	—	—
17 Title 39, Chapter 1, Idaho Code, "Idaho Environmental Protection and Health Act of 1972," Sections 39-101 through 39- 130***	—	—	—	—
18 "Idaho Underground Injection Control Program" (40 CFR 147, Subpart N)	—	—	—	—

Table 17-6GW. (continued).

Law, regulation, agreement, or DOE order	Requirement*			
	Statistical analysis	Risk or dose agreement**	Hydrogeologic modeling	Project radiologic transport
19 "Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes" (40 CFR 191)	a	a	b	a
20 "Licensing Requirements for Independent Storage of Spent Nuclear Fuel and High Level Radioactive Waste" (10 CFR 72)	—	a	—	a
21 "Environmental Radiation Protection Standards for Low-Level Radioactive Waste Disposal" (Draft Proposed Rule 40 CFR 193)	b	a	b	—
22 "Byproduct Material" (10 CFR 962)	—	—	—	—
23 "Naturally Occurring and Accelerator-Produced Materials" (Draft Proposed Rule 40 CFR 764)	—	b	—	—
24 "Radiation Protection Criteria for Cleanup of Land and Facilities Contaminated with Residual Radioactive Materials" (Proposed Rule 40 CFR 194)	—	—	—	—
25 "Radiation Protection" (Proposed Rule 10 CFR 834)	—	a	—	—
26 <i>Environmental Regulatory Guide on Radiological Effluent Monitoring and Environmental Surveillance</i> (DOE 1991).	a	a	a	a
27 DOE Order 4300.1C, "Real Property Management"	—	—	—	—
28 DOE Order 4320.1B, "Site Development Planning"	—	—	—	—
29 DOE Order 4700.1, "Project Management System"	—	—	—	—
30 DOE Order 5000.3B, "Occurrence Reporting and Processing of Operations Information"	—	—	—	—
31 DOE Order 5400.1, "General Environmental Protection Program"	a	a	b	a
32 DOE Order 5400.2A, "Environmental Compliance Issue Coordination"	—	—	—	—
33 DOE Order 5400.4, "CERCLA Requirements" (does not include SARA Title III requirements)	—	a	—	—
34 DOE Order 5400.5, "Radiation Protection of the Public and the Environment"	—	—	a	a

Table 17-6GW. (continued).

Law, regulation, agreement, or DOE order	Requirement*			
	Statistical analysis	Risk or dose agreement**	Hydrogeologic modeling	Project radiologic transport
35 DOE Order 5440.1E, "National Environmental Policy Act Compliance Program"	—	—	—	—
36 DOE Order 5480.1B, "Environmental, Safety and Health Program for DOE Operations"	—	—	—	—
37 DOE Order 5480.4, "Environmental Protection, Safety, and Health Protection Standards"	—	—	—	—
38 DOE Order 5481.1B, "Safety Analysis and Review System"	a	—	—	—
39 DOE Order 5482.1B, "Environmental, Safety, and Health Appraisal Program"	—	—	—	—
40 DOE Order 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements"	—	a	b	a
41 DOE Order 5500.1B, "Emergency Management System"	—	—	—	—
42 DOE Order 5500.3A, "Planning and Preparedness for Operational Emergencies"	—	—	—	—
43 DOE Order 5700.6C, "Quality Assurance"	—	a	b	a
44 DOE Order 5820.2A, "Radioactive Waste Management"	—	a	b	a
45 DOE Order 6430.1A, "General Design Criteria Manual"	—	a	b	a

*Key:

- a. Required explicitly.
- b. Implied.
- c. Required by reference to another regulation (number refers to the regulation numbers from this table).
- d. Required under certain circumstances only.

** Includes Performance Assessment.

*** Items on tables that are marked for the Idaho Code include requirements from the implementing regulations.

Table 17-6SW. Requirements for data analysis and evaluation (surface water).

Law, regulation, agreement, or DOE order	Requirement*			
	Statistical analysis	Risk or dose assessment*	Surface water modeling	Project radiologic transport
1 FFA/CO	c(3), d	c(3), d	—	—
2 RCRA Regulations (40 CFR 264, 265, and 270)	a	d	—	—
3 CERCLA/SARA Regulations	—	a	—	—
4 TSCA - PCB Regulations (40 CFR 761)	—	—	—	—
5 CWA Regulations	—	—	—	—
6 UST	—	—	—	—
7 Floodplain Management Executive Order 11988**	—	—	—	—
8 Wetlands Protection Executive Order 11990**	—	—	—	—
9 Title 1, Chapter 2, Idaho Code, "Water Quality Standards and Wastewater Treatment Requirements"	—	—	—	—
10 Title 1, Chapter 3, Idaho Code, "Rules for Individual/Subsurface Sewage Disposal Systems"	—	—	—	—
11 Title 1, Chapter 5, Idaho Code, "Rules and Standards for Hazardous Waste"***	a	d	—	—
12 Title 1, Chapter 6, Idaho Code, "Solid Waste Management Regulations and Standards"	—	—	—	—
13 Title 1, Chapter 17, Idaho Code, "Wastewater-Land Application Permit Rules"	—	—	—	—
14 Title 39, Chapter 1, Idaho Code, "Idaho Environmental Protection and Health Act of 1972," Sections 39-101 through 39-130	—	—	—	—
15 City of Idaho Falls Municipal Code, Chapter 1, Section 8	—	—	—	—
16 "Licensing Requirements for Independent Storage of Spent Nuclear Fuel and High Level Radioactive Wastes" (10 CFR 72)	—	a	—	a
17 "Radiation Protection" (Proposed Rule 10 CFR 834)	—	a	—	—
18 "Byproduct Material" (10 CFR 962)	—	—	—	—
19 "Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes" (40 CFR 191)	a	a	b	a
20 "Environmental Radiation Protection Standards for Low-Level Radioactive Waste Disposal" (Draft Proposed Rule 40 CFR 193)	b	a	b	—

Table 17-6SW. (continued)

Law, regulation, agreement, or DOE order	Requirement*			
	Statistical analysis	Risk or dose assessment*	* Surface water modeling	Project radiologic transport
21 "Radiation Protection Criteria for Cleanup of Land and Facilities Contaminated with Residual Radioactive Materials" (Proposed Rule 40 CFR 194)	—	—	—	—
22 "Naturally Occurring and Accelerator-Produced Materials" (Draft Proposed Rule 40 CFR 764)	—	b	—	—
23 <i>Environmental Regulatory Guide on Radiological Effluent Monitoring and Environmental Surveillance</i> (DOE 1991)	a	a	a	a
24 DOE Order 4300.1C, "Real Property Management"	—	—	—	—
25 DOE Order 4320.1B, "Site Development Planning"	—	—	—	—
26 DOE Order 4700.1, "Project Management System"	—	—	—	—
27 DOE Order 5000.3B, "Occurrence Reporting and Processing of Operations Information"	—	—	—	—
28 DOE Order 5400.1, "General Environmental Protection Program"	a	a	b	a
29 DOE Order 5400.2A, "Environmental Compliance Issue Coordination"	—	—	—	—
30 DOE Order 5400.4, "CERCLA Requirements" (does not include SARA Title III Requirements)	—	a	—	—
31 DOE Order 5400.5, "Radiation Protection of the Public and the Environment"	—	—	a	a
32 DOE Order 5440.1E, "National Environmental Policy Act Compliance Program"	—	—	—	—
33 DOE Order 5480.1B, "Environmental, Safety and Health Program for DOE Operations"	—	—	—	—
34 DOE Order 5480.4, "Environmental Protection, Safety, and Health Protection Standards"	—	—	—	—
35 DOE Order 5481.1B, "Safety Analysis and Review System"	a	—	—	—
36 DOE Order 5482.1B, "Environmental Protection, Safety, and Health Appraisal Program"	—	—	—	—
37 DOE Order 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements"	—	a	—	a

Table 17-6SW. (continued)

Law, regulation, agreement, or DOE order	Requirement*			
	Statistical analysis	Risk or dose assessment*	• Surface water modeling	Project radiologic transport
38 DOE Order 5500.1B, "Emergency Management System"	—	—	—	—
39 DOE Order 5500.3A, "Planning and Preparedness for Operational Emergencies"	—	—	—	—
40 DOE Order 5700.6C, "Quality Assurance"	—	—	—	—
41 DOE Order 5820.2A, "Radioactive Waste Management"	—	a	b	a
42 DOE Order 6430.1A, "General Design Criteria Manual"	—	a	b	a

*Key:

- a. Required explicitly.
- b. Implied.
- c. Required by reference to another regulation (number refers to the regulation numbers from this table).
- d. Required under certain circumstances only.

• Includes Performance Assessment.

** Items on the tables that are marked for this standard include requirements from the implementing regulations.

TSCA requires post-cleanup sampling to verify the level of cleanup. Any statistically valid sampling scheme (random or grid) may be used (40 CFR 761.130). However, the sampling area must be the greater of (1) an area equal to the area cleaned plus a 1-ft. boundary or (2) an area 20 percent larger than the original area of contamination. The sampling scheme must be based on a 95 percent confidence level and must include calculations for expected variability due to analytical error.

17.6.3 Modeling of Groundwater Data

Modeling in groundwater studies is a common tool. There are numerous models available for evaluating complex hydrogeologic flow conditions in either two or three dimensions and for predicting contaminant transport. EPA policy on model usage states that the model must be nonproprietary and must be Agency-approved. EPA believes that models can be an important qualitative tool when used properly, but that owner/operators typically rely too heavily on modeling results. Accurate models must be based on reliable, site-specific hydrogeologic information and must be corrected to reflect actual site-specific data.

Table 17-6GW presents the regulations and orders that require hydrogeologic modeling. Hydrogeologic modeling is implicitly required if the site owner/operator is required to predict contaminant or radionuclide transport through groundwater or contaminant dosage or if the TSD facility owner/operator is required to project long-term site performance.

In general, regulations that require hydrogeologic modeling also require comprehensive geologic and hydrogeologic investigations. This situation is expected, since most aquifers are complex and the modeling must consider subtle geologic changes that can be detected only with extensive site-specific information.

All of the analyses discussed above are required for assessing potential contamination by radionuclides as stated in the DOE guidance document for radiological monitoring (DOE 1991). In contrast, RCRA regulations require only statistical analysis of contaminant levels in groundwater. EPA will accept results of hydrogeologic modeling under RCRA, but they must be verified by sufficient site-specific data collected through direct methods.

Modeling is also required under DOE Order 5820.2A and 40 CFR 191 for performance assessments at radioactive waste disposal facilities. The other proposed EPA regulations relating to radioactive wastes also incorporate dose assessments and/or performance assessments.

17.6.4 Modeling of Surface Water Data

Table 17-6SW presents the regulations and orders that require hydrologic modeling. The DOE guidance document for radiological monitoring (DOE 1991) requires modeling for evaluating hydrologic flow conditions, and for performing contaminant transport analysis and defining environmental pathways. DOE (1991) provides guidance for the development and use of transport and pathway models. When selecting the appropriate model, it is important to evaluate the local site conditions, the receiving stream or aquifer characteristics, the duration of the release, the potential exposure pathways, and other factors.

Analytical models are required in DOE Order 5400.5 to demonstrate compliance with dose limits as part of the monitoring and surveillance program. Models are used to perform an evaluation of liquid effluent characteristics and transport media, and to perform fate analysis.

17.7 Summary of Remediation Requirements and Cleanup Standards

A number of regulations are triggered when waste constituents or degradation products are released from a waste site. Tables 17-7GW and 17-7SW show which of the standards reviewed for this report contain remediation requirements and cleanup standards. The tables also show applicable decontamination and decommissioning requirements. The first phase of the response is typically some type of remedial investigation, as discussed in Section 17.5. After the investigation, the regulatory requirements for a release can be as simple as isolating the site from intruders or as complex as requiring removal and treatment of the wastes and/or the contaminated groundwater and surface water.

Variable terminology is used to describe cleanup efforts. For example, "cleanup" under RCRA regulations is referred to as "corrective action," whereas under CERCLA regulations it is called "remedial action." Regulations addressing remediation requirements for groundwater and surface water investigations are discussed below.

17.7.1 Remediation Measures

The regulations with the most specific "cleanup" requirements are those under RCRA and CERCLA (see Sections 5 and 6). If a TSD facility is causing or allowing contaminant migration, RCRA regulations require a three-phase corrective action program that is analogous to the CERCLA remediation program. These phases are as follows:

- RFI, which is similar to the CERCLA RI
- CMS, which is similar to the CERCLA FS
- CMI, which is similar to the CERCLA RD/RA.

The RFI phase is discussed earlier in Section 17.5.3 on remedial investigations. Further detail on how the RFI coordinates with the corrective action is presented below.

Under RCRA regulations (40 CFR 264), if the TSD facility is being operated under a permit rather than under interim status when groundwater contamination is detected, the operator must implement a compliance monitoring program to determine if the detected constituents have exceeded the groundwater protection standard. If groundwater protection standards have been exceeded, the operator must submit an RFI work plan for approval. The RFI work plan must describe the approach selected for evaluating the nature and extent of contamination both onsite and offsite. The contamination investigation should address all media, including groundwater, surface water, surface and subsurface soil, and air.

EPA's *RCRA Corrective Action Plan* (EPA 1988f) provides guidance for developing the RFI work plan for facilities under permitted status, and for interim status facility corrective action orders under Section 3008(h) of RCRA.

Table 17-7GW. Remedial or corrective actions required (groundwater).

Law, regulation, agreement, or DOE order	Requirement*				
	Determine extent of contamination	Stop waste discharges	Restrict public access	Cleanup contaminated water	Cleanup contaminated soil
1 FFA/CO	c(3),d	c(3),d	c(3),d	c(3),d	c(3),d
2 RCRA (40 CFR 264 and 265)	a	a	a	a	a
3 CERCLA/SARA Regulations	a	a	a	a	d
4 TSCA - PCB Regulations (40 CFR 761)	—	—	—	d	d
5 SDWA Regulations	a	a	a	d	—
6 CWA Regulations	—	—	—	—	—
7 "UST Regulations" (40 CFR 280-281)	a	a	—	a	a
8 Title 1, Chapter 6, Idaho Code, "Solid Waste Management Regulations and Standards"	—	—	a	—	—
9 Title 39, Chapter 44, Idaho Code, "Idaho Hazardous Waste Management Act of 1983," Section 39-4401	—	—	—	—	—
10 Title 1, Chapter 5, Idaho Code, "Rules and Standards for Hazardous Waste"***	c(2)	c(2)	c(2)	c(2)	c(2)
11 Title 3, Chapter 3, Idaho Code, "Rules for the Construction and Use of Injection Wells," Section 42-3902**	b	b	—	—	—
12 Title 3, Chapter 9, Idaho Code, "Well Construction Standards Rules"***	—	—	—	—	—
13 Title 1, Chapter 2, Idaho Code, "Water Quality Standards and Wastewater Treatment Requirements"	b	a	—	b	b
14 Title 1, Chapter 3, Idaho Code, "Rules for Individual/Subsurface Sewage Disposal Systems"	—	b	—	—	—
15 Title 1, Chapter 17, Idaho Code, "Wastewater-Land Application Permit Rules"	—	b	—	—	—
16 Title 1, Chapter 8, Idaho Code, "Idaho Rules for Public Drinking Water Systems"***	a	a	a	d	—
17 Title 39, Chapter 1, Idaho Code, "Idaho Environmental Protection and Health Act of 1972," Sections 39-101 through 39-130**	—	—	—	—	—
18 "Idaho Underground Injection Control Program" (40 CFR 147, Subpart N)	—	—	—	—	—

Table 17-7GW. (continued).

Law, regulation, agreement, or DOE order	Requirement*				
	Determine extent of contamination	Stop waste discharges	Restrict public access	Cleanup contaminated water	Cleanup contaminated soil
19 "Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes" (40 CFR 191)	—	—	a	—	—
20 "Licensing Requirements for Independent Storage of Spent Nuclear Fuel and High Level Radioactive Waste" (10 CFR 72)	a	—	a	—	—
21 "Environmental Radiation Protection Standards for Low-Level Radioactive Waste Disposal" (Proposed Rule 40 CFR 193)	—	—	a	—	—
22 "Byproduct Material" (10 CFR 962)	—	—	—	—	—
23 "Naturally Occurring and Accelerator-Produced Materials" (Draft Proposed Rule 40 CFR 764)	—	—	—	—	—
24 "Radiation Protection Criteria for Cleanup of Land and Facilities Contaminated with Residual Radioactive Materials" (Proposed Rule 40 CFR 194)	b	—	—	—	—
25 "Radiation Protection" (Proposed Rule 10 CFR 834)	a	a	a	—	—
26 <i>Environmental Regulatory Guide on Radiological Effluent Monitoring and Environmental Surveillance</i> (DOE 1991).	—	—	—	—	—
27 DOE Order 4300.1C, "Real Property Management"	—	—	b	—	—
28 DOE Order 4320.1B, "Site Development Planning"	—	—	—	—	—
29 DOE Order 4700.1, "Project Management System"	—	—	—	—	—
30 DOE Order 5000.3B, "Occurrence Reporting and Processing of Operations Information"	—	—	—	—	—
31 DOE Order 5400.1, "General Environmental Protection Program"	b	—	—	—	—
32 DOE Order 5400.2A, "Environmental Compliance Issue Coordination"	—	—	—	—	—
33 DOE Order 5400.4, "CERCLA Requirements" (does not include SARA Title III requirements)	c(3)	c(3)	c(3)	c(3)	c(3)

Table 17-7GW. (continued).

Law, regulation, agreement, or DOE order	Requirement*				
	Determine extent of contamination	Stop waste discharges	Restrict public access	Cleanup contaminated water	Cleanup contaminated soil
34 DOE Order 5400.5, "Radiation Protection of the Public and the Environment"	—	a	a, e	a, e	a, e
35 DOE Order 5440.1E, "National Environmental Policy Act Compliance Program"	—	—	—	—	—
36 DOE Order 5480.1B, "Environmental, Safety and Health Program for DOE Operations"	—	—	—	—	—
37 DOE Order 5480.4, "Environmental Protection, Safety, and Health Protection Standards"	—	—	—	a, e	—
38 DOE Order 5481.1B, "Safety Analysis and Review System"	—	—	—	—	—
39 DOE Order 5482.1B, "Environmental, Safety, and Health Appraisal Program"	—	—	—	—	—
40 DOE Order 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements"	—	—	—	—	—
41 DOE Order 5500.1B, "Emergency Management System"	—	—	—	b	b
42 DOE Order 5500.3A, "Planning and Preparedness for Operational Emergencies"	—	—	a	—	—
43 DOE Order 5700.6C, "Quality Assurance"	—	—	—	—	—
44 DOE Order 5820.2A, "Radioactive Waste Management"	a, f	—	a	—	a, g
45 DOE Order 6430.1A, "General Design Criteria Manual"	—	—	—	—	—

*Key:

- a. Required explicitly.
- b. Implied.
- c. Required by reference to another regulation (number refers to the regulation numbers from this table).
- d. Required under certain circumstances only.
- e. As needed for D&D Sites.
- f. Only from buried TRU waste.
- g. "Major Contaminated Soils Removed."

** Items on tables that are marked for the Idaho Code include requirements from the implementing regulations.

Table 17-7SW. Remedial or corrective actions required (surface water).

Law, regulation, agreement, or DOE order	Requirement*				
	Determine extent of contamination	Stop waste discharges	Restrict public access	Cleanup contaminated surface water	Cleanup contaminated soil
1 FFA/CO	c(3), d	c(3), d	c(3), d	c(3), d	c(3), d
2 RCRA Regulations (40 CFR 264, 265, and 270)	a	a	a	a	a
3 CERCLA/SARA Regulations	d	d	d	d	d
4 TSCA - PCB Regulations (40 CFR 761)	—	—	a	b	—
5 CWA Regulations	a	a	—	—	—
6 UST	a	a	—	a	a
7 Floodplain Management Executive Order 11988*	—	—	—	—	—
8 Wetlands Protection Executive Order 11990*	—	—	—	—	—
9 Title 1, Chapter 2, Idaho Code, "Water Quality Standards and Wastewater Treatment Requirements"	b	a	a	b	b
10 Title 1, Chapter 3, Idaho Code, "Rules for Individual/Subsurface Sewage Disposal Systems"	b	a	—	—	—
11 Title 1, Chapter 5, Idaho Code, "Rules and Standards for Hazardous Waste"***	a	a	a	a	a
12 Title 1, Chapter 6, Idaho Code, "Solid Waste Management Regulations and Standards"	—	—	a	—	—
13 Title 1, Chapter 17, Idaho Code, "Wastewater-Land Application Permit Rules"	—	—	—	—	—
14 Title 39, Chapter 1, Idaho Code, "Idaho Environmental Protection and Health Act of 1972," Sections 39-101 through 39-130	—	—	—	—	—
15 City of Idaho Falls Municipal Code, Chapter 1, Section 8	—	a	—	—	—
16 "Licensing Requirements for Independent Storage of Spent Nuclear Fuel and High Level Radioactive Wastes" (10 CFR 72)	a	—	a	—	—
17 "Radiation Protection" (Proposed Rule 10 CFR 834)	a	a	a	—	—
18 "Byproduct Material" (10 CFR 962)	—	—	—	—	—

Table 17-7SW. (continued)

Law, regulation, agreement, or DOE order	Requirement*				
	Determine extent of contamination	Stop waste discharges	Restrict public access	Cleanup contaminated surface water	Cleanup contaminated soil
19 "Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes" (40 CFR 191)	—	—	a	—	—
20 "Environmental Radiation Protection Standards for Low-Level Radioactive Waste Disposal" (Draft Proposed Rule 40 CFR 193)	—	—	a	—	—
21 "Radiation Protection Criteria for Cleanup of Land and Facilities Contaminated with Residual Radioactive Materials" (Proposed Rule 40 CFR 194)	b	—	—	—	—
22 "Naturally Occurring and Accelerator-Produced Materials" (Draft Proposed Rule 40 CFR 764)	—	—	—	—	—
23 <i>Environmental Regulatory Guide on Radiological Effluent Monitoring and Environmental Surveillance</i> (DOE 1991)	—	—	—	—	—
24 DOE Order 4300.1C, "Real Property Management"	—	—	b	—	—
25 DOE Order 4320.1B, "Site Development Planning"	—	—	—	—	—
26 DOE Order 4700.1, "Project Management System"	—	—	—	—	—
27 DOE Order 5000.3B, "Occurrence Reporting and Processing of Operations Information"	—	—	—	—	—
28 DOE Order 5400.1, "General Environmental Protection Program"	b	—	—	—	—
29 DOE Order 5400.2A, "Environmental Compliance Issue Coordination"	—	—	—	—	—
30 DOE Order 5400.4, "CERCLA Requirements" (does not include SARA Title III Requirements)	c(3)	c(3)	c(3)	c(3)	c(3)
31 DOE Order 5400.5, "Radiation Protection of the Public and the Environment"	—	a	a,e	a,e	a,e
32 DOE Order 5440.1E, "National Environmental Policy Act Compliance Program"	—	—	—	—	—

Table 17-7SW. (continued)

Law, regulation, agreement, or DOE order	Requirement*				
	Determine extent of contamination	Stop waste discharges	Restrict public access	Cleanup contaminated surface water	Cleanup contaminated soil
33 DOE Order 5480.1B, "Environmental, Safety and Health Program for DOE Operations"	—	—	—	—	—
34 DOE Order 5480.4, "Environmental Protection, Safety, and Health Protection Standards"	—	—	—	a,e	—
35 DOE Order 5481.1B, "Safety Analysis and Review System"	—	—	—	—	—
36 DOE Order 5482.1B, "Environmental Protection, Safety, and Health Appraisal Program"	—	—	—	—	—
37 DOE Order 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements"	—	—	—	—	—
38 DOE Order 5500.1B, "Emergency Management System"	—	—	—	b	b
39 DOE Order 5500.3A, "Planning and Preparedness for Operational Emergencies"	—	—	a	—	—
40 DOE Order 5700.6C, "Quality Assurance"	—	—	—	—	—
41 DOE Order 5820.2A, "Radioactive Waste Management"	a,f	—	a	—	a,g
42 DOE Order 6430.1A, "General Design Criteria Manual"	—	—	—	—	—

*Key:

- a. Required explicitly.
- b. Implied.
- c. Required by reference to another regulation (number refers to the regulation numbers from this table).
- d. Required under certain circumstances only.
- e. As needed for D&D Sites.
- f. Only from buried TRU waste.
- g. "Major Contaminated Soils Removed."

** Items on the tables that are marked for this standard include requirements from the implementing regulations.

For CERCLA cleanups, several EPA documents provide guidance for investigation and remediation: *CERCLA Compliance with Other Laws Manual* (1988b), *Guidance on Remedial Actions for Contaminated Ground-Water at Superfund Sites* (1988c), and *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (1988e). Some other regulations require corrective action if contamination is detected, but RCRA, CERCLA, and the Idaho Hazardous Waste Management Act and implementing regulations have the most extensive cleanup requirements. The FFA/CO for the INEL emphasizes CERCLA cleanup requirements, and provides a schedule for implementing corrective actions.

17.7.2 Cleanup Standards

In general, Standards for cleanup of contaminated groundwater and surface water depend on two factors: the background water quality and the current and projected water uses. EPA used these guidelines, along with an assessment of aquifer vulnerability to contamination, in developing its 1984 and 1991 groundwater protection strategies (see Section 2).

Overall, cleanup levels for groundwater and surface water are usually referred to in terms of MCLs, MCLGs, water quality standards, health-based standards, or background levels. Health-based standards are most often used under CERCLA. Health-based criteria are doses that must be converted to ambient threshold concentrations before they can be compared directly to site monitoring data. MCLs and MCLGs are discussed in Section 8.

Note that cleanup of contaminated groundwater and surface water is specifically required in RCRA regulations. However, cleanup of groundwater and surface water can be an ARAR under CERCLA if the contaminants are threatening human health or the environment. Under CERCLA regulations, the level of cleanup depends upon the water quality prior to contamination, the types and degree of hazards of the contaminants present, and the current and projected water use. Cost factors are also considered. Under RCRA, cleanup has traditionally been required to conform with background water quality levels or drinking water standards. The trend in RCRA is toward a more CERCLA-like approach, where cleanup levels are negotiated based on water use, health concerns, and cleanup costs.

18. REFERENCES

Barcelona M. J., J. P. Gibb, and R. A. Miller, 1983, *A Guide to the Selection of Materials for Monitoring Well Construction and Groundwater Sampling*, Illinois State Water Survey, EPA-600/2-84-024, U.S. Environmental Protection Agency.

BNA (Bureau of National Affairs), 1988, *U.S. Environmental Laws*, 1988 Edition, Washington, D.C., 1988.

Claytor, Richard A., 1992, *Development of Plans for Providing and Inventory of Records Required for Epidemiologic or Other Health Studies*, U.S. Department of Energy Memorandum, June 5, 1992.

Code of Federal Regulations

10 CFR 20, "Standards for Protection Against Radiation," January 1, 1995.

10 CFR 30, "Rules of General Applicability to Domestic Licensing of Byproduct Material," January 1, 1995.

10 CFR 40, "Domestic Licensing of Source Material," January 1, 1995.

10 CFR 60, "Disposal of High-Level Radioactive Wastes in Geologic Repositories," January 1, 1995.

10 CFR 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste," January 1, 1995.

10 CFR 830, "Nuclear Safety Management," January 1, 1995.

10 CFR 834, "Radiation Protection of the Public and the Environment," Draft Proposed Rule, September, 1994.

10 CFR 962, "Byproduct Material," January 1, 1995.

10 CFR 1021, "National Environmental Policy Act Implementing Procedures," January 1, 1995.

10 CFR 1022, "Compliance with Floodplain/Wetlands Environmental Review Requirements," January 1, 1995.

10 CFR 1500, "Functions, Powers and Duties," January 1, 1995.

40 CFR 112, "Oil Pollution Prevention," July 1, 1994.

40 CFR 117, "Determination of Reportable Quantities for Hazardous Substances," July 1, 1994.

40 CFR 122, "EPA Administered Permit Programs: The National Pollutant Discharge Elimination System," July 1, 1994.

40 CFR 123, "State Program Requirements," July 1, 1994.

40 CFR 124, "Procedures for Decisionmaking," July 1, 1994.

40 CFR 125, "Criteria and Standards for the National Pollution Discharge Elimination System," July 1, 1994.

40 CFR 136, "Guidance Establishing Test Procedures for the Analysis of Pollutants," July 1, 1994.

40 CFR 141, "National Primary Drinking Water Regulations," July 1, 1994.

40 CFR 143, "National Secondary Drinking Water Regulations," July 1, 1994.

40 CFR 144, "Underground Injection Control Program," July 1, 1994.

40 CFR 145, "State Underground Injection Control Program Requirements," July 1, 1994.

40 CFR 146, "Underground Injection Control Program: Criteria and Standards," July 1, 1994.

40 CFR 147, "State Underground Injection Control Programs," Subpart N, "Idaho," July 1, 1994.

40 CFR 148, "Hazardous Waste Injection Restrictions," July 1, 1994.

40 CFR 149, "Sole Source Aquifers," July 1, 1992.

40 CFR 191, "Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes," July 1, 1994.

40 CFR 192, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings," July 1, 1994.

40 CFR 193, "Environmental Protection Standards for the Management, Storage, and Land Disposal of Low-Level Radioactive Waste and Naturally Occurring and Accelerator-Produced Radioactive Waste," U.S. Environmental Protection Agency Draft Proposed Rule, July 27, 1988.

40 CFR 194, "Radiation Protection Criteria for Cleanup of Land and Facilities Contaminated with Residual Radioactive Materials," Proposed Rule, June 1986.

40 CFR 231, "Section 404(c) Procedures," July 1, 1994.

40 CFR 257, "Criteria for Classification of Solid Waste Disposal Facilities and Practices," July 1, 1994.

40 CFR 260, "Hazardous Waste Management System: General," July 1, 1994.

40 CFR 261, "Identification and Listing of Hazardous Waste," July 1, 1994.

40 CFR 262, "Standards Applicable to Generators of Hazardous Waste," July 1, 1994.

40 CFR 263, "Standards Applicable to Transporters of Hazardous Waste," July 1, 1994.

40 CFR 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," July 1, 1994.

40 CFR 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," July 1, 1994.

40 CFR 267, "Interim Standards for Owners and Operators of New Hazardous Waste Land Disposal Facilities," July 1, 1994.

40 CFR 268, "Land Disposal Restrictions," July 1, 1994.

40 CFR 270, "EPA Administered Permit Programs: The Hazardous Waste Permit Program," July 1, 1994.

40 CFR 271, "Requirements for Authorization of State Hazardous Waste Programs," July 1, 1994.

40 CFR 272, "Approved State Hazardous Waste Management Programs," July 1, 1994.

40 CFR 280, "Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks (UST)," July 1, 1994.

40 CFR 281, "Approval of State Underground Storage Tank Programs," July 1, 1994.

40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan," July 1, 1994.

40 CFR 302, "Designation, Reportable Quantities, and Notification," July 1, 1994.

40 CFR 403, "General Pretreatment Regulations for Existing and New Sources of Pollution," July 1, 1994.

40 CFR 501, "State Sludge Management Program Regulations," July 1, 1994.

40 CFR 503, "Standards for the Use or Disposal of Sewage Sludge," July 1, 1994.

40 CFR 761, "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions," July 1, 1994.

40 CFR 764, "Environmental Standards for the Management, Storage, and Land Disposal of Low-Level Radioactive Waste and Naturally Occurring or Accelerator-Produced Radioactive Materials," Draft Proposed Rule, July 27, 1988.

40 CFR 1500-1508, "Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act," July 1, 1986.

43 CFR 11, "Natural Resource Damage Assessments," October 1, 1994.

DOE (U.S. Department of Energy), 1993, *Idaho National Engineering Laboratory Storm Water Pollution Prevention Plan for Construction Activities*, DOE/ID-10425, Idaho Falls, Idaho.

DOE (U.S. Department of Energy), 1993, *Idaho National Engineering Laboratory Storm Water Pollution Prevention Plan for Industrial*, DOE/ID-10431, Idaho Falls, Idaho.

DOE (U.S. Department of Energy, U.S. Environmental Protection Agency, Idaho Department of Health and Welfare), 1991, *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory*, Docket Number 1088-06-29-120, December 4, 1991.

DOE (U.S. Department of Energy, U.S. Environmental Protection Agency, Idaho Department of Health and Welfare), 1991, *Action Plan for the Implementation of the Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory*, Docket Number 1088-06-29-120, December 4, 1991.

DOE (U.S. Department of Energy), 1991, *Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance*, EH/0173T, January 1991.

DOE (U.S. Department of Energy), 1991, *Environmental Compliance Planning Manual at the Idaho National Engineering Laboratory*, Volumes I, II, and III, DOE/ID-10166, Revision 3, Idaho Falls, Idaho, April 1991.

DOE Orders

4300.1C, "Real Property Management," June 28, 1992.

4320.1B, "Site Development Planning," January 7, 1991, updated March 26, 1992.

4700.1, "Project Management System," March 6, 1987, updated June 2, 1992.

5000.3B, "Occurrence Reporting and Processing of Operations Information," January 19, 1993.

5400.1, "General Environmental Protection Program," November 9, 1989, updated June 29, 1990.

5400.2A, "Environmental Compliance Issue Coordination," January 31, 1989, updated January 7, 1993.

5400.4, "Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Requirements," October 6, 1989.

5400.5, "Radiation Protection of the Public and the Environment," February 8, 1990, updated June 5, 1990.

5440.1E, "National Environmental Policy Act Compliance Program," November 10, 1992.

5480.1B, "Environmental, Safety, and Health Program for Department of Energy Operations," September 23, 1986, updated March 27, 1990.

5480.4, "Environmental Protection, Safety, and Health Protection Standards," May 15, 1984, updated January 7, 1993.

5480.5, "Safety of Nuclear Facilities," September 23, 1986.

5480.6, "Safety of DOE Owned Nuclear Reactors," September 23, 1986.

5480.7, "Fire Protection," July 9, 1991.

5481.1B, "Safety Analysis and Review System," September 23, 1986, updated May 19, 1987.

5482.1B, "Environmental, Safety, and Health Appraisal Program," September 23, 1986, updated November 18, 1991.

5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements," February 24, 1981, updated October 17, 1990.

5500.1B, "Emergency Management System," April 30, 1991, updated February 27, 1992.

5500.3A, "Planning and Preparedness for Operational Emergencies," April 30, 1991, updated February 27, 1992.

5700.6C, "Quality Assurance," August 21, 1991.

5820.2A, "Radioactive Waste Management," September 26, 1988.

6430.1A, "General Design Criteria," April 6, 1989.

DOE Notices

5400.AA, "DOE Groundwater Quality Protection Strategy," Draft, July 10, 1989.

EPA (U.S. Environmental Protection Agency), 1991, *Protecting the Nation's Ground Water: EPA's Strategy for the 1990s; The Final Report of the EPA Ground-Water Task Force*, Office of the Administrator (WH-550G), 212-1020, July 1991.

EPA (U.S. Environmental Protection Agency), 1990, *Support Document for the EPA Designation of the Eastern Snake River Plain Aquifer as a Sole Source Aquifer*, EPA 910/9-90-020, EPA Region X, Seattle, WA, 1990.

EPA (U.S. Environmental Protection Agency), 1989a, *RCRA Facility Investigation (RFI) Guidance Manual*, Interim Final, EPA 530/SW-89-031, May 1989.

EPA (U.S. Environmental Protection Agency), 1989b, *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities—Interim Final Guidance*, PB89-151047, 1989.

- EPA (U.S. Environmental Protection Agency), 1988a, *Test Methods for Evaluating Solid Waste - Physical/Chemical Methods*, SW-846, 3rd Edition, Update 1, 1988.
- EPA (U.S. Environmental Protection Agency), 1988b, *CERCLA Compliance with Other Laws Manual*, Draft Guidance, OSWER Directive 9234.1-01, 1988.
- EPA (U.S. Environmental Protection Agency), 1988c, *Guidance on Remedial Actions for Contaminated Ground Water at Superfund Sites*, EPA 540/G-88/003, 1988.
- EPA (U.S. Environmental Protection Agency), 1988d, *Guidelines for Ground-Water Classification under EPA Ground-Water Protection Strategy* (Final Draft), EPA 440/6-86/007, 1988.
- EPA (U.S. Environmental Protection Agency), 1988e, *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA*, Final Report, EPA 540/G-89/004, 1988.
- EPA (U.S. Environmental Protection Agency), 1988f, *RCRA Corrective Action Plan*, Interim Final, EPA 530/SW-88-028, 1988.
- EPA (U.S. Environmental Protection Agency), 1987, *A Compendium of Superfund Field Operations Methods*, EPA 540/P-87/001, 1987.
- EPA (U.S. Environmental Protection Agency), 1986, *RCRA Ground-Water Monitoring Technical Enforcement Guidance Document (TEGD)*, OSWER 9950.1, 1986.
- EPA (U.S. Environmental Protection Agency), 1985, *Final RCRA Ground-Water Monitoring Compliance Order Guidance*, PB87-193710, 1985.
- EPA (U.S. Environmental Protection Agency), 1984, *Ground-Water Protection Strategy*, EPA-44016-84/002, 1984.

Federal Register

- 41 FR 232, "U.S. Environmental Protection Agency Water Program Guidelines Establishing Test Procedures for the Analysis of Pollutants Amendments," U.S. Environmental Protection Agency, December 1, 1976, pp. 52779-52786.
- 48 FR 170, "Environmental Radiation Protection Standards for Low-Level Radioactive Waste Disposal," U.S. Environmental Protection Agency, August 31, 1983, p. 39563.
- 50 FR 132, "Publication of Domestic Mail Classification Schedule; Order for Rulemaking; Final Rule," Postal Rate Commission, July 10, 1985, pp. 28144-28160.
- 50 FR 186, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities; U.S. Environmental Protection Agency Administered Permit Programs: the Hazardous Waste Permit Program," U.S. Environmental Protection Agency, September 25, 1985, pp. 38946-38949.

51 FR 117, "Radiation Protection Criteria for Cleanup of Land and Facilities Contaminated with Residual Radioactive Materials," U.S. Environmental Protection Agency, June 18, 1986, pp. 22264-22266.

52 FR 84, "Radioactive Waste; Byproduct Material," U.S. Department of Energy, May 1, 1987, pp. 15937-15941.

52 FR 84, "Proposed Revisions to Certain Regulations Regarding Annual Reporting and Disclosure Requirements," U.S. Environmental Protection Agency, May 1, 1987, pp. 16022-16029.

52 FR 131, "List (Phase 1) of Hazardous Constituents for Ground-Water Monitoring," U.S. Environmental Protection Agency, July 9, 1987, pp. 25942-25953.

52 FR 240, "Compliance with the National Environmental Policy Act (NEPA); Amendments to the DOE NEPA Guidelines," U.S. Environmental Protection Agency, December 15, 1987, pp. 47662-47670.

53 FR 108, "Delay of Closure Period for Hazardous Waste Management Facilities," U.S. Environmental Protection Agency, June 6, 1988, pp. 20738-20761.

53 FR 185, "Clarification of Interim Status Qualification Requirements for the Hazardous Components of Radioactive Mixed Waste," U.S. Environmental Protection Agency, September 23, 1988, pp. 37045-37048.

53 FR 185, "Underground Storage Tanks; Technical Requirements," U.S. Environmental Protection Agency, September 23, 1988, pp. 37082-37247.

54 FR 7, "Land Disposal Restrictions for Second Third Scheduled Wastes," U.S. Environmental Protection Agency, January 11, 1989, pp. 1056-1120.

54 FR 13, "Hazardous Waste Management System; Testing and Monitoring Activities," U.S. Environmental Protection Agency, January 23, 1989, pp. 3212-3329.

54 FR 83, "National Pollutant Discharge Elimination System Sewage Sludge Permit Regulations: State Sludge Management Program Requirements," U.S. Environmental Protection Agency, May 2, 1989, pp. 18716-18796.

54 FR 99, "Reportable Quantity Adjustment—Radionuclides," U.S. Environmental Protection Agency, May 24, 1989, pp. 22524-22542.

54 FR 132, "Safe Drinking Water Act Administrative Enforcement Regulations," U.S. Environmental Protection Agency, July 12, 1989, pp. 29516-29521.

54 FR 223, "National Priorities List for Uncontrolled Hazardous Waste Sites," U.S. Environmental Protection Agency, November 21, 1989, pp. 48184-48200.

54 FR 243, "National Primary Drinking Water Regulations Implementation; Primary Enforcement Responsibility," U.S. Environmental Protection Agency, December 20, 1989, pp. 52126-52140.

54 FR 244, "Polychlorinated Biphenyls; Notification and Manifesting for PCB Waste Activities," U.S. Environmental Protection Agency, December 21, 1989, pp. 52716-52756.

55 FR 82, "Underground Storage Tanks; Technical Requirements," U.S. Environmental Protection Agency, April 27, 1990, pp. 17763-17769.

55 FR 124, "Polychlorinated Biphenyls; Notification and Manifesting for PCB Wastes Activities; Correction," U.S. Environmental Protection Agency, June 27, 1990, pp. 26204-26205.

55 FR 125, "Revisions to the Safe Drinking Water Act Underground Injection Control Regulations," U.S. Environmental Protection Agency, June 28, 1990, pp. 26462-26470.

55 FR 145, "Corrective Action for Solid Waste Management Units (SWMUs) at Hazardous Waste Management Facilities," U.S. Environmental Protection Agency, July 27, 1990.

55 FR 191, "Variance and Exemptions for Primary Drinking Water Regulations; Unreasonable Risk to Health Guidance," U.S. Environmental Protection Agency, October 2, 1990, pp. 40205-40206.

55 FR 203, "National Primary Drinking Water Regulations: Lead and Copper," U.S. Environmental Protection Agency, October 19, 1990, pp. 42409-42412.

55 FR 222, "National Pollutant Discharge Elimination System Permit Application Regulations for Storm Water Discharges," U.S. Environmental Protection Agency, November 16, 1990, p. 47990-48091.

55 FR 235, "Hazardous Waste Management Program Codification of Approved State Hazardous Waste Program for Idaho," U.S. Environmental Protection Agency, December 6, 1990, pp. 50327-50329.

56 FR 20, "Safe Drinking Water Act; Administrative Enforcement Regulations," U.S. Environmental Protection Agency, January 30, 1991, pp. 3752-3757.

56 FR 20, "National Primary Drinking Water Regulations—Monitoring for Synthetic Organic Chemicals; MCLGs and MCLs for Aldicarb, Aldicarb Sulfoxide, Aldicarb Sulfone, Pentachlorophenol, and Barium," U.S. Environmental Protection Agency, January 30, 1991, pp. 3600-3614.

56 FR 44, "Underground Injection Control Program; State-Administered Programs; Incorporation by Reference Update," U.S. Environmental Protection Agency, March 6, 1991, pp. 9408-9422.

56 FR 92, "Criteria for Classifying Pesticides for Restricted Use Due to Groundwater Concerns," U.S. Environmental Protection Agency, May 13, 1991, pp. 22076-22085.

56 FR 106, "National Primary Drinking Water Regulations Implementation Primary Enforcement Responsibility," U.S. Environmental Protection Agency, June 3, 1991, pp. 25046-25050.

56 FR 111, "Disposal of Polychlorinated Biphenyls; Availability of Draft Guidance," U.S. Environmental Protection Agency, June 10, 1991, p. 26745.

56 FR 135, "Drinking Water Regulations; Maximum Contaminant Level Goals and National Primary Drinking Water Regulations for Lead and Copper," U.S. Environmental Protection Agency, July 15, 1991, pp. 32112-32113.

56 FR 138, "National Primary Drinking Water Regulations; Radionuclides," U.S. Environmental Protection Agency, July 18, 1991, pp. 33050-33127.

56 FR 157, "Underground Storage Tanks Containing Petroleum; Financial Responsibility Requirements," U.S. Environmental Protection Agency, August 14, 1991, pp. 40292-40295.

56 FR 170, "National Primary Drinking Water Regulations; Radionuclides," U.S. Environmental Protection Agency, September 3, 1991, pp. 43573-43574.

56 FR 194, "Sole Source Designation of the Eastern Snake River Plain Aquifer, Southern Idaho; Final Determination," U.S. Environmental Protection Agency, October 7, 1991, pp. 50634-50638.

56 FR 246, "Hazardous Waste Management System: Amendments to Interim Status Standards for Down Gradient Ground-Water Monitoring Well Locations at Hazardous Waste Facilities," U.S. Environmental Protection Agency, December 23, 1991, pp. 66365-66369.

57 FR 19, "Liners and Leak Detection Systems for Hazardous Waste Land Disposal Units," U.S. Environmental Protection Agency, January 29, 1992, pp. 3462-3497.

57 FR 80, "National Environmental Policy Act Implementing Procedures," U.S. Environmental Protection Agency, April 24, 1992, pp. 15122-15159.

58 FR 28, "Corrective Action Management Units (CAMUs) and Temporary Units (TUs); Corrective Action Provisions under Subtitle C," U.S. Environmental Protection Agency, February 16, 1993, pp. 7924-7936.

58 FR 32, "Standards for the Use of Disposal of Sewage Sludge," U.S. Environmental Protection Agency, February 19, 1993, pp. 9248-9414.

58 FR 56, "Radiation Protection of the Public and the Environment," U.S. Department of Energy, March 25, 1993, pp. 16268-16322.

59 FR 233, "Disposal of Polychlorinated Biphenyls," U.S. Environmental Protection Agency, December 6, 1994, pp. 62788-62875.

60 FR 169, "Nuclear Safety Management and Radiation Protection of the Public and the Environment," U.S. Department of Energy, August 31, 1995, pp. 45381-45385.

GAO 1986, U.S. General Accounting Office, *Environmental Issues at DOE's Nuclear Defense Facilities*, GAO/RCED-86-192, September 1986.

Grumbles, Benjamin, *Wetlands Debate Still Far From Over*, *Environmental Protection* 35(1): 33-38, January 1994.

IDHW (Idaho Department of Health and Welfare), Title 39, Chapter 1, Idaho Code, "Idaho Environmental Protection and Health Act of 1972."

IDHW (Idaho Department of Health and Welfare), Title 39, Chapter 44, Idaho Code, "Idaho Hazardous Waste Management Act of 1983."

IDHW (Idaho Department of Health and Welfare), Rules and Regulations, Title 1, Chapter 2, Idaho Code, "Water Quality Standards and Wastewater Treatment Requirements."

IDHW (Idaho Department of Health and Welfare), Rules and Regulations, Title 1, Chapter 3, Idaho Code, "Rules for Individual/Subsurface Sewage Disposal Systems."

IDHW (Idaho Department of Health and Welfare), Rules and Regulations, Title 1, Chapter 5, Idaho Code, "Rules and Standards for Hazardous Waste."

IDHW (Idaho Department of Health and Welfare), Rules and Regulations, Title 1, Chapter 6, Idaho Code, "Solid Waste Management Regulations and Standards."

IDHW (Idaho Department of Health and Welfare), Rules and Regulations, Title 1, Chapter 8, Idaho Code, "Idaho Rules for Public Drinking Water Systems."

IDHW (Idaho Department of Health and Welfare), Rules and Regulations, Title 1, Chapter 17, Idaho Code, "Wastewater-Land Application Permit Rules."

IDWR (Idaho Department of Water Resources), Rules and Regulations, Title 03, Chapter 03, Idaho Code, "Rules for the Construction and Use of Injection Wells."

IDWR (Idaho Department of Water Resources), Rules and Regulations, Title 03, Chapter 09, Idaho Code, "Well Construction Standards Rules."

IDWR (Idaho Department of Water Resources), Rules and Regulations, Title 03, Chapter 11, Idaho Code, "Rules Governing Conjunctive Management of Surface and Ground Water."

IDHW (Idaho Department of Health and Welfare), Rules and Regulations, Title 39, Chapter 3601, Idaho Code, "Idaho Water Pollution Control Law."

IDHW (Idaho Department of Health and Welfare), Rules and Regulations, Title 42, Chapter 2, Idaho Code, "Appropriation of Water - Permits, Certificates, and Licenses - Survey."

IDHW (Idaho Department of Health and Welfare), Rules and Regulations, Title 42, Chapter 39, Idaho Code, "Waste Disposal and Injection Wells."

IDHW (Idaho Department of Health and Welfare), 1994, *Guidelines for Land Application of Municipal and Industrial Wastewater*, Boise, Idaho, 1994.

IDWR (Idaho Department of Water Resources), 1986, *A Guide to the Idaho Injection Well Program*, Boise, Idaho, 1986.

Idaho Ground Water Quality Council, 1991, *Idaho Ground Water Quality Plan*, Boise, Idaho, 1991.

Jessup, D. H., *Guide to State Environmental Programs*, Bureau of National Affairs, Inc., Washington, D.C., 1988.

Municipal Code of the City of Idaho Falls, Chapter 1, Section 8, 1994.

USGS (United States Geological Survey), 1988, *Hydrologic Conditions at the INEL 1982 - 1985*, USGS Water Resource Investigations Paper 89-4008, December 1988.

19. GLOSSARY

Accessible Environment—The atmosphere, land surfaces, surface waters, oceans, and all of the lithosphere beyond the controlled area (40 CFR 191.12).

Activation Produce—A chemical element made radioactive by bombardment with neutrons, protons, or other subatomic particle.

Activity—the number of radioactive atoms decaying per unit time.

Agreement State—A state that has been delegated regulatory authority by the Nuclear Regulatory Commission.

Alternate Concentration Limits—The concentrations that hazardous constituents must not exceed in the groundwater in order to comply with 40 CFR 264.94. The ACLs are proposed by the owner/operator and must be approved by EPA (40 CFR 264.94).

Annual Committed Effective Dose Equivalent—The committed effective dose equivalent resulting from a 1-year intake of radionuclides released plus the annual effective dose equivalent caused by direct radiation from facilities or activities subject to Subparts B and C of this Part (40 CFR 191.12).

Appendix IX—The list of hazardous constituents that an owner/operator is required to use to collect and analyze groundwater samples if statistically significant increases of indicator parameters are detected (40 CFR 264.98).

Applicable or Relevant and Appropriate Requirements—The requirement to comply with all Federal, State, and local environmental regulations that are applicable to the activity being performed (CERCLA).

Aquifer—

- An underground geological formation, group of formations, or part of a formation that is capable of yielding a significant amount of groundwater wells or springs (40 CFR 260 and 40 CFR 191.12).
- A groundwater-bearing stratum sufficiently permeable to transmit and yield water in usable quantities (DOE Order 6430.1A, 04/06/89).

As Low As Reasonable Achievable—An approach to radiation protection to control or manage exposures (both individual and collective to the work-force and the general public) as low as technical, economic, practical, and public policy considerations will permit (Draft Proposed Rule 10 CFR 834.2).

Background Water Quality—The quality of the groundwater in the saturated zones beneath a facility determined by collecting and analyzing samples from monitoring wells that are located in areas unaffected by the facility's operation (constituents listed in 40 CFR 264.97, 264.98, 265.91, 265.92 and 265.93).

Below Regulatory Concern—A definable amount of low-level waste that can be deregulated with minimal risk to the public (DOE Order 5820.2A).

Best Available Technology—

- Preferred technology for treating a particular process waste, selected from among others after taking into account factors related to technology, economics, public policy and other parameters (DOE Order 5820.2A).

Note: This term is used only in the context of liquid waste treatment processing. BAT takes into account such factors as the age of the equipment being used and facilities involved, the process used, the engineering aspects of the application of various types of control techniques, process changes, safety considerations, the cost of achieving effluent reduction, and the nonwater-quality environmental impact (DOE Order 6430.1A, 04/06/89).

Byproduct Material—Definitions for byproduct material may vary, depending on the statute, regulation, or order in which the term occurs. DOE Order 5400.3 incorporates both of the definitions below.

- Any radioactive material (except special nuclear material) yielded in, or made radioactive by, exposure to the radiation incident or to the process of producing or using special nuclear material.
- The tailings or waste produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content.

Class B Equipment—Any device/system that will result in facility shutdown or degradation of operating parameters or any secondary environmental monitors (DOE Order 5000.3A, 05/30/90).

Class I Groundwater—Groundwater of unusually high value, vulnerable to contamination, and including irreplaceable sources of drinking water and/or groundwater that are ecologically vital. Groundwater may be considered "irreplaceable" if it serves a population of 2,500 or more, and if delivery of comparable quality and quantity of water from alternative sources in the area would be economically infeasible or precluded by institutional constraints. Groundwater may be considered "ecologically vital" if it supplies a sensitive ecological system that supports a unique habitat (40 CFR 193).

Class II Groundwater—All non-Class I groundwater currently used, or potentially available, for drinking water (40 CFR 193).

Class III Groundwater—Groundwater that is saline, or otherwise contaminated beyond levels that would allow use for drinking or other beneficial purposes. Groundwater with a total dissolved solids concentration over 10,000 milligrams per liter, and/or that is so contaminated by naturally occurring conditions, or by the effects of broad-scale human activity (i.e., unrelated to a specific activity), that cannot be remediated using treatment methods reasonably employed in public water-supply systems (40 CFR 193).

Class IIIA Groundwater—Class III groundwater that is highly or intermediately interconnected to adjacent groundwater of higher class and/or surface water (40 CFR 193).

Class IIIB Groundwater—Class III groundwater characterized by a low degree of interconnection to adjacent groundwater of higher class and/or surface water (40 CFR 193).

Closure—The physical and administrative requirements necessary for decommissioning hazardous waste management units under Subpart G of 40 CFR 264 and 265 (40 CFR 264).

Operational Closure: Actions that are taken, when operations are complete to prepare the disposal site or disposal unit for custodial care (DOE Order 5820.2A)

Final Site Closure: Actions that are taken as a part of a formal decommissioning or remedial action plan, the purpose is to eliminate (to the extent practical) the need for active maintenance so that only surveillance, monitoring, and minor custodial care are required (DOE Order 5820.2A).

Community Water System—A system that provides the public with piped water for human consumption. The system must have at least 15 service connections used by year-round residents (40 CFR 141-146).

Compliance Monitoring—A program to monitor groundwater at a treatment, storage, or disposal unit. The program is implemented by an owner/operator upon determining a statistically significant increase in indicator parameters during detection monitoring (40 CFR 264).

Compliance Period—The number of years a waste management area is active, including the closure period and the time prior to and during permitting [40 CFR 264.96(a)].

Compliance Point—Any point along a vertical surface located at the hydraulically down-gradient limit of the waste management area and extends into the uppermost aquifer underlying the regulated units [40 CFR 264.95(a)].

Corrective Action Program—A program of evaluation and response to a release of hazardous constituents from a hazardous or solid waste management unit. Includes RCRA facility investigation, corrective measures study, and corrective measures implementation (40 CFR 264.100 and 264.101).

Decommissioning—

- Actions taken to reduce the potential health and safety impacts of DOE contaminated facilities, including activities to stabilize, reduce, or remove radioactive materials or to demolish the facilities (DOE Order 5820.2A).
- The process of closing and securing a nuclear facility, or nuclear materials storage facility to provide adequate protection from radiation exposure and isolate radioactive contamination from the human environment (DOE Order 6430.1A).

Decontamination—The act of removing a chemical, biological, or radiological contaminant from, or neutralizing its potential effect on, persons, objects, or the environment using washing, chemical action, mechanical cleaning, or other techniques (DOE Order 6430.1A, 04/06/89).

Derived Concentration Guide—The concentration of a radionuclide in air or water that under conditions of continuous exposure for one year by one exposure mode (i.e., ingestion of water, submersion in air, or inhalation) would result in an effective dose equivalent of 100 mrem, 0.1 rem (1 mSv) (Draft Proposed Rule 10 CFR 834).

Detection—The discovery, through analysis of monitoring data, of statistically significant amounts of hazardous waste or hazardous waste constituents that are migrating from the waste management area to the uppermost aquifer [40 CFR 265.91(a)].

Detection Monitoring—

- A monitoring program required at TSDs Facilities where no hazardous constituents are known to have migrated from the waste management area to groundwater. The program is designed for early detection of a release (40 CFR 264.98).
- A monitoring program required at interim status land-based hazardous waste management units that is designed for early detection of a release from the waste management area [40 CFR 265.92(d)].

Disposal—Permanent isolation of spent nuclear fuel or radioactive waste from the accessible environment with no intent of recovery even if such isolation permits the recovery of such fuel or waste [40CFR 191.02 (l)].

Effective Dose Equivalent—the sum of the products of the dose equivalent received by specified tissues of the body and a tissue-specific weighing factor. The total EDE is the sum of the EDE from exposures to radiation sources external to the body during the year plus the committed EDE from radionuclides taken into the body during the year (Draft Proposed Rule 10 CFR 834).

Effluent—

- Any treated or untreated air emission or liquid discharge, including stormwater runoff, at a site or facility (10 CFR 834).
- Airborne and liquid wastes discharged from a DOE site or facility following engineered waste treatment and all effluent controls, including onsite retention and decay. This term does not include solid wastes, wastes for shipment offsite, waste that are contained (e.g., in tanks) or wastes that are to remain onsite through treatment or disposal (DOE Order 5484.1, 02/24/81).

Environmental Audit—A documented assessment of a facility to monitor the progress of necessary corrective actions, to ensure compliance with environmental laws and regulations, and to evaluate field organization practices and procedures (DOE Order 5480.1B, 09/23/86).

Environmental Monitoring—The collection and analysis of samples or direct measurements of environmental media (DOE Order 5400.1, 11/09/88).

Environmental Occurrence—Any sudden or sustained deviation from a regulated or planned performance at a DOE operation that has environmental protection and compliance significance (DOE Order 5400.1, 11/09/88).

Environmental Surveillance—The collection and analysis of samples of air, water, soil, foodstuffs, biota, and other media from DOE sites and their environs to measure external radiation to demonstrate compliance with applicable standards and assess radiation exposures to members of the public and the effects on the local environment (Draft Proposed Rule 10 CFR 834).

Environmental Survey—A documented, multi-discipline assessment (with sampling and analysis) of a facility to determine conditions and identify environmental problems of risks requiring corrective action (DOE Order 5480.1B, 09/23/86).

EPA Interim Primary Drinking Water Standards—The concentrations of the constituents and parameters listed in Appendix III to 40 CFR 265.

Groundwater—Water below the land surface in a zone of saturation (40 CFR 191 and 40 CFR 193).

Groundwater Protection Standard—Concentration limit of hazardous constituents. This limit must not be exceeded in the groundwater underlying a regulated unit (40 CFR 264.94).

Groundwater Quality Parameters—Constituents for which the owner/operator of an interim status, land-based, hazardous waste management unit must collect and analyze samples (40 CFR 265.92).

Hazardous Constituent—A constituent that is listed in either Subpart D of 40 CFR 261 or Table 1 of 40 CFR 261.24.

Hazardous Substance—Under CERCLA Section 101(14), any substance EPA has designated for special consideration under the Clean Air Act, Clean Water Act, or Toxic Substances Control Act, and any "hazardous waste" under RCRA. Includes 724 substances and 1,500 radionuclides. The only two basic types of substances excluded from the definition are petroleum and natural gas.

Hazardous Waste—Any substance identified in Subpart D of 40 CFR 261 and any substance possessing the characteristics described in Subpart C of 40 CFR 261 (unless excluded under 40 CFR 260.20, 260.22, 261.4(b), 260.10, or 261.3). Does not include radionuclides (DOE Order 5400.3).

Hazardous Waste Management Unit—A contiguous area of land where hazardous waste is placed, or the largest area where there is significant likelihood of mixing hazardous waste [e.g., surface impoundment, waste pile, a land treatment unit, landfill cell, incinerator, tank, or container storage unit (40 CFR 260.10)].

High-Level Waste—Highly radioactive waste material that results from reprocessing spent nuclear fuel, including liquid waste produced during reprocessing and any solid waste derived from the liquid, that contains a combination of transuranic waste and fission products in concentrations requiring permanent isolation (DOE Orders 5820.2A and 6430.1A).

Independent Spent Fuel Storage Installation—a complex designed or constructed for the interim storage of spent nuclear fuel and other radioactive materials associated with spent fuel storage.

Indicator Parameters—Parameters used in detection monitoring as indicators of contamination (Subpart F of 40 CFR 264 and 265).

Interagency Agreement—An agreement between two or more government entities that focuses on mutual objectives. Such an agreement may be either regulatory or nonregulatory in nature and can include such vehicles as Compliance Agreements, Memoranda of Agreement, and Memoranda of Understanding. IAGs of a regulatory nature typically outline actions and/or schedules one entity must implement to meet the regulatory requirements established by the other entity.

Interim Status—The operational status of a facility prior to its being issued a RCRA permit (40 CFR 124, 264, and 270).

Inventory Control—Includes volume measurements and reconciliation of product additions and withdrawals as a method of release detection under the Underground Storage Tank regulations (40 CFR 280-281).

Land-Based TSD—Under RCRA, this is a surface impoundment, land treatment unit, or landfill used to treat, store, or dispose hazardous waste (40 CFR 265.90).

Land Disposal Unit—Surface impoundment, landfill, land treatment unit, waste pile, or open burn/open detonation area.

Low-Level Waste—Waste that contains radioactivity and is not classified as high-level waste, transuranic waste, or spent nuclear fuel or byproduct material. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level waste, provided the concentration of transuranics is less than 100 nCi/g (DOE Order 5820.2A).

Manual Tank Gauging—Tank liquid level measurements commonly referred to as stick readings under the Underground Storage Tank regulations (40 CFR 280-281).

Maximum Contaminant Level—

- Concentration limits set on specific substances in drinking and surface waters in order to protect human health (SDWA and CWA).
- The maximum permissible level of a contaminant in water that is delivered to the free flowing outlet of the ultimate user of a public water system, except in the case of turbidity where the maximum permissible level is measured at the point of entry to the distribution system (40 CFR 141.2).

Mixed Waste—Waste containing both radioactive and hazardous components as defined by the Atomic Energy Act and RCRA, respectively. The term "radioactive component" refers only to the actual radionuclides dispersed or suspended in the waste substance (DOE Order 5820.2A).

Monitored Retrievable Storage Installation—a complex designed, constructed, and operated by DOE for the receipt, transfer, handling, packaging, possession, safeguarding and storage of spent nuclear fuel aged for at least one year and solidified high level radioactive waste resulting from civilian nuclear activities, pending shipment to a HLW repository or other disposal.

National Contingency Plan—Plan that codifies the EPA implementation policy for the cleanup of hazardous substance spills under CERCLA. Refers to the National Oil and Hazardous Substances Pollution Contingency Plan, developed under Section 311(c)(2) of the Federal Water Pollution Control Act (40 CFR 304.20).

National Pollutant Discharge Elimination System—The national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under Section 307, 402, 318, and 405 of CWA (40 CFR 122.2).

National Priorities List—A compilation of the hazardous waste sites that post the greatest threat to human health and the environment (CERCLA). The INEL was included on the list in December 1989.

Naturally Occurring or Accelerator-Produced Radioactive Materials—Any radioactive material that can be considered naturally occurring and is not source, special nuclear, or byproduct material, or that is produced in a charged particle accelerator (DOE Order 5820.2A).

Nuclear Waste Policy Act (1982)—Title 42, USC 10101, et seq., as amended, provides for the development of repositories for the disposal of HLW and spent nuclear fuel, and establishes a program of research, development, and demonstration regarding the disposal of HLW and spent nuclear fuel.

Occurrence—Any deviation from the planned or expected behavior or course of events in connection with any DOE or DOE-controlled operation if the deviation has environmental protection, safety, or health protection significance (DOE Order 5484.1, 02/24/81).

Onsite Discharge—Airborne or liquid wastes discharged to onsite treatment or disposal systems, such as sewage lagoons, retention ponds, and cribs for retention, settling, decay, or storage onsite (DOE Order 5484.1, 02/24/81).

Operator—The person responsible for the overall operation of a facility (40 CFR 260).

Owner—Under RCRA, the person who owns a facility or part of a facility. Under the Underground Storage Tank regulations, for an underground storage tank in use on the date of enactment of the Hazardous and Solid Waste Amendments of 1984, or brought into use after that date, any person who owns an underground storage tank used for the storage, use, or dispensing of regulated substances. In the case of any underground storage tank in use before the date of enactment of the Hazardous and Solid Waste Amendments of 1984, but no longer in use on the date of enactment of such Amendments, any person who owned such tank immediately before discontinuing its use. (40 CFR 260 and 40 CFR 280.12).

Performance Assessment—"Any analysis that (a) identifies the processes and events that might affect a disposal system, (b) examines the effects of these processes and events on the performance of the disposal system, and (c) estimates the cumulative releases of radionuclides, considering the associated uncertainties, caused by all significant processes and events and converts the information into individual and population dose estimates." [(40 CFR 193 193.11(e))]

Phased Compliance—Comprehensive, integrated environmental compliance planning strategy (DOE Order 4700.1, 03/06/87).

Post-Closure Care—The maintenance and operation of containment and monitoring systems and the reporting of maintenance, operating, and monitoring activities during the 30-year period following closure of a hazardous waste management unit under Subparts F, K, L, M, N and X of 40 CFR 264 (40 CFR 264.117 through 264.120).

Primary Environmental Monitors—Monitoring equipment legally required to monitor ongoing discharges. This term applies to monitors closest to the point of discharge that are used to determine whether discharges are within specified limits. It also includes any equipment that actuates automatically in response to set level signals from such a monitor. It does not include equipment in general areas, remediation, or compliance monitoring programs (DOE Order 5000.3A, 05/30/90).

Public Water System—A system that provides the public with piped water for human consumption. The system must have at least 15 service connections or regularly serve at least 25 individuals. Includes (a) any collection, treatment, storage, and distribution facilities under the control of an operator of such a system and used primarily in connection with such a system, and (b) any collection or pretreatment storage facilities not under such control, but are used primarily in connection with such a system (40 CFR 191.22).

Publicly Owned Treatment Works—Any device or system owned by a "State" or "municipality" that is used to treat of municipal sewage or industrial wastes of a liquid nature (40 CFR 403).

Radioactive Material—Any material or combination of materials that spontaneously emits ionizing radiation.

Radioactive Waste—Solid, liquid, or gaseous material that contains radioactive nuclides regulated under the Atomic Energy Act of 1954 (as amended) and is of negligible economic value considering costs of recovery (DOE Order 5820.2A).

Release— Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment. This includes abandoning/discarding any type of receptacle containing substances or the stockpiling of a reportable quantity of hazardous substance in an unenclosed containment structure (40 CFR 260).

Saturated Zone—That region below the ground surface where the groundwater is above atmospheric pressure (DOE Order 6430.1A, 04/06/89).

Seasonal Variation—Used in the context of groundwater measurements, variations in measurements across sampling events that are periodic or cyclical and can be explained by seasonal effects such as the annual cycle of groundwater recharge [40 CFR 264.97(i)].

Secondary Environmental Monitors—Environmental monitoring equipment or activities, which, if degraded, will produce a more than minor disruption of a monitoring program. An example of a minor effect would be the failure of a unit whose place in the program is effectively duplicated by overlap between one or more other components. An example of a more than minor effect would be the failure of sufficient units to preclude continued coverage, or the failure of a unit that provides the only coverage for large areas, such as a groundwater monitoring well (DOE Order 5000.3A, 05/30/90).

Significant Source of Groundwater—

- An aquifer that is saturated with water having less than 10,000 milligrams per liter of total dissolved solids, is within 2,500 feet of the land surface, has a transmissivity greater than 200 gallons per day per foot (provided that any formation or part of a formation included within the source of groundwater has hydraulic conductivity greater than 2 gallons per day per square foot), and is capable of continuously yielding at least 10,000 gallons per day to a pumped or flowing well for a period of at least a year (40 CFR 191.12).
- An aquifer that provides the primary source of water for a community water system (40 CFR 191.12).

Soil Column—an in situ volume of soil down through which liquid wastes percolate from ponds, cribs, seepage basins, or trenches.

Solid Waste Management Unit (SWMU)—Any discernible unit where solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. Such units include any area at a facility where solid wastes have been routinely and systematically released.

Spatial Variation—The variation among a group of groundwater measurements from samples obtained at the same time but from different areal or depth locations [40 CFR 264.97(i)].

Special Source of Groundwater—Class I groundwaters that (a) are within the controlled area encompassing a disposal system or are less than five kilometers beyond the controlled area, (b) are supplying drinking water for thousands of persons as of the date that DOE chooses a location within that area for detailed characterization as a potential site for a disposal system (e.g., in accordance with Section 112(b)(1)(B) of the NWPA), and (c) are irreplaceable in that no reasonable alternative source of drinking water is available to that population (40 CFR 191.12).

Spent Nuclear Fuel—fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated by processing.

Tank Tightness Testing—A release detection method capable of detecting a 0.1 gallon per hour leak rate from any portion of the tank that routinely contains product while accounting for effects of thermal expansion or contraction of the product, vapor pockets, tank deformation, evaporation or condensation, and the location of the water table. Also known as "precision testing" (40 CFR 280.43).

Temporal Variation—The variation among a series of groundwater measurements from samples obtained over time at one location [40 CFR 264.97(i)].

Transmissivity—The hydraulic conductivity integrated over the saturated thickness of an underground formation. The transmissivity of a series of formations is the sum of the individual transmissivities of each formation comprising the series (40 CFR 191).

Transuranic Elements—Those elements having an atomic number greater than 92 (uranium) (DOE Order 6430.1A, 04/06/89).

Transuranic Waste—Without regard to source or form, radioactive waste that at the end of the institutional control periods is contaminated with alpha-emitting transuranium radionuclides with half-lives greater than 20 years and concentrations greater than 100 nCi/g at the time of assay (DOE Order 6430.1A, 04/06/89).

Underground Source Of Drinking Water—An aquifer or its portion that (a) supplies any public water system, or (b) contains a sufficient quantity of ground water to supply a public water system, and (c) currently supplies drinking water for human consumption, or (d) contains fewer than 10,000 milligrams of total dissolved solids per liter (40 CFR 191.22).

Underground Storage Tank—Any tank, including its attached underground piping, that has at least 10% of its volume underground. Even an above-ground tank with extensive underground piping can be classified as a UST (40 CFR 280.20).

Unusual Occurrences—An unusual occurrence is a nonemergency that has significant impact or potential for impact on the environment. Unusual occurrences include

- Those that result in the release of radioactive or hazardous materials above limits established in, or violate environmental requirements defined in permits or regulations
- Are significant internal or external threats to safety, environment, or health protection or the ability of the facility to operate
- Involve significant degradation of safety systems or environmental, safety or health conditions
- Result in fatalities, exposures to hazardous or radioactive materials or off-site or on-site contamination in excess of regulatory acknowledged limits
- Violate DOE environmental requirements
- Result in the release of a hazardous substance or material that exceeds a reportable quantity and is not Federally permitted (DOE Order 5000.3A, 05/30/90).

Uppermost Aquifer—The geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers that are hydraulically interconnected with this aquifer (40 CFR 260.10).

Waste Management Area—The limit projected in the horizontal plane of the area on which waste will be placed during the active life of a regulated unit [40 CFR 264.95(b)].