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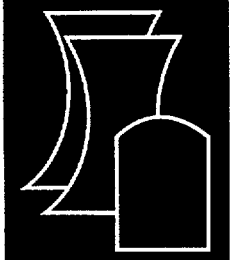

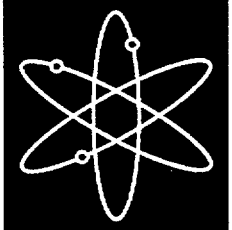

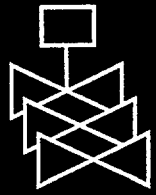

Consolidated NMSS Decommissioning Guidance

Decommissioning Process

Draft Report for Comment

U.S. Nuclear Regulatory Commission
Office of Nuclear Material Safety and Safeguards
Washington, DC 20555-0001

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Vol. 1

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COMMENTS ON DRAFT REPORT

Any interested party may submit comments on this report for consideration by the NRC staff. Comments may be accompanied by additional relevant information or supporting data. Please specify the report number draft NUREG-1757, Vol. 1, in your comments, and send them by May 2, 2002 to:

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ABSTRACT

As part of its redesign of the materials license program, the U.S. Nuclear Regulatory Commission (NRC) Office of Nuclear Material Safety and Safeguards (NMSS) is consolidating and updating numerous decommissioning guidance documents into a three-volume NUREG. Specifically, the three volumes address the following topics:

(1) Decommissioning Process;

(2) Characterization, Survey, and Determination of Radiological Criteria; and

(3) Financial Assurance, Recordkeeping, and Timeliness.

Draft Volume 1 of this NUREG series, entitled "Consolidated NMSS Decommissioning Guidance: Decommissioning Process," dated January 2002, is the first of the three volumes and is intended for use by NRC staff and licensees. It will also be available to Agreement States. The approaches to license termination described in this NUREG will help to identify the information (subject matter and level of detail) needed to terminate a license by considering the specific circumstances of the wide range of radioactive materials users licensed by NRC. When this three-volume guidance is complete, it will replace NUREG-1727 (NMSS Decommissioning Standard Review Plan) and NUREG/BR-0241 (NMSS Handbook for Decommissioning Fuel Cycle and Materials Licensees). The contents of the Decommissioning Handbook will be updated and integrated into this guidance, while the Standard Review Plan will be incorporated as appropriate into the new guidance, preserving the Standard Review Plan format and language. Many of the documents to be evaluated as part of the consolidation effort are listed in Chapter 4. This guidance takes a risk-informed, performance-based approach to the information needed to support an application for decommissioning a materials license. When published as a final report, licensees should use this guidance in preparing license amendment requests. NRC staff will use the final guidance in reviewing these amendment requests.

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FOREWORD

We suggest that you contact NRC or the appropriate Agreement State authority to assure that you understand what actions should be taken to initiate and complete decommissioning at your facility.

In response to the U.S. Nuclear Regulatory Commission (NRC) Office of Nuclear Material Safety and Safeguards (NMSS) performance goals in the NRC's Strategic Plan of: (1) making NRC activities and decisions more effective, efficient, and realistic; and (2) reducing unnecessary regulatory burden on stakeholders, NMSS has implemented a project to consolidate and update the policies and guidance of its decommissioning program. The product will be a three-volume guidance NUREG series grouped into the functional categories of: (1) Decommissioning Process; (2) Characterization, Survey, and Determination of Radiological Criteria; and (3) Financial Assurance, Recordkeeping, and Timeliness.

Volume 1 of this NUREG series, entitled "Consolidated NMSS Decommissioning Guidance: Decommissioning Process," dated [insert month] [insert year], is the first of these three volumes and is intended for use by licensees and NRC staff. It will also be available to Agreement States. This guidance document addresses the regulations in the Code of Federal Regulations (CFR), Title 10, Parts 20, 30, 40, 70, and 72, that pertain to termination of licenses.

A team composed of NRC staff from Headquarters, Regional Offices, and representatives of States prepared this document, drawing on their collective experience in site decommissioning and license termination. NRC used the Business Process Redesign techniques to consolidate and update existing decommissioning guidance documents into a NUREG series of reports, using an expedited writing and review process. Below is a list of volumes currently scheduled for inclusion in NUREG-1757:

Vol. No.	Vol. Title	Status
1	Consolidated NMSS Decommissioning Guidance: Decommissioning Process	Draft for Comment
2	Consolidated NMSS Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria	Future
3	Consolidated NMSS Decommissioning Guidance: Financial Assurance, Recordkeeping, and Timeliness	Future

The current document, Draft NUREG-1757, Volume 1, "Consolidated NMSS Decommissioning Guidance: Decommissioning Process," dated January 2002, is the first of three volumes on decommissioning guidance. It is intended for use by applicants, licensees, NRC license reviewers, and other NRC personnel. This document updates and builds upon the risk-informed approach in, and in whole or in part incorporates, the NMSS Decommissioning Handbook

(NUREG/BR-0241, "NMSS Handbook for Decommissioning Fuel Cycle and Materials Facilities," March 1997). This draft NUREG also incorporates the parts of the "NMSS Decommissioning Standard Review Plan," NUREG-1727, September 2000, that provide guidance for developing those parts of a decommissioning plan addressing general site description and current radiological conditions; decommissioning activities, management, and quality assurance; and modifications to decommissioning programs and procedures. The specific sections of NUREG-1727 that have been incorporated into this NUREG are listed in Section 4.10.

NRC staff are reviewing and considering approximately 80 documents (see 66 FR 21793) related to decommissioning for consolidation into this NUREG. Those documents that have been considered superseded by Volume 1 of this NUREG are set forth in Section 4.10. A final list of consolidated documents will be provided in Volume 3. The approaches to decommissioning described in this NUREG help to identify the information (subject matter and level of detail) needed to terminate a license by considering the wide range of radioactive materials users licensed by NRC. It also incorporates the risk-informed and performance-based alternatives of NRC's License Termination Rule (10 CFR Part 20, Subpart E). This NUREG is available on the Internet at the following address: <http://www.nrc.gov>.

This NUREG is not a substitute for NRC regulations, and compliance with this document is not required. However, it does describe an approach acceptable to NRC. The approaches and methods described in this draft report are provided for information and comment only.

This draft report is published for public comment only and is not intended for use in preparing or reviewing decommissioning documents or activities until it is published in final form. It is being distributed for comment to encourage public participation in its development. Please submit comments within 90 days of the draft report's publication. Comments received after that time will be considered only if the status of finalizing the document makes it practicable.

Address comments to: Chief, Rules and Directives Branch, Division of Administrative Services, Office of Administration, U. S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Hand deliver comments to 11545 Rockville Pike, Rockville, Maryland, between 7:15 a.m. and 4:30 p.m. on Federal workdays. Comments may also be submitted through the Internet by addressing electronic mail to decomcomments@nrc.gov.

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ABBREVIATIONS

ADAMS	Agencywide Documents Access and Management System
ALARA	As low as is reasonably achievable
ANSI	American National Standards Institute
APF	Assigned Protection Factors
Bq	Becquerel
CAM	Continuous Air Monitor
CATX	Categorical Exclusion
CEDE	Committed Effective Dose Equivalent
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
Ci	Curie
DCGLs	Derived Concentration Guideline Levels
DOT	U.S. Department of Transportation
dpm	disintegrations per minute
DP	Decommissioning Plan
DWM	Division of Waste Management
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
EPAB	Environmental and Performance Assessment Branch
ER	Environmental Report
FONSI	Finding of No Significant Impact
FR	Federal Register
FSS	Final Status Survey
FSSP	Final Status Survey Plan
FSSR	Final Status Survey Report
GEIS	Generic Environmental Impact Statement
IC	Institutional Control
ICRP	International Commission on Radiological Protection

IMC	Inspection Manual Chapter
IP	Inspection Procedure
IROFS	Items Relied on for Safety
ISA	Integrated Safety Analysis
ISFSI	Independent Spent Fuel Storage Installation
LA	License Amendment
LPDR	Local Public Document Room
LTP	License Termination Plan
MARRSIM	Multi-Agency Radiological Survey and Site Investigation Manual (NUREG-1575)
mCi	milliCurie
MDA	Minimum Detectable Activity
MDC	Minimum Detectable Concentration
MIP	Master Inspection Plan
mrem	millirem
mSv	milliSievert
NCRP	National Council on Radiation Protection and Measurements
NCS	Nuclear Criticality Safety
NCSA	Nuclear Criticality Safety Analysis
NEPA	National Environmental Policy Act
NMSS	Office of Nuclear Material Safety and Safeguards
NMMSS	Nuclear Materials Management and Safeguards System
NOAA	National Oceanic and Atmospheric Administration
NORM	Naturally Occurring Radioactive Material
NRC	Nuclear Regulatory Commission
OSHA	U.S. Occupational Safety and Health Administration
OSTP	Office of State and Tribal Programs
pCi	picoCurie
PG	Policy and Guidance Directive
QA	Quality Assurance

RAI	Request for Additional Information
REM	Roentgen Equivalent Man
RSO	Radiation Safety Officer
RWP	Radiation Work Permit
SDMP	Site Decommissioning Management Plan
SER	Safety Evaluation Report
SRP	Standard Review Plan for Decommissioning (NUREG-1727)
TEDE	Total Effective Dose Equivalent
TODE	Total Effective Organ Equivalent
TI	Transportation Index
TLD	Thermoluminescent Dosimeter
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey

DEFINITIONS

Acceptance Review. The evaluation the NRC staff performs upon receipt of a license amendment request to determine if the information provided in the document is sufficient to begin the technical review.

Activity. The rate of disintegration (transformation) or decay of radioactive material. The units of activity are the curie (Ci) and the becquerel (Bq).

ALARA. Acronym for "As Low As [is] Reasonably Achievable," which means making every reasonable effort to maintain exposures to ionizing radiation as far below the dose limits as is practical, consistent with the purpose for which the licensed activity is undertaken, and taking into account the state of technology, the economics of improvements in relation to the state of technology, the economics of improvements in relation to the benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to use of nuclear energy and licensed materials in the public interest (see 10 CFR 20.1003).

Alternate Criteria. Residual contamination level resulting in a dose in excess of the limits described in 10 CFR 20.1402 and 20.1403, which must be approved by the Commission, as allowed in 10 CFR 20.1404.

Aquifer. A body of rock or soil that can conduct ground water and can yield significant quantities of ground water to wells and springs.

Background Radiation. Radiation from cosmic sources, naturally occurring radioactive materials including radon (except as a decay product of source or special nuclear material) and global fallout as it exists in the environment from the testing of nuclear explosive devices or from past nuclear accidents such as Chernobyl that contribute to background radiation and are not under the control of the licensee. It does not include radiation from source, byproduct, or special nuclear materials regulated by NRC.

Broad Scope Licenses. A type of specific license authorizing receipt, acquisition, ownership, possession, use, and transfer of any chemical or physical form of the byproduct material specified in the license, but not exceeding quantities specified in the license. The requirements for specific domestic licenses of broad scope for byproduct material are found in 10 CFR Part 33. Examples of broad scope licensees are facilities such as large universities and large research and development facilities.

Byproduct Material. (1) Any radioactive material (except special nuclear material) yielded in, or made radioactive by exposure to the radiation incident to the process of producing or using special nuclear material (as in a reactor); and (2) the tailings or waste produced by the extraction or concentration of uranium or thorium from ore (see 10 CFR 20.1003).

Categorical Exclusion. A category of actions that do not individually or cumulatively have a significant effect on the human environment and that the Commission has found to have no such

effect in accordance with the procedures set out in 10 CFR 51.22. Therefore, neither an environmental assessment nor an environmental impact statement is required.

Close-out Inspection. An inspection performed by NRC, or its contractor, to determine if a licensee has adequately decommissioned its facility. Typically, a close-out inspection is performed after the licensee has demonstrated that its facility is suitable for release in accordance with NRC requirements.

Confirmatory Survey. A survey conducted by NRC, or its contractor, to verify the results of the licensee's final status survey. Typically, confirmatory surveys consist of measurements at a small percentage of locations, previously surveyed by the licensee, to determine whether the licensee's results are valid and reproducible.

Contamination. Undesired radioactive materials that are deposited on the surface of or inside structures, areas, objects, or people.

Critical Group. The group of individuals reasonably expected to receive the greatest exposure to residual radioactivity for any applicable set of circumstances.

Decommission. To safely remove a facility from service and reduce residual radioactivity to a level that permits release of the property for unrestricted use or under restricted conditions, and termination of the license.

Decommissioning Groups. The categories of decommissioning activities that depend on the type of operation and the residual contamination.

Decommissioning Plan (DP). A detailed description of the activities the licensee intends to use to assess the radiological status of its facility, to remove radioactivity attributable to licensed operations at its facility to levels that permit release of the site in accordance with NRC's regulations and termination of the license, and to demonstrate that the facility meets NRC's requirements for release. A DP typically consists of several interrelated components, including: (1) site characterization information; (2) a remediation plan that has several components, including a description of remediation tasks, a health and safety plan, and a quality assurance plan; (3) site-specific cost estimates for the decommissioning; and (4) a final status survey plan.

Decontamination. The reduction or removal of radioactive material contaminants from a structure, area, object, or person. Decontamination may be accomplished by: (1) treating the surface to remove or decrease the contamination; (2) letting the material stand so that the radioactivity is decreased as a result of natural radioactive decay; or (3) covering the contamination to shield or attenuate the radiation emitted (see 10 CFR 20.1003 and 20.1402).

Derived Concentration Guideline Levels (DCGLs). Radionuclide-specific concentration limits used by the licensee during decommissioning to achieve the regulatory dose standard that permits the release of the property and termination of the license.

Dose. The absorbed dose, given in rads (or in the international system of units, grays), that represents the energy absorbed from the radiation in a gram of any material. The biological dose or dose equivalent, given in rem or sieverts, is a measure of the biological damage to living tissue from the radiation exposure.

Effluent. Waste material (as smoke, liquid industrial refuse, or sewage) discharged into the environment, especially when serving as a pollutant.

Environmental Assessment. A concise public document for which the Commission is responsible that serves to: (1) briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact; (2) aid the Commission's compliance with NEPA when no environmental impact statement is necessary; and (3) facilitate preparation of an environmental impact statement when one is necessary.

Environmental Impact Statement. A detailed written document that ensures that the policies and goals defined in the NEPA are considered in the actions of the Federal government. It discusses significant impacts and reasonable alternatives to the proposed action.

Environmental Monitoring. The process of sampling and analyzing environmental media in and around a facility to: (1) confirm compliance with performance objectives; and (2) detect contamination entering the environment to facilitate timely remedial action.

Environmental Report (ER). A report developed by a licensee that is submitted to support the licensee's amendment request. The ER is used by the NRC staff to prepare environmental assessments and environmental impact statements. The requirements for ERs are specified in 10 CFR 51.45–51.69.

Exposure Pathways/Exposure Scenario. Pathways through which ionizing radiation or radioactive material travels from its source and through the environment, until it interacts with a dose recipient.

External Dose. The exposure to ionizing radiation when the radiation source is located outside the dose recipient.

Final Status Survey (FSS). A survey conducted by a licensee to demonstrate the radiological status of its facility. Typically, the FSS consists of evaluations for both fixed and removable residual radioactive material and determinations of radiation levels in formerly used areas. Also referred to as a Close-out Survey or Termination Survey.

Final Status Survey Plan (FSSP). The description of the final status survey design.

Final Status Survey Report (FSSR). The results of the final status survey conducted by a licensee to demonstrate the radiological status of its facility. The FSSR is submitted to NRC for review and approval.

Financial Assurance. The financial arrangements made by a licensee to assure that funds adequate to complete decommissioning in a safe and timely manner are available when needed.

Financial Assurance Mechanism. Financial instruments used to provide financial assurance for decommissioning.

Floodplain. That portion of a river valley, adjacent to the channel, which is built of sediments deposited by the stream and is covered with water when the river overflows its banks at flood stages.

General Licenses. Licenses that are effective without the filing of applications with the NRC or the issuance of licensing documents to particular persons. The requirements for general licenses are found in 10 CFR Parts 30 and 31. Examples of general licenses are gauges and smoke detectors.

Ground Water. Water contained in pores or fractures in either the unsaturated zone or the saturated zone below ground level.

Hydraulic Conductivity. The capacity of a porous medium to transmit water through a unit cross-sectional area. Hydraulic conductivity is dependent upon the physical properties of the porous medium and the viscosity of the water and is expressed in units of length/time.

Hydrology. (1) The study of water characteristics, especially the movement of water. (2) The study of water, involving aspects of geology, oceanography, and meteorology.

Impact. The positive or negative effect of an action (past, present, or future) on the natural environment (land use, air quality, water resources, geological resources, ecological resources, aesthetic and scenic resources) and the human environment (infrastructure, economics, social, and cultural).

Inactive Outdoor Area. The outdoor portion of a site not used for licensed activities or materials for 24 months or more.

Infiltration. The flow of a fluid into a solid substance through pores or small openings; specifically, the movement of water into soil or porous rock.

Institutional Controls. Measures to control access to a site and minimize disturbances to engineered measures established by the licensee to control the residual radioactivity. Institutional controls include administrative mechanisms (e.g., land use restrictions) and may include, but are not limited to, physical controls (e.g., signs, markers, landscaping, and fences).

Karst. A type of topography that is formed over limestone, dolomite, or gypsum by dissolution, characterized by sinkholes, caves, and underground drainage.

Land Use Scenario. A licensee's description of scenarios or exposure pathways based on local land use practices.

Leak Test. A test for leakage of radioactivity from sealed radioactive sources. These tests are made when the sealed source is received and on a regular schedule thereafter. The frequency is usually specified in the sealed source and device registration certificate and/or license.

Model. A simplified representation of an object or natural phenomenon. The model can be in many possible forms, such as a set of equations or a physical, miniature version of an object or system constructed to allow estimates of the behavior of the actual object or phenomenon when the values of certain variables are changed. Important environmental models include those estimating the transport, dispersion, and fate of chemicals in the environment.

Monitoring. The periodic or continuous determination of the amount of ionizing radiation or radioactive contamination present in an occupied region, as a safety measure, for the purpose of health protection.

mrem/yr (millirem per year). One one-thousandth (0.001) of a rem per year.

National Environmental Policy Act (NEPA). The National Environmental Policy Act of 1969, which requires Federal Agencies, as part of their decision-making process, to consider the environmental impacts of actions under their jurisdiction. Both the Council on Environmental Quality (CEQ) and NRC have promulgated regulations to implement NEPA requirements. CEQ regulations are contained in 40 CFR Parts 1500 to 1508, and NRC requirements are provided in 10 CFR Part 51.

Naturally Occurring Radioactive Material (NORM). The natural radioactivity in rocks, soils, air and water.

Non-Impacted Areas. Areas in which there is no reasonable possibility of residual contamination from licensed operations.

Pathway. See Exposure Pathway.

Permeability. The capacity of such media as rock, sediment, and soil to transmit liquid or gas. Permeability depends on the substance transmitted (oil, air, water, etc.), the size and shape of the pores, joints, and fractures in the medium, and the manner in which they interconnect. "Hydraulic conductivity" means the same thing as "permeability" in technical discussions relating to ground water.

Porosity. A measure of the void or pore space within rocks and sediments (the ratio of the volume of void spaces to the total volume).

Potentiometric Surface. (1) The level to which water in a confined aquifer will rise under its own pressure in a borehole, the confining pressure having been removed. (2) The level to which water will rise in a piezometer (a tube inserted into the ground so that the lower end, with a permeable tip, is at a position from which pre-pressure measurements are required).

Reasonable Alternatives. Those alternatives that are practical or feasible from a technical and economic standpoint.

Restricted Area. Any area to which access is controlled for the protection of individuals from exposure to radiation and radioactive materials.

Safety Evaluation Report. The NRC staff's evaluation of the radiological consequences of a licensee's proposed action to determine if that action can be accomplished safely.

Saturated Zone. The portion of the ground wholly saturated with water.

Scoping Survey. An evaluation of site locations using limited direct measurements (exposure rates and activity levels) conducted to identify (1) radionuclide contaminants, (2) relative radionuclide ratios, (3) general levels and extent of contamination, and (4) preliminary information to support development of detailed remediation activities.

Screening Approach/Methodology/Process. The use of predetermined building surface concentration and surface soil concentration values that meet the radiological decommissioning criteria without further analysis to simplify decommissioning in cases where low levels of contamination are achievable.

Sealed Source. Any special nuclear material or byproduct material encased in a capsule designed to prevent leakage or escape of the material.

Sievert (Rem) (Roentgen Equivalent Man). A standard unit that measures the effects of ionizing radiation on humans. One Sievert = 100 Rem.

Site. The area of land currently or previously owned or controlled by the licensee for the principal purpose of operating a facility. As a general rule, the licensee's current and historical "site boundaries" should be considered when defining the site.

Site Characterization. Studies that enable the licensee to sufficiently describe the conditions of the site, buildings, or outdoor areas to evaluate the acceptability of the decommissioning plan.

Site Characterization Survey. A survey that determines the type and extent of radioactive contamination of structures, residues, and environmental media.

Site Decommissioning Management Plan (SDMP). The program established by NRC in March 1990 to help ensure the timely cleanup of sites with limited progress in completing the remediation of the site and the termination of the facility license. SDMP sites typically have buildings, former waste disposal areas, large volumes of tailings, groundwater contamination, and soil contaminated with low levels of uranium or thorium or other radionuclides.

Site-Specific Dose Analysis. Any dose analysis that is done other than by using the default screening tools.

Source Material. Uranium or thorium, or any combination thereof, in any physical or chemical form, or ores that contain by weight one-twentieth of one percent (0.05%) or more of: (1) uranium; (2) thorium; or (3) any combination thereof. Source material does not include special nuclear material.

Source Term. A conceptual representation of the radioactive source at a site or facility.

Special Nuclear Material. (1) Plutonium, uranium-233 (U-233), uranium enriched in the isotope 233 or 235, and any other material that the Commission, pursuant to the provisions of Section 51 of the Act, determines to be special nuclear material, but does not include source material or (2) Any material artificially enriched by any of the forgoing but does not include source material.

Specific Licenses. Licenses issued to a named person who has filed an application for the license under the provisions of 10 CFR Parts 30, 32 through 36, 39, 40, 61, 70 and 72. Examples of specific licenses are industrial radiography, medical use, irradiators, and well logging.

Survey. An evaluation of the radiological conditions and potential hazards incident to the production, use, transfer, release, disposal, or presence of radioactive material or other sources of radiation. When appropriate, such an evaluation includes a physical survey of the location of radioactive material and measurements or calculations of levels of radiation, or concentrations or quantities of radioactive material present.

Total Effective Dose Equivalent (TEDE). The sum of the deep-dose equivalent (for external exposures) and the committed effective dose equivalent (CEDE) (for internal exposures).

Transmissivity. The rate at which water is transmitted through an aquifer.

Unrestricted Area. An area, access to which is neither limited nor controlled by the licensee.

Unsaturated Zone. The area between the surface and the upper limit of the saturated zone (water table) where only some of the spaces (fractures and rock pores) are filled with water.

PART I: DECOMMISSIONING PROCESS AND DECOMMISSIONING GROUPS

1 PURPOSE OF DRAFT REPORT AND DECOMMISSIONING ROADMAP

1.1 PURPOSE OF THIS REPORT

The purpose of this volume is to:

- Illustrate to licensees, and the general public, NMSS's decommissioning process;
- Provide guidance to NRC licensees for terminating an NRC nuclear materials license and to make available methods, acceptable to the NRC staff, for implementing specific parts of the Commission's decommissioning regulations;
- Delineate techniques and criteria used by NRC staff in evaluating decommissioning actions;
- Provide guidance to NRC staff overseeing NMSS decommissioning programs to evaluate a licensee's decommissioning actions; and
- Maintain a risk-informed, performanced-based, and flexible decommissioning approach.

This NUREG provides guidance regarding decommissioning leading to termination of a license. Licensees[1] decommissioning their facilities are required to demonstrate to NRC that their proposed methods will ensure that the decommissioning can be conducted safely and that the facility, at the completion of decommissioning activities, will comply with NRC's requirements for license termination. The policies and procedures discussed in this NUREG should be used by NRC staff overseeing the decommissioning program at licensed fuel cycle, fuel storage, and materials sites to evaluate a licensee's decommissioning actions. This NUREG is also intended to be used in conjunction with NRC Inspection Manual Chapter 2605, "Decommissioning Inspection Program for Fuel Cycle and Materials Licensees."

This NUREG is also being issued to describe, and make available to the public, methods acceptable to the NRC staff in implementing specific parts of the Commission's regulations, to delineate techniques and criteria used by the staff in evaluating decommissioning actions, and to provide guidance to licensees responsible for decommissioning NRC-licensed sites. This NUREG is not a substitute for regulations, and compliance with it is not required. Methods and solutions different than those in this NUREG will be acceptable, if they provide a basis for concluding that the decommissioning actions are in compliance with the Commission's regulations.

Other NRC licensees (e.g. nuclear reactors or uranium recovery facilities) may find this information useful, but they are not the subject of this NUREG. Licensees of Agreement States should contact the appropriate regulatory authority. In many instances, depending on the State, licensees may substitute "Agreement State authority" for NRC.

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[1] For purposes of this document, the term "licensee" includes persons in possession of licensable material whom NRC could require become a licensee.

1.2 APPROACH

The basic approach in this document is similar to that in the NMSS Decommissioning Handbook (NUREG/BR-0241). The methodology of the Handbook has been updated to conform with the new requirements of the 10 CFR Part 20, Subpart E (License Termination Rule). A brief discussion of recent decommissioning regulatory history, an overview of the decommissioning process, and the License Termination Rule are discussed in Chapters 4, 5, and 6, respectively.

NRC staff reviewed the numbers and types of licenses issued by the Commission and determined that the majority of licensees were those that used and possessed sealed sources or relatively limited amounts of unsealed radioactive material. Because of the amounts, forms, and types of radioactive material used by these licensees, it did not appear that most licensees would need to submit decommissioning plans or perform complex remedial activities to decommission their facilities in accordance with NRC's criteria.

However, certain licensees need to submit information regarding either the status of their facilities when they request license termination, or the activities that they intend to use to remediate their facilities. The types of information required could range from very simple descriptions of the radiological status of the facilities and the disposition of radioactive material possessed by the licensees to, in the case of licensees that proposed license termination under restricted conditions, very detailed descriptions of institutional controls, dose estimates to potential future critical groups, and arrangements to ensure that adequate financial assurance mechanisms are in place at license termination.

Based on the above, NRC staff determined that the best approach would be to develop detailed descriptions of the types of information that would be required to evaluate proposed decommissioning activities and then tailor the information required from the licensees based on the complexity and safety significance of the decommissioning project. As described below, this approach is implemented through several interactions between the NRC staff and licensees.

1.3 DECOMMISSIONING ROADMAP

To implement the approach chosen by the NRC staff to incorporate the risk-informed, iterative approach, the staff revised the decommissioning "types" described in the NMSS Decommissioning Handbook into "groups," based on the complexity of the decommissioning and the decommissioning alternatives in the License Termination Rule. A roadmap to these groups is provided in Figure 1.1.

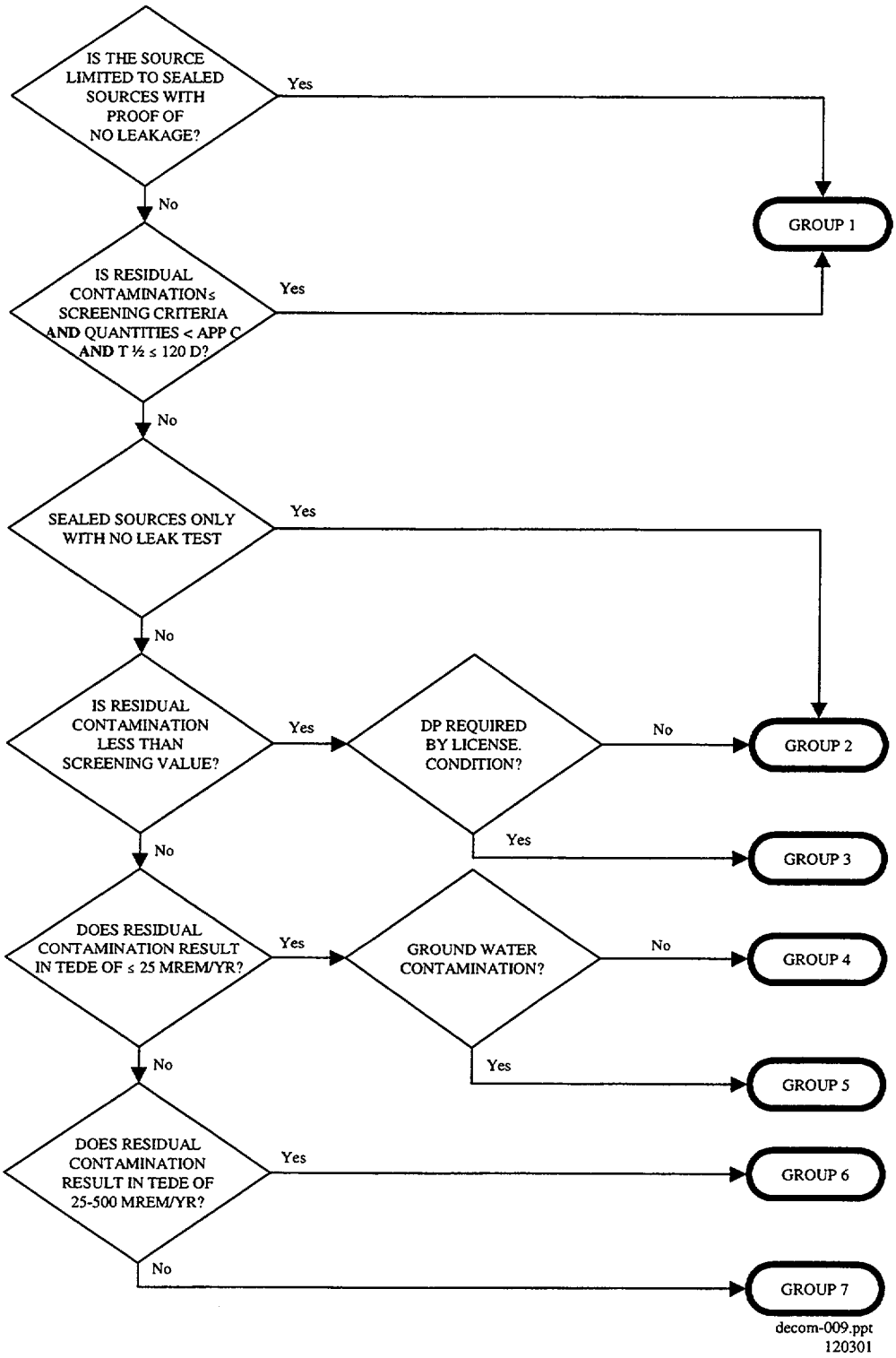

Figure 1.1 Determining the Appropriate Decommissioning Group.

The decommissioning process begins when the licensee determines that decommissioning of all or a portion of a site is necessary or desirable. Decommissioning of a site, or portion of a site, is necessary when certain site use conditions are met. These conditions, related to decommissioning timing, are explained in Chapter 5.

In the past, the NRC staff classified facilities undergoing decommissioning by either the activities performed during the operation of the facilities or the types of licensed material possessed by the licensee. However, to write this NUREG, the staff classified facilities undergoing decommissioning into seven (7) groups, based on the amount of residual contamination, the location of that material, and the complexity of the activities needed to decommission the site. Group 1 is typically a sealed source facility that has not experienced any leakage; Group 7 would be a large facility with contamination that would result in the license being terminated with restrictions on future site use and require an EIS to support the action. The groups are defined in Chapter 7. A more detailed description of each group, and the action necessary to decommission it, are given in Chapters 8-14. Table 1.1 describes, gives examples, and identifies reference chapters in this document for each decommissioning group.

Table 1.1 Description, Examples, and Reference Chapters in this Document for Each Decommissioning Group.

Group	Description	Typical Examples	Ref Chpt in this document
1	Group 1 facilities typically involve licensed material used in a way that precluded its release into the environment, did not cause the activation of adjacent materials, and did not contaminate work areas. A DP is not required.	Sites where only sealed sources were used, e.g., radiography and irradiator sites	8
2	Group 2 facilities may have residual radiological contamination in building surfaces and/or soils from radioisotopes with a half-life > 120 days. However, the licensee is able to demonstrate that the site meets the generic screening criteria for unrestricted use. A DP is not required.	Sites that used only small quantities of loose radioactive material that they routinely cleaned up and did not release radioactivity to effluents	9
3	Group 3 facilities could meet the Group 2 criteria, but they need to amend their license to modify or add procedures to remediate buildings or sites; therefore, a DP is required.	Sites that used only small quantities of loose radioactive material on an irregular basis and/or may have occasionally released radioactivity in effluents within NRC limits	10
4	Group 4 facilities have residual radiological contamination present in building surfaces and/or soils (but not ground water). However, the licensee cannot meet, or chooses not to use, the generic screening criteria. Instead, the licensee demonstrates that the site can meet unrestricted use levels derived from site-specific dose modeling. A DP is required.	Sites where loose or dissolved radioactive material was routinely released to effluent waste streams within NRC limits and may have had some operational occurrences that resulted in releases above NRC limits	11
5	Group 5 facilities have residual radiological contamination present in building surfaces, soils, and/or ground water. Licensee demonstrates that the site can meet unrestricted use levels derived from site-specific dose modeling. A DP is required.	Sites where large amounts of loose or dissolved radioactive material was released, stored, or disposed of onsite	12
6	Group 6 facilities have residual radiological contamination present in building surfaces, and/or soils, and possibly ground water. The licensee demonstrates that the site meets restricted and unrestricted use levels derived from site-specific dose modeling. A DP is required.	Sites where cleaning up to the unrestricted release limit would cause more health and safety or environmental impact than could be justified	13
7	Group 7 facilities have residual radiological contamination present in building surfaces, and/or soils, and possibly ground water. The licensee demonstrates that the site meets restricted and alternate unrestricted use levels derived from site-specific dose modeling. A DP is required.	Sites where cleaning up to the unrestricted release limit would cause more health and safety or environmental impact than could be justified	14

Once the decision has been made to decommission, the next step is to determine what information the licensee needs to provide to demonstrate site conditions successfully. When the NRC staff is informed that a licensee has decided to permanently cease licensed operations and decommission all or part of its facility, the staff should contact the licensee and determine if the licensee will need to submit a Decommissioning Plan (DP) to support its request for license termination. If the licensee does not need to submit a DP, the NRC staff should follow the guidance in this NUREG for that decommissioning group. Licensees needing to submit a DP should follow the requirements of the regulations briefly discussed in Chapters 10, 11, 12, 13, or 14, depending on the decommissioning group. Detailed descriptions of applicable portions of DP contents are found in Chapters 16-18 of this volume, and a complete discussion of DP contents is in NUREG-1727, NMSS Decommissioning Standard Review Plan. Table 1.2 identifies the minimum information that would be sufficient for the staff to conduct its technical review for each of the decommissioning groups.

Table 1.2 Principal Regulatory Features of Decommissioning Groups.

	GROUP 1	GROUP 2	GROUP 3	GROUP 4	GROUP 5	GROUP 6	GROUP 7
Description	Sealed source, screening criteria[2]	Screening criteria[2], No DP	Screening criteria[2], DP	Site specific, no ground water contamination	Site specific, ground water contamination	Restricted release	Alternate criteria
Licensee Requests Release for Restricted or Unrestricted Use	Unrestricted use	Unrestricted use	Unrestricted use	Unrestricted use	Unrestricted use	Restricted Use	Restricted use
Decommissioning Plan Required	No	No	Yes	Yes	Yes	Yes	Yes
Decommissioning Plan Review Documentation	N/A	N/A	Letter to the licensee	Safety Evaluation Report	Safety Evaluation Report	Safety Evaluation Report	Safety Evaluation Report
Radioactive Material Disposition Documentation	NRC Form 314 or equivalent	NRC Form 314 or equivalent	NRC Form 314 or equivalent	NRC Form 314 or equivalent	NRC Form 314 or equivalent	NRC Form 314 or equivalent	NRC Form 314 or equivalent
Method for Demonstrating Site is Suitable for Release	Survey or demonstration	Survey or demonstration	Survey or demonstration	Site specific[3]	Site specific[3]	Site specific[3]	Site specific[3]
Confirmatory or Side-by Side Survey	Not Customary	Depends on licensee's survey and rad. material use at facility	Depends on licensee's survey and rad. material use at facility	Yes	Yes	Yes	Yes
Closeout Inspection	No	Yes	Yes	Yes	Yes	Yes	Yes
Federal Register Notices used to Inform the Public of Staff Actions	No	Yes	Yes - to announce DP receipt and NRC's intended actions	Yes - to announce DP receipt and NRC's intended actions	Yes - to announce DP receipt and NRC's intended actions	Yes - to announce DP receipt and NRC's intended actions	Yes - to announce DP receipt and NRC's intended actions
Documentation Used to Support License Termination/NEPA Compliance	Letter to licensee, License Term Form / Categorical Exclusion	Letter to licensee and License Term Form / EA	Letter to licensee and License Term Form / EA	Letter to licensee and License Term Form / EA	Letter to licensee and License Term Form / EA	Letter to licensee and License Term Form / EIS	Letter to licensee and License Term Form / EIS

[2] See Appendix B.

[3] Site conditions for these groups are beyond the scope of MARSSIM. A site-specific approach should be developed. (See Section 2.6 of NUREG -1575, and sections 4.2.4 and 6.5.5 of NUREG-5849). Licensee should coordinate approach with NRC staff.

1.4 DECOMMISSIONING SCREENING CRITERIA

The decommissioning roadmap (Figure 1.1) and the regulatory features of decommissioning groups, in Table 1.2, both describe the use of decommissioning screening criteria for Groups 1-3. The technical basis, scope, criteria, qualification, and recommended approaches and tools for the use of screening criteria are presented in this Section.

1.4.1 TECHNICAL BASIS FOR SCREENING

On July 21, 1997, NRC published a final rule on "Radiological Criteria for License Termination," in the *Federal Register* (62 FR 39058), which was incorporated as Subpart E to 10 CFR Part 20. On July 8, 1998, the Commission directed staff to develop a standard review plan (SRP) for decommissioning. The staff completed development of the SRP in September 2000, in part, as a technical information support document for performing the staff's evaluations of the licensee's dose modeling. It presents detailed technical approaches, methodologies, criteria, and guidance for staff reviewing dose modeling to demonstrate compliance with the dose criteria in 10 CFR Part 20, Subpart E.

The NRC staff developed, in conjunction with the SRP, building surface concentration screening values and surface soil concentration values to support implementation of the license termination rule and to simplify decommissioning in cases where low levels of contamination exist. These values were published in the *Federal Register* on November 18, 1998, December 7, 1999, and June 13, 2000 (see Section 4.1), and their use is discussed in this section. The use of the screening values provides reasonable assurance that the dose criterion in 10 CFR 20.1402 will be met. This section explains the staff's review when the licensee proposes to use these screening values. In addition to these screening criteria, NRC has developed a screening code "DandD" for demonstrating compliance with the dose criteria in Part 20, Subpart E and to simplify decommissioning in cases where low levels of contamination exist. A full discussion of the use of screening criteria to evaluate site conditions can be found in volume 2 of this NUREG, and in Chapter 5 and Appendix C of NUREG-1727.

1.4.2 BRIEF DESCRIPTION AND SCOPE

The screening process, discussed below, is fully described in Volume 2, and should be used by licensees for demonstrating compliance with the unrestricted release dose criteria in 10 CFR 20, Subpart E. The sections of Volume 2 specific to screening are summarized below.

Sections 1.4.1, 1.4.2, 1.4.3, and 1.4.4 of this volume summarize the Volume 2 discussions of:

- Acceptable approaches, look-up tables, and screening models for evaluating a licensee's demonstration of compliance with the dose criteria, using a screening methodology;

- The attributes of screening and site-specific analysis, to evaluate the merits of both dose modeling approaches; and
- The criteria for qualification of the site for this screening approach.

These sections of Volume 2 are intended for use by staff performing technical reviews of dose analysis methods and approaches, as well as the reviews of employed codes/models and associated pathways and parameters by licensees to demonstrate compliance with the dose criteria in Part 20, Subpart E. Volume 2 is also intended for use by licensees as guidance for acceptable approaches or methodologies to conduct these dose modeling analyses.

1.4.3 CRITERIA FOR CONDUCTING SCREENING

This section pertains to the licensee's demonstration of compliance with the dose criteria in Part 20, Subpart E, using a screening approach dose analysis. The licensee's use of the screening analysis should be performed using one or more of the currently available screening tools: (1) a look-up table for common beta-/gamma-emitting radionuclides for building surface contamination (63 FR 64132, November 18, 1998); (2) a look-up table for common radionuclides for soil surface contamination (64 FR 68395, December 7, 1999) (tabulated in Appendix B); and (3) screening levels derived using DandD, Version 2.0, for the specific radionuclide(s), using the code's default parameters. A full discussion of the use of screening criteria to evaluate site conditions can be found in Volume 2 of this NUREG and in Chapter 5 and Appendix C of NUREG-1727.

A screening analysis is usually conducted for simple sites with building surface (e.g., non-volumetric) contamination and/or with surficial soil contamination [considered to be within approximately the first 15 cm (6 in) of soil].

The licensee must demonstrate qualification of the site for screening in terms of site physical conditions and compatibility with the modeling code's assumptions and default parameters and the acceptable screening tools (e.g., code, look-up tables), approaches, and parameters that staff can use to translate the dose into equivalent screening concentration levels. When using the screening approach for demonstrating compliance with the dose criteria in Part 20, Subpart E, licensees need to demonstrate that the particular site conditions (e.g., physical and source-term conditions) are compatible and consistent with the DandD model assumptions (NUREG/CR-5512, Volume 1).

1.4.4 QUALIFICATION OF THE SITE FOR SCREENING

Sites exhibiting any of the conditions found in Figure 1.2 (excluding those caused by sources of background radiation) would probably not be a Group 2 or 3 candidate, but would probably be a Group 4-7 candidate.

GROUP 2 OR 3 EXCLUSION CRITERIA

- Soil contamination greater than 15 cm (6 inches) below the ground surface;
- Radionuclide residual radioactivity present in an aquifer;
- Buildings with volumetrically contaminated material;
- Radionuclide concentrations in surface water sediments; and
- Sites that have an infiltration rate greater than the vertical saturated hydraulic conductivity (i.e., resulting in the water running off the surface rather than purely seeping into the ground).

These are limitations caused by the conceptual models used in developing the screening analysis. In other words, the conceptual model, parameters, and scenarios in the DandD computer code are generally incompatible with such conditions. However, situations do exist where you can still use the analyses using scenario assumptions to modify the source term. For example, by assuming buried radioactive material is excavated and spread across the surface, the screening criteria may be applicable for use at the site.

Figure 1.2 Group 2 or 3 Exclusion Criteria.

Licensees should be aware that a screening analysis, for demonstrating compliance with the dose criteria in Part 20, Subpart E, may not be applicable for certain sites because of the status of contaminants (e.g., location and distribution of radionuclides) or because of site-specific physical conditions. Therefore, licensees must assess the site source-term (e.g., radionuclide distribution) characteristics to ensure consistency with the source-term assumptions in the screening model/code used (e.g., DandD). See Figure 1.2 for a description of these limitations. In addition, licensees should determine if specific physical conditions at the site would invalidate the model and code assumptions associated with the screening code/model. Licensees should review the selected screening parameters and pathways to ensure that they are conservative and consistent with the parameters and pathways of the DandD code. Further, licensees may determine that there could be conditions at their site that cannot be handled by the simple screening model, either because of the complex nature of the site or because of the simple conceptual model in the DandD screening code. Recommended approaches to address and resolve these screening issues are presented in Appendix B.

1.4.5 SCREENING DEFINITION AND APPROACHES FOR THE TRANSITION FROM SCREENING TO SITE-SPECIFIC ANALYSIS

Licensees may also consider the use of other screening tools on a case-by-case basis (e.g., other look-up tables or other conservative codes/models) after evaluation and comparison of the level of conservatism, compatibilities, and consistencies of these tools with the DandD code default conditions and with site-specific conditions. Scenario descriptions used in generic screening are

developed and discussed in NUREG/CR-5512, Volume 1. This NUREG and NUREG-1549 provide the rationale for applicability of the generic scenarios, criteria, rationale and assumptions, and the associated parameter values or ranges. A summary of the scenarios can be found in Appendix C of Volume 2. In general, licensees should recognize that when they select other approaches or models for the dose analysis, or modify the DandD code default parameters, scenarios, and/or pathways, they would be performing a site-specific analysis.

1.4.6 SITE SCREENING: QUALIFICATION OF ASSUMPTIONS

When using the screening approach for demonstrating compliance with the unrestricted release dose criteria in Part 20, Subpart E, licensees need to demonstrate that the particular site conditions (e.g., physical and source-term conditions) are compatible and consistent with the DandD model assumptions (NUREG/CR-5512, Volume 1). In addition, the default parameters and default scenarios/pathways must be used in the screening dose analysis. Therefore, reviewers should examine the site conceptual model, the generic source-term characteristics, and other attributes of the sites, to ensure that the site is qualified for screening.

Staff should verify that the following site conditions exist:

- Building Surface Contamination:
  - — The contamination on building surfaces (e.g., walls, floors, ceilings) should be surficial and non-volumetric [e.g., < 10 mm (0.4 in)];
  - — Contamination on surfaces is mostly fixed (not loose), with the fraction of loose contamination not to exceed 10 percent of the total surface activity; and
  - — The screening criteria may not be applied to surfaces such as buried structures (e.g., drainage or sewer pipes) or mobile equipment within the building; such structures and buried surfaces will be treated on a case-by-case basis.
- Surface Soil Contamination:
  - — The initial residual radioactivity (after decommissioning) is contained in the top layer of the surface soil [e.g., approximately 15 cm (6 in)];
  - — The unsaturated zone and the ground water are initially free of contamination; and
  - — The vertical saturated hydraulic conductivity at the specific site is greater than the infiltration rate.

After verifying that a site qualifies for screening, staff may compare the actual level of contamination at the site with the screening levels published in NRC's look-up tables or may use the latest version of the DandD code.

Questions have also been raised about the appropriateness of using a screening analysis at sites with contaminated areas larger than the current default cultivated area [e.g., 2400 m^2 (25,800 ft^2)]. Staff evaluated the effect of a large contaminated area on the derived screening dose and determined that this effect is trivial for sites with the dominant dose arising from direct exposure or inhalation. However, for sites with a significant dose contribution associated with the ingestion pathway (specifically, ingestion associated with the drinking water and irrigation pathways), this effect could be appreciable. Staff determined that, for sites with contaminated areas of 6000 - 7200 m^2 (64,600 - 77,500 ft^2), the dose may be underestimated under worst-case conditions by a factor of 2 to 3. However, the staff analysis showed that, if users select the site-specific analysis, the dose would be far less than the estimated dose. For sites with areas larger than 7200 m2 (77,500 ft2), this effect is not appreciable. Therefore, staff should accept screening analysis for relatively large-area sites, because they are likely to be conservative and may be counted among the 10 percent of the sites where the dose may be slightly underestimated. In addition, because of the conservative assumptions of the DandD code, it is more likely that the derived dose, based on the use of other codes or the use of a site-specific analysis, would be far less than the derived dose using these default conditions. In summary, assuming that the site is qualified for screening based on the above listed criteria, the screening approach would be accepted for sites with areas larger than the default cultivated area [i.e., 2400 m^2 (25,800 ft^2)].

It should be noted that staff should also evaluate complex site conditions that may disqualify the site for screening. Examples of such complex site conditions may include: highly fractured formation, karst conditions, extensive surface-water contamination, and/or a highly non-homogeneous distribution of contamination. Therefore, reviewers should ensure that the site meets the definition of a "simple site" to qualify for screening.

1.4.7 ACCEPTABLE SCREENING TOOLS

The currently available screening tools that NRC will accept for a screening analysis are:

- A look-up table (Table B.1 in Appendix B) for common beta-/gamma-emitting radionuclides for building-surface contamination.
- A look-up table (Table B.2 in Appendix B) for common radionuclides for soil surface contamination.

  The screening values in Tables B.1 and B.2 are intended for single radionuclides. For radionuclides in mixtures, the "sum of fractions" rule should be used.

- A look-up table for radionuclides for building-surface contamination from NUREG/CR-5512, Volume 3.

  Some radionuclides are not included in Table B.1. Additional radionuclides are listed in the equivalent table for building-surface contamination (Table 5.19 in NUREG/CR-5512, Volume 3).

- A look-up table for radionuclides for soil surface contamination from NUREG/CR-5512, Volume 3.

  Some radionuclides are not included in Table B.2. Additional radionuclides are listed in the equivalent table for soil surface contamination (Table 6.91 in NUREG/CR-5512, Volume 3).

- Screening levels derived using DandD Version 2.0 for the specific radionuclide and using code default parameters. (The DandD code may be accessed at the web site: <http://techconf.llnl.gov>.)

A comprehensive discussion of the screening methodology for dose calculations can be found in Volume 2 of this NUREG and in NUREG-1727 (the SRP).

1.5 FURTHER INFORMATION FOR LICENSEES AND REVIEWERS

NRC staff should refer to this volume to identify the information to be submitted by the licensee for the staff to conduct its technical review and for what review actions the staff takes for each decommissioning group. A licensing review conducted using this volume of the NUREG is not intended to be a detailed evaluation of all aspects of facility decommissioning. NRC staff should use the approach outlined in this volume in a manner that allows for flexibility. The objectives of the review are to confirm that the decommissioning of the site will be accomplished in a manner consistent with applicable regulatory requirements. In conducting the evaluation, the staff should determine if the proposal submitted by the licensee is acceptable. In most cases, this involves assessing whether the methods and data used by the licensee in support of its proposal are acceptable, and if the results meet the requirements in 10 CFR Part 20, Subpart E.

NRC regulations indicate when a DP is required. Groups 1-2 do not generally require a DP, but Groups 3-7 do. For those that require a DP, the content of the DP is shown in Chapters 16-18, the Checklist in Appendix D, and in Volume 2 of this NUREG. This information is taken directly from the Standard Review Plan (NUREG-1727) for decommissioning plans in support of Subpart E (the License Termination Rule). NUREG-1727 may also be used for preparing a DP. Compliance with the environmental requirements of the National Environmental Policy Act (NEPA) and NRC environmental regulations (10 CFR 51) is explained in Chapter 15.7.

Details of requirements for dose modeling, inspections and surveys will be presented in Volume 2 of this NUREG. Interim guidance is in Chapter 15 and Appendix C of NUREG-1727 (SRP) and NUREG-1575 (MARSSIM). Details of Financial Assurance and Institutional Controls will be in Volume 3 of this NUREG. For a complete listing of documents used in the compilation of this work, and the current status of each, see Section 4.10.

2 REGULATORY AUTHORITY: NRC AND AGREEMENT STATES

Certain states, called Agreement States (see Figure 2.1), have entered into agreements with NRC that give them the authority to license and inspect byproduct, source, or limited quantities of special nuclear materials used or possessed within their borders. Any applicant other than a Federal Agency who wishes to possess or use licensed material in one of these Agreement States needs to contact the responsible officials in that State for guidance on preparing a license application.

In the special situation of work at Federally-controlled sites in Agreement States, it is necessary to understand the jurisdictional status of the land in order to determine whether NRC or the Agreement State has regulatory authority. NRC has regulatory authority in areas determined to be of "exclusive Federal jurisdiction," while the Agreement State has jurisdiction in land areas of non-exclusive Federal jurisdiction. Licensees are responsible for determining the jurisdictional status of the specific areas where they plan to conduct licensed operations. NRC recommends that licensees ask their local contact for the Federal Agency controlling the site (e.g., contract officer, base environmental health officer, district office staff) to help determine the jurisdictional status of the land and to provide the information in writing, so that licensees can comply with NRC or Agreement State regulatory requirements, as appropriate. Additional guidance on determining jurisdictional status is found in All Agreement States Letter, SP-96-022, dated February 16, 1996, which is available from NRC upon request.

Regulatory authority for power reactors and formula quantities (see 10 CFR 150.11) of special nuclear material is not delegated to the Agreement States.

Table 2.1 provides a quick way to check on which Agency has regulatory authority.

Table 2.1 Who Regulates the Activity?

Applicant and Proposed Location of Work	Regulatory Agency
Federal Agency regardless of location (except that Department of Energy [DOE] and, under most circumstances, its prime contractors are exempt from licensing)	NRC
Non-Federal entity in non-Agreement State, US territory, or possession	NRC
Non-Federal entity in Agreement State at non-Federally controlled site	Agreement State
Non-Federal entity in Agreement State at Federally-controlled site not subject to exclusive Federal jurisdiction	Agreement State
Non-Federal entity in Agreement State at Federally-controlled site subject to exclusive Federal jurisdiction	NRC

Figure 2.1 shows NRC's four Regional Offices and their respective geographical areas of responsibility for licensing purposes. It also identifies the Agreement States.

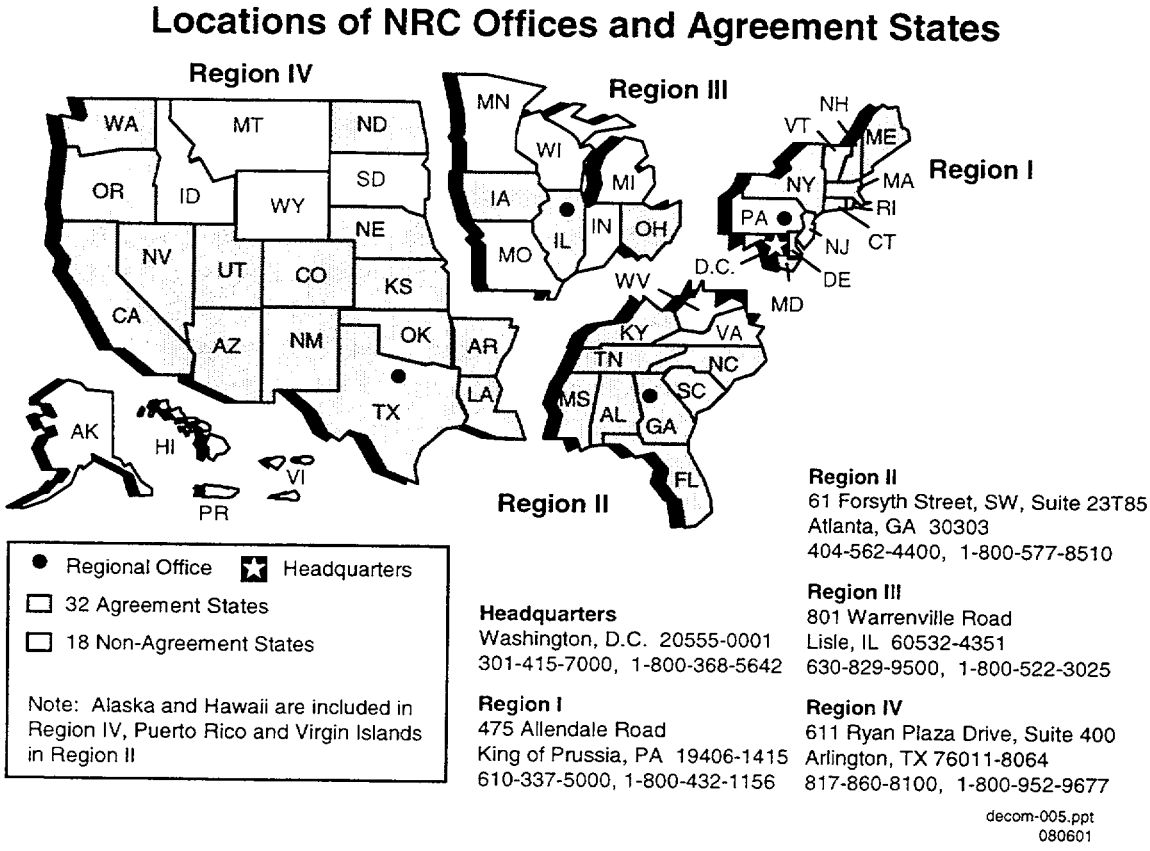

Figure 2.1 U.S. Map. *Location of NRC Offices and Agreement States in the United States.*

Reference: A current list of Agreement States (including names, addresses, and telephone numbers of responsible officials) is available by choosing "Directories" on the NRC Office of State and Tribal Programs' (OSTP's) Home Page, <http://www.hsrd.ornl.gov/nrc/home.html>. As an alternative, request the list from NRC's Regional Offices.

All Agreement States Letter, SP-96-022, dated February 16, 1996, is available on OSTP's Home Page. Choose "NRC-State Communications," then choose "All of the Above" and follow the directions for submitting a query for "SP96022." As an alternative, to request the letter from OSTP, call NRC's toll free number, (800) 368-5642, and ask for extension 415-3340.

3 LICENSEE'S MANAGEMENT RESPONSIBILITY

NRC recognizes that effective radiation safety program management is vital to achieving safe and compliant operations. NRC believes that consistent compliance with its regulations provides reasonable assurance that licensed activities will be conducted safely.

> "Management" refers to the processes for conducting and controlling a radiation safety program and the individuals who are both responsible for those processes and authorized to provide the necessary resources to achieve regulatory compliance.

To ensure adequate management involvement, a management representative must sign the license application, acknowledging management's commitment and responsibility for the following:

- Radiation safety, security, control of radioactive materials, and compliance with regulations;
- Completeness and accuracy of the radiation safety records and all information provided to NRC;
- Knowledge about the contents of the license and application;
- Meticulous compliance with current NRC and Department of Transportation (DOT) regulations and the licensee's operating and emergency procedures;
- Provision of adequate resources (including space, equipment, personnel, time, and, if needed, contractors) to the radiation protection program to ensure that the public and workers are protected from radiation hazards and that meticulous compliance with regulations is maintained;
- Selection and assignment of a qualified individual to serve as the Radiation Safety Officer (RSO) for licensed activities;
- Prohibition against discrimination of employees engaged in protected activities;
- Provision of information to employees regarding the employee protection and deliberate misconduct provisions;
- Obtaining NRC's prior written consent before transferring control of the license;
- Notifying the appropriate NRC Regional Administrator in writing, immediately following the filing of a petition for voluntary or involuntary bankruptcy.

For information on NRC inspection, investigation, enforcement, and other compliance programs, see the current version of "General Statement of Policy and Procedures for NRC Enforcement Actions," NUREG-1600. For hard copies of NUREG-1600, see the Notice of Availability (on the inside front cover of this report).

4 APPLICABLE REGULATIONS, GUIDANCE, AND REFERENCES

It is the licensee's responsibility to obtain, understand, and abide by each applicable regulation and existing license condition.

4.1 DECOMMISSIONING REGULATORY HISTORY

On June 27, 1988, NRC amended its regulations in 10 CFR Parts 30, 40, 50, 70, and 72 to set forth the technical and financial criteria for decommissioning licensed nuclear facilities (53 *Federal Register* (FR) 24018). These regulations were further amended on July 26, 1993, to establish additional recordkeeping requirements for decommissioning (58 FR 39628); on July 15, 1994, to establish time frames and schedules for the decommissioning of licensed nuclear facilities (59 FR 36026); and on July 26, 1995, to clarify that financial assurance requirements must be in place during operations and updated when licensed operations cease. NRC promulgated these amendments to ensure that the decommissioning of all licensed nuclear facilities is performed in a safe and timely manner and that adequate funds are available to ensure that the decommissioning of licensed facilities can be accomplished.

On July 21, 1997, NRC published the final rule on "Radiological Criteria for License Termination" (the License Termination Rule) as Subpart E to 10 CFR Part 20 (62 FR 39058). The License Termination Rule establishes criteria for the release of sites for unrestricted use. These criteria are that the residual radioactivity, which is distinguishable from background, results in a total effective dose equivalent (TEDE) to an average member of a critical group that does not exceed 0.25 milliSievert per year (mSv/yr) (25 millirem/year (mrem/yr)). In addition, the residual radioactivity has been reduced to levels that are as low as is reasonably achievable (ALARA). The License Termination Rule also establishes criteria for license termination with restrictions on future land use, as long as specific conditions are met. These criteria are for license termination in unusual situations where the site may exceed the 0.25 mSv/yr (25 mrem/year) limit but would still be limited to 1.0 mSv/yr (100 mrem/yr) or 5.0 mSv/yr (500 mrem/yr) under certain conditions.

Supplemental information regarding implementation of the License Termination Rule was published by NRC in the *Federal Register* on November 18, 1998 (63 FR 64132), December 7, 1999 (64 FR 68395), and June 13, 2000 (65 FR 37186). This supplemental information established screening values for building surface contamination for beta/gamma radiation emitters, screening values for surface soil contamination, and clarifying information on the use of the screening values. These screening values correspond to levels of radionuclide contamination that would be deemed in compliance with the unrestricted use dose limit in 10 CFR 20.1402 (i.e., 0.25 mSv/yr (25 mrem/yr)).

4.2 STATUES

NRC's decommissioning and environmental protection regulations derive their authority from the following statutes:

- Atomic Energy Act of 1954, as amended
- Energy Reorganization Act of 1974, as amended
- National Environmental Policy Act of 1969, as amended

4.3 DECOMMISSIONING REGULATIONS

The following Parts of 10 CFR contain regulations applicable to decommissioning materials licenses:

- 10 CFR Part 2, "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders." Section 10 CFR 2.1205 discusses the public's opportunities to request hearings on licensing actions.
- 10 CFR Part 19, "Notices, Instructions and Reports to Workers: Inspection and Investigations."
- 10 CFR Part 20, "Standards for Protection Against Radiation," especially Subpart E - Radiological Criteria for License Termination. The requirements for release criteria are contained in 10 CFR 20.1402, 20.1403, and 20.1404. The requirements for final status surveys are contained in 10 CFR 20.1501(a).
- 10 CFR Part 30, "Rules of General Applicability to Domestic Licensing of Byproduct Material." Termination of licenses and decommissioning are discussed in 10 CFR 30.36. Financial assurance requirements are found in 10 CFR 30.35 and 30.36. Completeness and accuracy of the radiation safety records and information provided to NRC is addressed in 10 CFR 30.9.
- 10 CFR Part 40, "Domestic Licensing of Source Material." Termination of licenses and decommissioning are discussed in 10 CFR 40.42. Financial assurance requirements are found in 10 CFR 40.36 and 40.42. Completeness and accuracy of the radiation safety records and information provided to NRC is addressed in 10 CFR 40.9. Note that this guidance does not apply to uranium recovery facilities.
- 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."
- 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material." Termination of licenses and decommissioning are discussed in 10 CFR 70.38. Financial assurance requirements are found in 10 CFR 70.25 and 70.38. Completeness and accuracy of the radiation safety records and information provided to NRC are addressed in 10 CFR 70.9.

- 10 CFR Part 71, "Packaging and Transportation of Radioactive Material." Part 71 requires that licensees or applicants who transport licensed material, or who may offer such material to a carrier for transport, must comply with the applicable requirements of the DOT that are found in 49 CFR Parts 170 through 189. Copies of DOT regulations can be ordered from the Government Printing Office (GPO), whose address and telephone number are listed below.
- 10 CFR Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste." Termination of licenses and decommissioning are discussed in 10 CFR 72.54. Financial assurance requirements are found in 10 CFR 72.30 and 72.54. Criteria for decommissioning are found in 10 CFR 72.130. Completeness and accuracy of the radiation safety records and information provided to NRC are addressed in 10 CFR 72.11.

4.4 DECOMMISSIONING INSPECTION MANUAL CHAPTERS

- Inspection Manual Chapter 2605, "Decommissioning Procedures for Fuel Cycle and Materials Licensees," November 1996.
- Inspection Manual Chapter 2602, "Decommissioning Inspection Program for Fuel Cycle Facilities and Materials Licensees," June 1997.

4.5 DECOMMISSIONING INSPECTION PROCEDURES

- Inspection Procedure 87104, "Decommissioning Inspection Procedure for Materials Licensees," June 1997.
- Inspection Procedure 88104, "Decommissioning Inspection Procedure for Fuel Cycle Facilities," June 1997.
- Inspection Procedure 83890, "Closeout Inspection and Survey," March 1994.
- Temporary Instruction 2800/026, "Follow-up Inspection of Formerly Licensed Sites Identified as Potentially Contaminated," July 2000.

4.6 OTHER NRC DOCUMENTS REFERENCED THIS NUREG WITH APPLICATION OUTSIDE OF DECOMMISSIONING

- Branch Technical Position, "License Condition for Leak Testing Sealed Byproduct Material Sources," April 1993.
- Branch Technical Position, "License Condition for Leak Testing Sealed Plutonium Sources," April 1993.
- Branch Technical Position, "License Condition for Leak Testing Sealed Source Which Contains Alpha and/or Beta-Gamma Emitters," April 1993.

- Branch Technical Position, "License Condition for Leak Testing Sealed Uranium Sources," April 1993.
- Information Notice 94-07, "Solubility Criteria for Liquid Effluent Releases to Sanitary Sewerage Under the Revised 10 CFR Part 20," January 28, 1994.
- Information Notice 94-23, "Guidance to Hazardous, Radioactive and Mixed Waste Generators on the Elements of a Waste Minimization Program," March 25, 1994.
- Information Notice 96-28, "Suggested Guidance Relating to Development and Implementation of Corrective Action," May 1, 1996.
- Information Notice 97-55, "Calculation of Surface Activity for Contaminated Equipment and Materials," July 23, 1997.
- NUREG-0041, Rev. 1, "Manual of Respiratory Protection Against Airborne Radioactive Material," October, 1976.
- NUREG-1460, Rev. 1, "Guide to NRC Reporting and Recordkeeping Requirements," July 1994.
- NUREG-1556. Vol. 15, "Guidance About Changes of Control and About Bankruptcy Involving Byproduct, Source or Special Nuclear Material Licenses," November 2000.
- NUREG-1600, "General Statement of Policy and Procedures for NRC Enforcement Actions," May 1, 2000.
- NUREG-1660, "Specific Schedules of Requirements for Transport of Specified Types of Radioactive Material Consignments," November, 1998.
- NUREG-1748, "Environmental Review Guidance for Licensing Actions Associated with NMSS Programs," September 2001.
- Regulatory Guide 1.23, "Onsite Meteorological Programs," February 1972.
- Regulatory Guide 1.86, "Termination of Operating Licenses for Nuclear Reactors," June 1974.
- Regulatory Guide 3.71, "Nuclear Criticality Safety Standards for Fuels and Materials Facilities," August 1998.
- Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment," February 1979.
- Regulatory Guide 4.16, "Monitoring and Reporting Radioactivity in Releases of Radioactive Materials in Liquid and Gaseous Effluents from Nuclear Fuel Processing and Fabrication Plants and Uranium Hexafluoride Production Plants," December 1985.
- Regulatory Guide 4.20, "Contraint on Releases of Airborne Radioactive Materials to the Environment for Licensees Other Than Power Reactors," December 1996.
- Regulatory Guide 8.4, "Direct-reading and Indirect-reading Pocket Dosimeters," February 1973.

- Regulatory Guide 8.7, "Instructions for Recording and Reporting Occupational Radiation Exposure Data," June 1992.
- Regulatory Guide 8.9, "Acceptable Concepts, Models Equations, and Assumptions for a Bioassay Program," July 1993.
- Regulatory Guide 8.15, "Acceptable Programs for Respiratory Protection," October 1999.
- Regulatory Guide 8.21, "Health Physics Surveys for Byproduct Material at NRC-Licensed Processing and Manufacturing Plants," October, 1979.
- Regulatory Guide 8.23, "Radiation Surveys at Medical Institutions," January 1981.
- Regulatory Guide 8.24, "Health Physics Surveys During Enriched Uranium-235 Processing and Fuel Fabrication," October 1979.
- Regulatory Guide 8.25, "Air Sampling in the Workplace," June 1992.
- Regulatory Guide 8.28, "Audible-Alarm Dosimeters," August 1981.
- Regulatory Guide 8.34, "Monitoring Criteria and Methods to Calculate Occupational Radiation Doses," July 1992.
- Regulatory Guide 8.36, "Radiation Dose to the Embryo/Fetus," July 1992.
- Regulatory Guide 8.37, "ALARA Levels for Effluents from Materials Facilities," July 1993.

4.7 DECOMMISSIONING DOCUMENTS REFERENCED IN THIS NUREG

- "Action Plan to Ensure Timely Cleanup of Site Decommissioning Management Plan Sites," 57 FR 13389, April 1992.
- Information Notice 96-47, "Recordkeeping, Decommissioning Notification for Disposals of Radioactive Waste by Land Burial Authorized Under Former 10 CFR 20.304, 20.302 and 20.2002," August 16, 1996
- NUREG/BR-0241, "NMSS Handbook for Decommissioning Fuel Cycle and Materials Licensees," March 1997.
- NUREG-0586, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities," August 1988.
- NUREG-1496, "Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities," July 1997.
- NUREG-1506, "Measurement Methods for Radiological Surveys in Support of New Decommissioning Criteria," August 1995.

- NUREG-1507, "Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions," August 1995.
- Draft NUREG-1549, "Decision Methods for Dose Assessment to Comply with Radiological Criteria for License Termination," July 1998.
- NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), Rev. 1," August 2000.
- NUREG-1727, "NMSS Decommissioning Standard Review Plan," September 2000.
- NUREG/CR-5512, Volume 1, "Residual Radioactive Contamination from Decommissioning: Technical Basis for Translating Contamination Levels to Annual Total Effective Dose Equivalent," October 1992.
- Draft NUREG/CR-5512, Volume 2, "Residual Radioactive Contamination from Decommissioning: User's Manual DandD Version 2.1," April 2001.
- Draft NUREG/CR-5512, Volume 3, "Residual Radioactive Contamination From Decommissioning: Parameter Analysis," October 1999.
- Draft NUREG/CR-5512, Volume 4, "Comparison of the Models and Assumptions used in the DandD 1.0, RESRAD 5.61, and RESRAD-Build Computer Codes with Respect to the Residential Farmer and Industrial Occupant Scenarios Provided in NUREG/CR-5512," October 1999.
- NUREG/CR-5621, "Groundwater Models in Support of NUREG/CR-5512," December 1998.
- NUREG/CR-5849, "Manual for Conducting Radiological Surveys in Support of License Termination," Draft for Comment, June 1992.
- NUREG/CR-6692, "Probabilistic Modules for the RESRAD and RESRAD-Build Computer Codes," November 2000.
- Policy and Guidance Directive Fuel Cycle 83-23, "Termination of Byproduct, Source and Special Nuclear Material Licenses," November 4, 1983.

4.8 PUBLIC INTERACTION DOCUMENTS REFERENCED IN THIS NUREG

- NUREG/BR-0199, "Responsiveness to the Public," January 1996.
- NUREG/BR-0224, "Guidelines for Conducting Public Meetings," February 1996.
- U.S. Nuclear Regulatory Commission, "Management Directive 3.4, Release of Information to the Public," December 1, 1999.
- U.S. Nuclear Regulatory Commission, "Management Directive 3.5, Public Attendance at Certain Meetings Involving NRC Staff," May 24, 1996.

- U.S. Nuclear Regulatory Commission, "Policy Statement on Staff Meetings Open to the Public," 65 FR 56964, September 20, 2000.
- U.S. Nuclear Regulatory Commission, "Public Outreach Handbook," March 1995.
- U.S. Nuclear Regulatory Commission, "Regulation of Decommissioning Communications Plan," March 26, 2001.

4.9 OTHER DOCUMENTS REFERENCED IN THIS NUREG

- American National Standards Institute (ANSI) - publications available at http://www.ansi.org.
- International Atomic Energy Agency (IAEA), No. 16, "Manual on Environmental Monitoring in Normal Operations," Vienna, 1996.
- IAEA, No. 18, "Environmental Monitoring in Emergency Situations," Vienna, 1966.
- IAEA Safety Series No. 41, "Objectives and Design of Environmental Monitoring Programs for Radioactive Contaminants," Vienna, 1975.
- Internation Commission on Radiological Protection (ICRP) 30, "Limits for Intakes of Radionuclides by Workers," 1978.
- National Fire Protection Association (NFPA) Standard 232, "Standards for the Protection of Records," 1986.
- National Council on Radiation Protection and Measurements (NCRP) Report 50, "Environmental Radiation Measurements," December 1976.
- NCRP Report 123, "Screening Models for Releases of Radionuclides to Atmosphere, Surface Water, and Ground," January 1996.
- NCRP Report 127, "Operational Radiation Safety Program," 1998.
- Slade, D. (ed.), "Meteorology and Atomic Energy - 1968," TID-24190, July 1968 (available from the National Technical Information Service, Springfield, Virginia).
- Thom, H.C.S., "New Distribution of Extreme Winds in the United States," Journal of the Structural Division, Proceedings of the American Society of Civil Engineers, pp. 1787-1801, July 1968.
- U.S. Department of Commerce, "Climatic Atlas of the United States," Environmental Data Service, Environmental Science Service Administration, Washington, D.C., 1968.
- U.S. Environmental Protection Agency, "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion," Federal Guidance Report No.11, September 1988.
- U.S. Geological Survey and U.S. Bureau of Mines, Circular 831, "Principles of a Resource/Reserve Classification for Minerals," Washington, D.C., 1980.

4.10 DOCUMENTS SUPERSEDED BY THIS REPORT

This report, when issued in final, will supersede the Regulatory Guides (RG) and Policy and Guidance Directives (P&GD) listed in Table 4.1 below, and they should no longer be used.

Table 4.1 List of Documents Superseded by this Report

Document Identification	Title	Date
RG 3.65	Standard Format and Content Decommissioning Plans for Licensees Under 10 CFR Parts 30, 40, and 70	6/89
RG 3.66	Standard Format and Content of Financial Assurance Mechanisms Required for Decommissioning Under 10 CFR Parts 30, 40, 70, and 72	6/90
P&GD FC 90-2	Standard Review Plan for Evaluating Compliance with Decommissioning Requirements for Source, Byproduct, and Special Nuclear Material License Applications	4/91
P&GD FC 91-2	Standard Review Plan: Evaluating Decommissioning Plans for Licensees Under 10 CFR Parts 30, 40, 70	8/91
P&GD FC 83-3	Standard Review Plan for Termination of Special Nuclear Material Licenses of Fuel Cycle Facilities	3/83

In addition, this report supersedes most of NUREG/BR-0241, "NMSS Handbook for Decommissioning Fuel Cycle and Materials Facilities," except for those portions of the handbook covering decommissioning financial assurance and recordkeeping (Chapter 5 and Appendices D and P).

Volume 1 of this NUREG also incorporates and updates numerous portions of NUREG-1727, "NMSS Decommissioning Standard Review Plan," specifically, Chapters 1-4, 8-13, portions of 14 and 15, 16, and Appendix A, portions of Appendix C dealing with screening, I, and J. While these Chapters and Appendices have been incorporated into this NUREG, they are not superseded until completion of this NUREG series. This 3-volume NUREG series will, when complete, supersede NUREG/BR-0241 and NUREG-1727 in their entirety. Until then NUREG-1727 can continue to be used as guidance for decommissioning.

4.11 TO REQUEST COPIES

To request copies of the regulations cited in Section 4.3, call GPO's order desk in Washington, DC, at (202) 512-1800. Order the two-volume bound version of Title 10, Code of Federal Regulations, Parts 0-50 and 51-199 from the GPO, Superintendent of Documents, Post Office Box 371954, Pittsburgh, Pennsylvania 15250-7954. You may also contact the GPO electronically at <http://www.gpo.gov>. Request single copies of NRC documents from NRC's Regional Offices (see Figure 2.1 for addresses and telephone numbers). Note that NRC publishes amendments to its regulations in the *Federal Register.*

Appendix I explains how to use the Internet to obtain copies of NRC documents and other information.

5 THE DECOMMISSIONING PROCESS

NOTE: In addition to the guidance in this chapter, licensees are encouraged to contact NRC, or the appropriate Agreement State authority, to assure an understanding of what actions should be taken to initiate and complete the license termination process on a license-specific or facility-specific basis.

Decommissioning means to safely remove a facility from operations and reduce remaining radioactive contamination to levels that permit license termination. The following sections discuss timing and activities associated with decommissioning.

10 CFR 20.1406 establishes requirements on minimizing contamination during operations. While the requirements apply only to applications filed after August 20, 1997, all licensees are strongly encouraged to remediate any contamination immediately after it occurs. If license amendments to authorize specific activities are necessary to remediate the results of unplanned events, these actions should be initiated promptly. If contamination is reduced to acceptable release levels during the operational phase of the facility, it will significantly reduce the regulatory burden during decommissioning. For example, if any remaining contamination (after operations cease) can be remediated without new procedures or activities, a decommissioning plan (DP) may not be required.

5.1 TIMING OF DECOMMISSIONING

Decommissioning normally occurs after a licensee decides to stop operating. However, there are other requirements to decommission parts of a facility prior to complete shutdown (see 10 CFR 30.36(d), 40.42(d), 70.38(d), and 72.54(d)). Collectively, these are known as the Timeliness Rule. In short, any separate building or area that has not been used for two years must be promptly remediated if the remediation activities are allowed by the existing license (see Section 15.5 for an additional discussion of Partial Site Decommissioning). If the remediation activities are not currently allowed under an existing license, the licensee must develop a DP and submit a request for a license amendment within one year. The decommissioning process is to be completed within two years, unless an alternative schedule is approved. Figure 5.1 shows how to determine if decommissioning is needed and the actions necessary to achieve it.

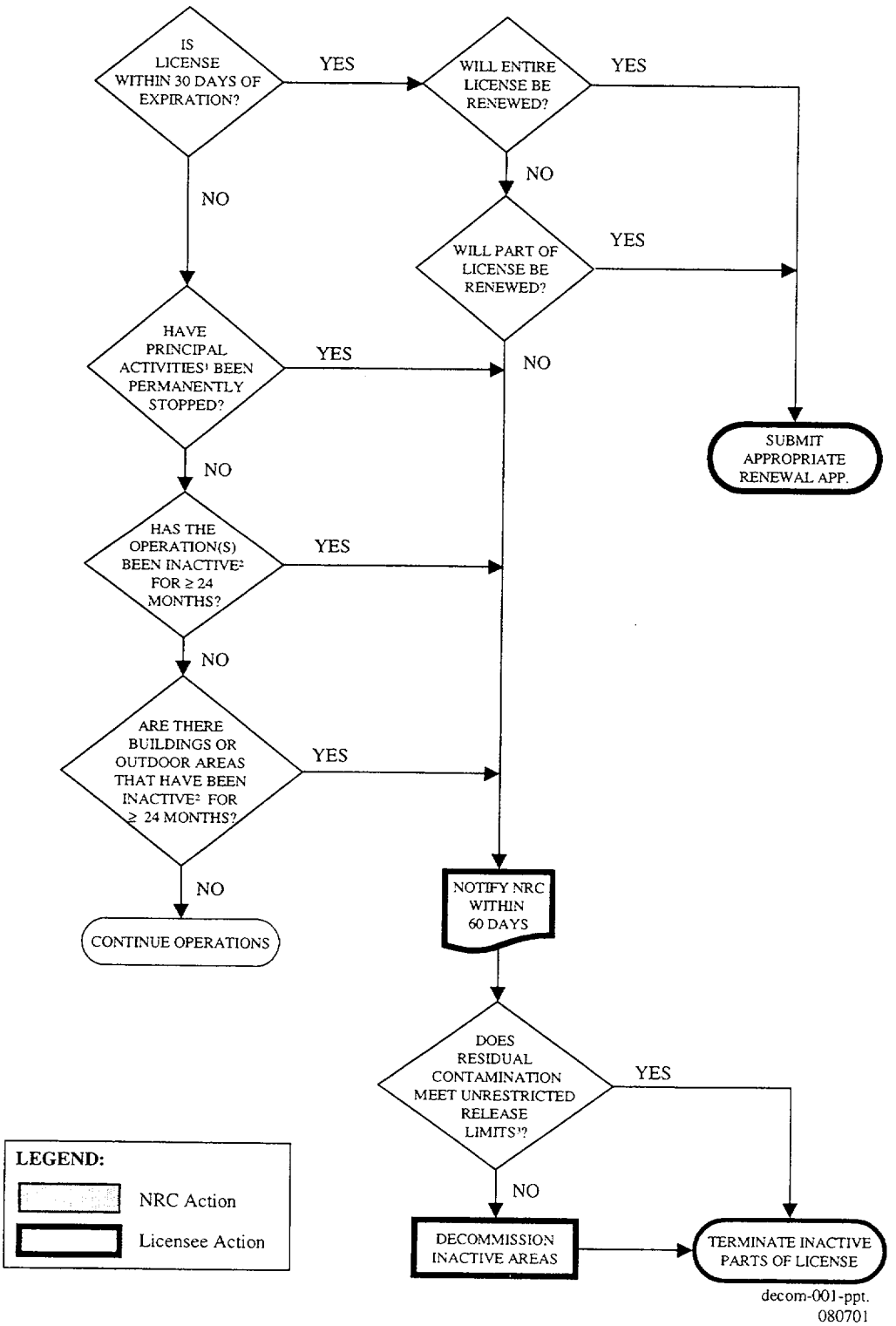

Figure 5.1 Do I Need to Decommission?

Notes:

1 Principal activities are defined as those identified in the license and necessary supporting functions.

2 Inactive means not used for principal activities for a period of > 24 months.

3 10 CFR 20 Subpart E defines limits for residual contamination based on calculated dose; 10 CFR 20.1402 defines unrestricted release limits ≤25 mrem/yr plus ALARA to an average member of the critical group for the approved land use scenario.

Licensed facilities convert from "Active" status to "Decommissioning" status when:

- The license expires or is revoked by the Commission.
- The licensee decides to permanently cease operations with licensed material at the entire site or in any separate building or outdoor area that contains residual radioactivity, such that the area is unsuitable for release in accordance with NRC requirements.[4]
- 24 months have elapsed since principal activities have been conducted under the license, or
- No principal activities have been conducted in a separate building or outdoor area for a period of 24 months, and residual radioactivity is present that would preclude its release in accordance with NRC requirements.

Within 60 days of the occurrence of any of the above, the licensee is required to inform NRC of the occurrence in writing. In addition, the licensee is required to: (1) begin decommissioning the facility; or (2) within 12 months, submit a DP to NRC and begin decommissioning in accordance with the plan when it is approved by NRC. Unless otherwise approved by NRC, licensees are required to complete decommissioning their facilities within 24 months of initiating decommissioning operations.

NRC staff has also determined that the final rule on decommissioning materials facilities applies to previous onsite burials of radioactive material, if the former disposal site met the definition of an inactive outdoor area. NRC regulations require licensees to notify NRC if they have burial sites that may require decommissioning and to maintain records of these burials. Disposals made pursuant to former 10 CFR 20.304, 20.302 and current 20.2002 at facilities licensed under 10 CFR Parts 30, 40, 70, and 72, and that have been unused for NRC licensed operations for a period of 24 months, are subject to the requirements of the Timeliness Rule. The requirements for recordkeeping and application of the timeliness rule to former on-site disposals are discussed in Information Notice 96-47, "Recordkeeping, Decommissioning Notification for Disposals of Radioactive Waste by Land Burial Authorized under Former 10 CFR 20.304, 20.302 and 20.2002," August 16, 1996 (see Volume 3 of this NUREG series).

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[4] Outdoor areas where radioactive materials were used that currently meet NRC's criteria for unrestricted use are not subject to the timeliness rule's notification requirements.

Pursuant to 10 CFR 30.36(f), 40.42(f), 70.38(f), and 72.54(f)(1), the Commission may grant a request to extend the time periods outlined above, if the Commission determines that the relief is not detrimental to the public health and safety and is otherwise in the public interest. In order for a licensee's request for an alternative schedule to be considered, the licensee must submit the request to the Commission not later than 30 days before notification is required (e.g., not later than 30 days after the facility converts from "active" to "decommissioning" status). The schedule for decommissioning the site will be held in suspension until a decision on the licensee's request is made by the Commission.

The Timeliness Rule provides for two alternative schedules: (1) an alternative schedule for submitting a decommissioning plan; and (2) an alternative schedule for completion of site decommissioning. The Commission may approve an alternate DP submission date after considering the following:

- If the Commission determines the alternative schedule is necessary for effective conduct of decommissioning operations;
- If the delay presents no undue risk from radiation to the public health and safety; and
- If the alternative DP submission schedule is otherwise in the public interest.

A request for an alternative schedule for completion of decommissioning may be approved, if warranted, after considering the following:

- Whether it is technically feasible to complete the decommissioning within the 24-month period;
- Whether sufficient waste disposal capacity is available to allow the completion of the decommissioning within the 24-month period;
- Whether a significant volume reduction in waste requiring disposal will be achieved by allowing short-lived radionuclides to decay;
- Whether a significant reduction in radiation exposure to workers can be achieved by allowing short-lived radionuclides to decay; and
- Other site-specific factors such as the regulatory requirements of other Agencies, lawsuits, ground water treatment activities, monitored natural groundwater restoration, actions that could result in more environmental harm than deferred cleanup, and other factors beyond the control of the licensee.

In addition, approval of the request must also be in the "public interest." NRC has determined that it is normally in the public's interest to have radiologically contaminated areas remediated soon after permanent cessation of operations. NRC has stated that "When decommissioning is delayed for long periods following cessation of operations, there is a risk that safety practices may become lax as key personnel relocate and management interest wanes. In addition, bankruptcy, corporate takeover, or other unforeseen changes in a company's financial status may

complicate and perhaps further delay decommissioning." (59 *Federal Register* 36027) Further, waste disposal costs have, in the past, increased at rates significantly higher than the rate of inflation and therefore delaying remediation will result in higher costs to the public if the government eventually assumes responsibility for the decommissioning. Therefore, in evaluating a licensee's request for an alternative completion schedule, NRC staff shall consider whether the licensee has adequately addressed how postponing decommissioning would be in the public's interest. For example, the licensee might demonstrate that delaying remediation reduces or eliminates overall health risk to the public and/or impact to the human environment and is thus in the "public interest."

5.2 DECOMMISSIONING PROCESS

The decommissioning process consists of a series of integrated activities, beginning with the licensee notifying NRC and changing the licensee's program from "active" to "decommissioning" status, and concluding with the termination of the license and release of the site pursuant to 10 CFR 30.36(k), 40.42(k), or 70.38(k). Depending on several factors, including the type of license, the use of radioactive material at the facility, or past management of radioactive material at the facility, the decommissioning may be either relatively simple and straightforward or complex.

While the steps may vary for different sites, the basic process is the same. Figure 5.2 illustrates the steps in a flow chart format, showing licensee and NRC actions. The steps in the process are:

- Stop operations, either in a specific area or building (see Chapter 15.5, Partial Site Decommissioning) or for the entire facility.
- Notify NRC of the decision within 60 days.
- Determine locations and concentrations of remaining radiological contamination.
- If necessary, develop a decommissioning plan (see Figure 5.3) that:
  - — Defines the current radiological contamination at the site;
  - — States the criteria for the final condition of the site;
  - — Identifies the activities to remediate existing contamination that are not currently authorized by the license;
  - — Includes procedures to protect workers;
  - — Includes decommissioning cost estimates;
  - — Specifies the final survey method to demonstrate compliance with NRC criteria; and
  - — Provides the schedule for remediation activities and license termination.
- If necessary, provide environmental information as described in Section 15.7, NEPA Compliance.

- Clean up contamination, as needed.
- Conduct Final Status Survey to show compliance with dose limits for license termination.
- Request that NRC terminate the license.

Note that it is important for licensees to notify NRC promptly when operations cease. It is also important that the staff meet with the licensee to discuss the decommissioning requirements early in the process.

5.3 DECOMMISSIONING PLAN REVIEW

If a DP is required, licensees are strongly encouraged to meet with NRC prior to the submittal of their DP and at any stage in this process. The conditions requiring a DP are specified in 10 CFR 30.36(g), 40.42(g), or 70.38(g). In short, a DP is required if one is specified in the existing license or if new activities or procedures -- those not currently authorized in the license -- are needed to conduct remediation. Figure 5.3 illustrates these conditions in the form of a flowchart; if any of the specified conditions exist, a DP is required. The DP is processed as follows (see Figure 5.2):

- Licensee submits DP for all or part of the facility.
- NRC conducts an acceptance review to decide if the plan is complete:
  - — NRC determines if all of the items identified in Chapters 16 and 17 and Appendix D (Acceptance Review Checklist) are present.
  - — NRC determines if there is sufficient information in each section for NRC to evaluate the proposed decommissioning alternative.
    - Current condition of site;
    - Release criteria and important values (e.g., residual concentrations);
    - Land use scenario and critical group(s) (See Consolidated NMSS Decommissioning Guidance, Volume 2); and
    - Final survey plan.
- If the decommissioning plan is not complete, NRC rejects it, and the licensee is informed in writing.
- After acceptance for technical review, NRC conducts a detailed evaluation of the plan from environmental (NEPA) and safety perspectives.
- If the information in the plan is not sufficient for NRC to complete the environment and safety reviews, NRC requests additional information (RAI).
- Upon receipt of the RAI, the licensee revises the plan; the revised plan is reviewed, as above.
- NRC issues license amendment approving the DP.

- Once the plan is approved, the licensee implements the plan. NRC will conduct in-process inspections to verify compliance (see Section 15.3, Decommissioning Inspection Guidance).
- At the completion of remediation, the licensee conducts a final status survey to demonstrate compliance with license termination criteria.
- NRC verifies the survey by one or more of the following:
  - — QA/QC reviews;
  - — Side-by-side or split sampling; and
  - — Independent, confirmatory survey.
- If the survey does not demonstrate compliance, additional remediation and/or surveys are required.
- When the survey demonstrates compliance with release criteria, NRC terminates, or modifies the license for partial site release.

For sites that require a DP, the NRC publishes notices in the *Federal Register*. Once the NRC staff finds the DP is acceptable for review, NRC issues a *Federal Register* notice to announce: (1) staff consideration of a license amendment, (2) the receipt of the DP, (3) opportunity for a hearing, and (4) any public meetings. Following this, there may be a public meeting to discuss the proposed actions with interested and affected parties. Following approval of the DP, NRC issues a second *Federal Register* notice announcing approval of the DP and the environmental review's finding of no significant impact (FONSI). Appendix H contains examples of these *Federal Register* notices. NUREG-1748 contains detailed guidance concerning *Federal Register* notices for EAs and EISs. If a site is on the SDMP list, NRC also issues a *Federal Register* notice announcing removal of the site from the SDMP list at the completion of remediation.

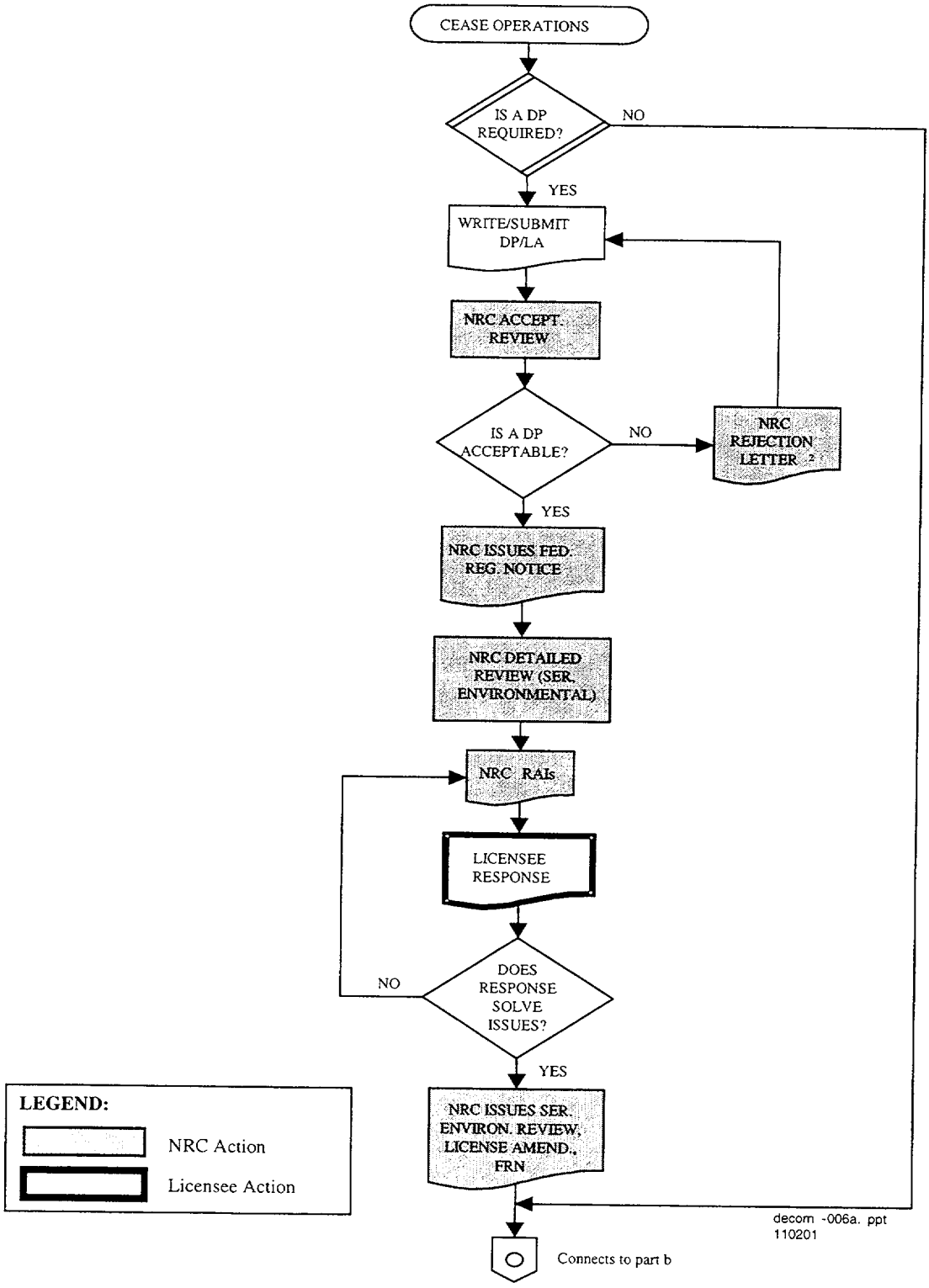

Figure 5.2a The Decommissioning Process (part 1 of 2).

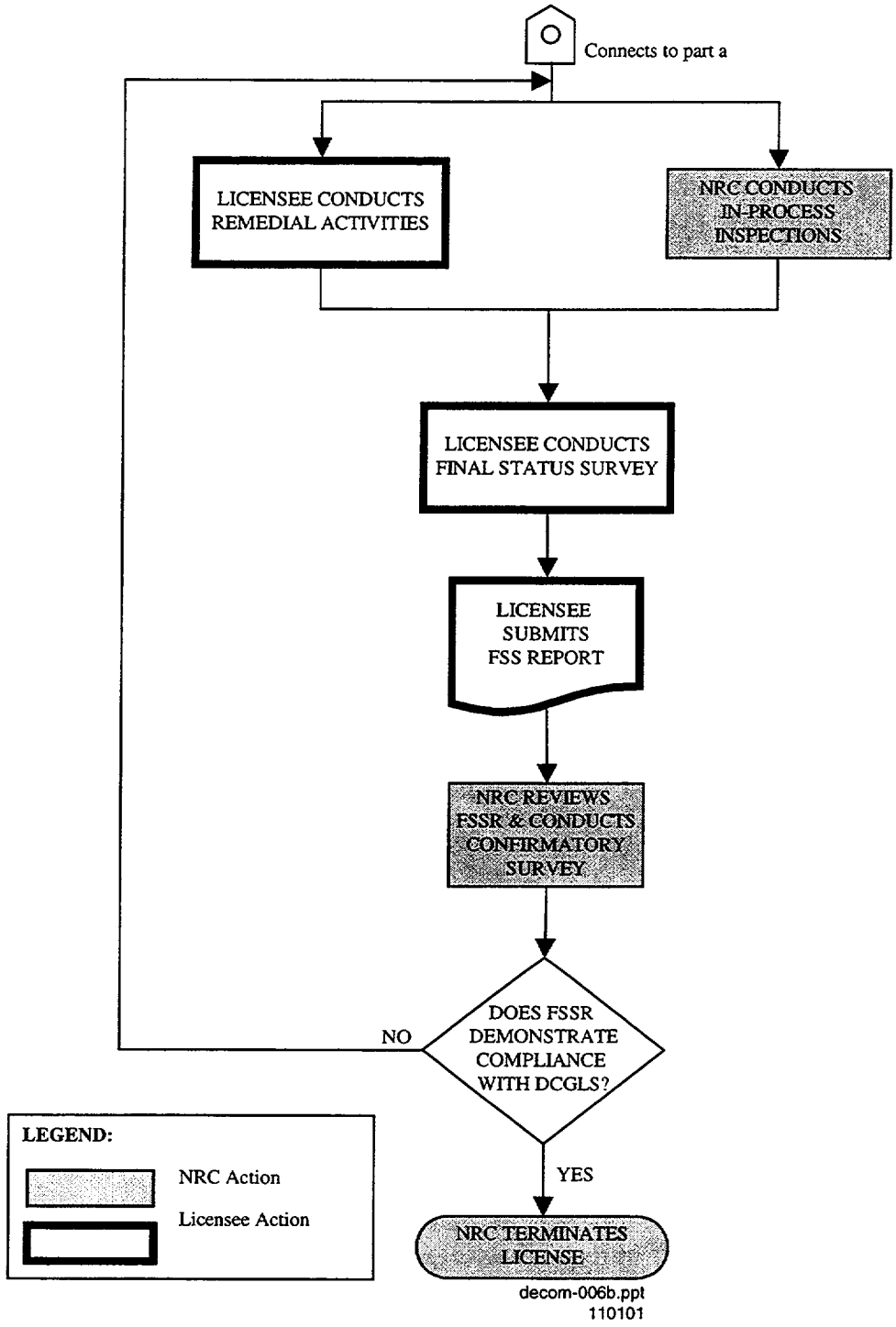

Figure 5.2b The Decommissioning Process (part 2 of 2).

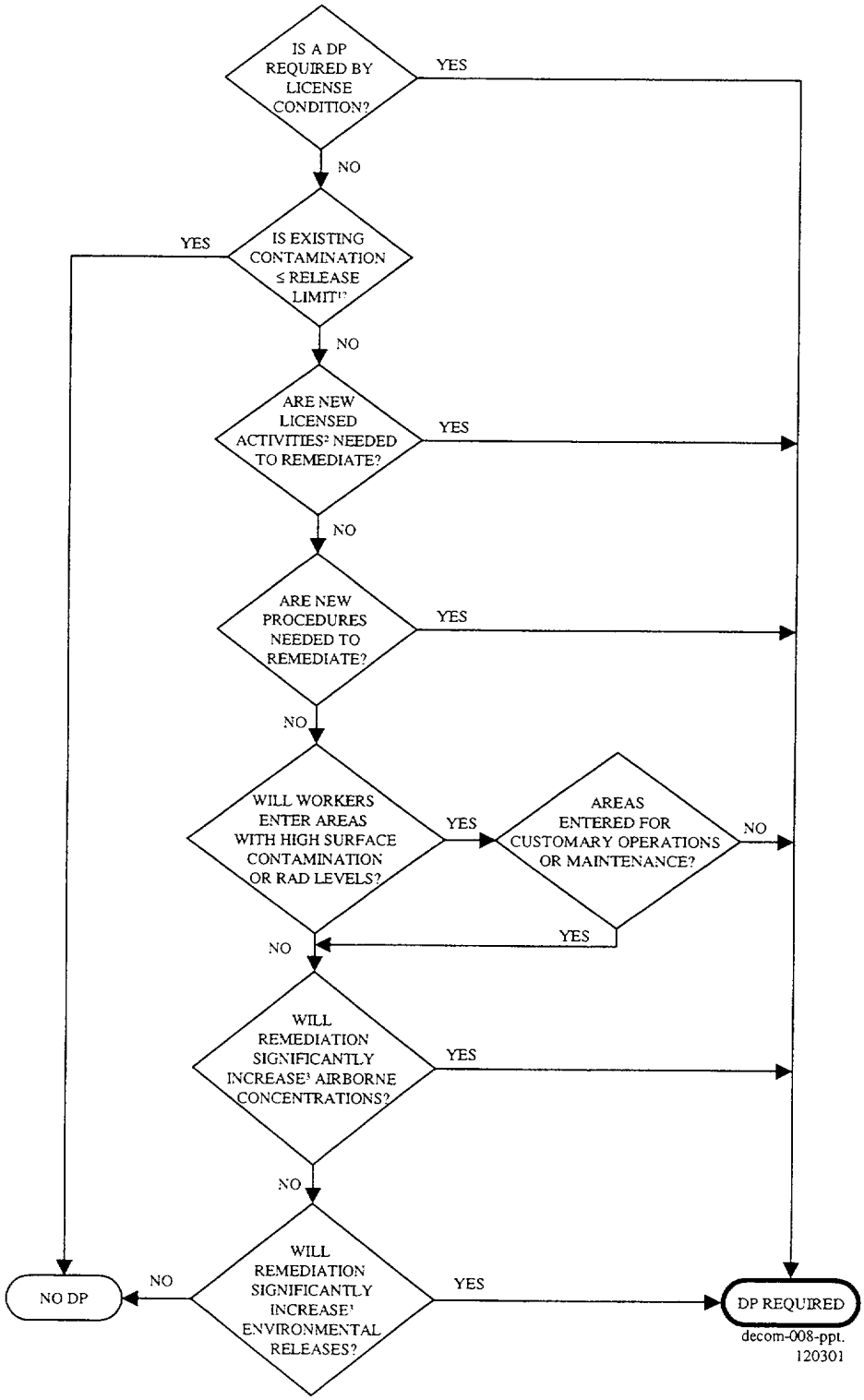

Figure 5.3 Is a Decommissioning Plan (DP) Required?

Notes

1 Release Limits are defined in 10 CFR 20 Subpart E.

2 New Licensed Activity means any activity at the facility involving radioactive materials that is not authorized in the current license. Examples of activities not typically authorized include building demolition and exhumation of burial areas.

3 Significantly increase means any increase that initiates or changes any report to NRC.

6 RADIOLOGICAL CRITERIA FOR DECOMMISSIONING

One of NRC's missions is to protect the public from unnecessary exposure to radiation from licensed facilities. 10 CFR 20 Subpart D specifies the limits NRC has determined are protective of public health and safety. Section 20.1301(a) requires licensees to "... conduct operations so that (1) the [TEDE] to individual members of the public from licensed operations does not exceed 0.1 rem [1 millisievert (mSv)] in a year ...." and "... (2) The dose in any unrestricted area ... does not exceed 0.002 rem (0.02 millsievert) in any one hour."

The use of a dose limit allows both the licensee and the regulator to take site-specific information into account in determining acceptable concentrations of residual radioactivity at the site using dose models and exposure scenarios that are as realistic as necessary. Chapter 1 describes the NRC Technical Basis for Dose Modeling Evaluations (Screening). This document discusses procedures, acceptance criteria, and evaluation findings acceptable to NRC staff for limited dose analyses. Dose analyses for more complicated decommissioning projects, that is, projects requiring collection of site-specific parameters and the submission of a Decommissioning Plan, are to be discussed in the Consolidated NMSS Decommissioning Guidance, Volume 2.

Dose-based requirements for licensees seeking license termination are found in 10 CFR 20, Subpart E. These regulations establish two final states for licensee termination: unrestricted use and restricted use. In addition to the specific limits for each state, specified below, NRC requires licensees to maintain doses as low as is reasonably achievable (ALARA). This means the licensee must make every reasonable effort to reduce the dose as far below the specified limits as is practical, taking into account the state of technology and economics (see 10 CFR 20.1003).

6.1 RESTRICTED USE

Residual radioactivity, distinguishable from background, results in a calculated dose from all pathways to the average member of the critical group that is not in excess of 25 mrem (0.25 mSv) per year.

6.2 RESTRICTED CONDITIONS

The basic requirement for license termination under restricted conditions is that the licensee provide institutional controls that limit the calculated dose to 25 mrem (0.25 mSv) per year. Further, the licensee must reduce residual contamination so that if these controls fail, the calculated dose would not exceed 100 mrem (1 mSv) per year. In rare instances, the calculated dose may exceed 100 mrem/yr, but it may not exceed 500 mrem/yr. Additional institutional controls would be established to meet regulatory requirements (see Chapter 13, Group 6 Decommissioning, for a discussion of institutional controls).

To qualify for license termination under restricted conditions, the licensee must meet several criteria:

1. Demonstrate that further reductions in residual contamination would either cause net environmental harm or are technically or economically not feasible;
2. Demonstrate provisions for legally enforceable controls to limit dose to 25 mrem (0.25 mSv) per year;
3. Provide financial assurance to allow a third party to control and maintain the site; and
4. Demonstrate that advice from affected parties on the adequacy of the proposed institutional controls and financial assurance has been obtained and used in developing the DP. See Chapter 17.8 for guidance on obtaining advice from the public.

6.3 ALTERNATE CRITERIA

In the unlikely event that a licensee is not able to reduce residual contamination to a level that limits the calculated dose such that it is not in excess of 25 mrem/year with restrictions in place, the licensee may request permission from the Commission to use alternate criteria. In doing so, the licensee must demonstrate that:

1. The calculated dose from all man-made sources is unlikely to exceed 100 mrem (1 mSv) per year by identifying these sources and the expected dose from each;
2. Institutional controls will minimize the dose from the site; and
3. The licensee has obtained public advice on the proposed institutional controls and financial assurance. See Chapter 17.7 for guidance on obtaining advice from the public.

The staff will review the application, publish a notice in the *Federal Register*, solicit comments from State and local governments and from potentially affected parties, Indian Nations, and from the EPA. The staff will then make a recommendation. The Commission will consider the comments from the public, the EPA, and the staff and make the final decision on the acceptability of the proposed criteria. See 10 CFR 20.1404(b) and 20.1405.

6.4 RELEASE CRITERIA

The NRC staff reviews the release criteria to verify that the licensee has developed appropriate release criteria, referred to as the derived concentration guideline levels (DCGLs). Volume 2 of this NUREG discusses the information to be submitted by the licensee and provides details of the staff's review.

6.5 GRANDFATHERED SITES

Sites being decommissioned under approved decommissioning plans, submitted before August 20, 1998, are grandfathered from the provisions of 10 CFR 20 Subpart E. Specifically, the criteria in the Site Decommissioning Mangement Plan (SDMP) Action Plan (57 FR 13389) are reasonably consistent with the dose-based criteria and are within the range of measurable values that could be derived through the site-specific screening and modeling approaches used in dose-based site analysis. See Section 15.6 for a discussion of SDMP sites. However, the grandfathering provision does not generally extend to all pre-license termination rule decommissioning actions, because they were not all done under the criteria of the SDMP Action Plan and therefore would not provide assurance that such actions were adequate to protect the public. NRC has conducted a systematic review of terminated licenses and identified any sites warranting further NRC attention under the requirements of 10 CFR 20, Subpart E.

7 DECOMMISSIONING GROUPS

NOTE: In addition to the guidance in this chapter, licensees are encouraged to contact NRC, or the appropriate Agreement State authority, to assure an understanding of what actions should be taken to initiate and complete the license termination process on a license-specific or facility-specific basis.

7.1 INTRODUCTION

Activities to decommission a site depend on the type of operations conducted by the licensee and the residual contamination. The various site conditions have been divided into seven decommissioning groups. These groups are defined below.

The decommissioning actions that are typically applicable to each decommissioning group are summarized in the following chapters. It is important to recognize that every applicable NRC action cannot be fully addressed. NRC staff and licensees should use the decommissioning groups described in this document as a general guide to the actions and scope of the decommissioning process, while remaining flexible with respect to the appropriate actions that they will be required to undertake.

Although it is anticipated that most licensees will fall under one of the decommissioning groups as described, it is not expected that all actions will be appropriate for each licensee. The intent is to present the general information needed by NRC and the actions to be taken by the licensee, recognizing that the unique nature of some facilities may require site-specific modifications to the procedures.

NRC will review the information supplied by the licensee to determine if the description of the current radiological status of the facility is adequate to allow NRC to fully understand the types, levels, and extent of radioactive material contamination at the facility. This information should include summaries of the types and extent of radionuclide contamination in all media at the facility, including buildings, systems and equipment, surface and subsurface soil, and surface and groundwater.

7.2 CRITERIA

Generally, the staff will evaluate the decommissioning of nuclear facilities using one of seven reviews (referred to as "Groups"), summarized below and described in the following sections. Groups 1 and 2 typically will not require a DP, and will be able to demonstrate compliance with 10 CFR Part 20.1402. Group 3 sites will require an abbreviated DP, without a site-specific dose modeling analysis. Group 4 through 7 sites and all Part 72 licensees are required to submit a DP with site-specific dose modeling in accordance with NRC regulations in 10 CFR 30.36(g)(1), 40.42(g)(1), 70.38(g)(1), or 72.54(d).

Figure 7.1 provides a decision tree for determining the appropriate decommissioning group.

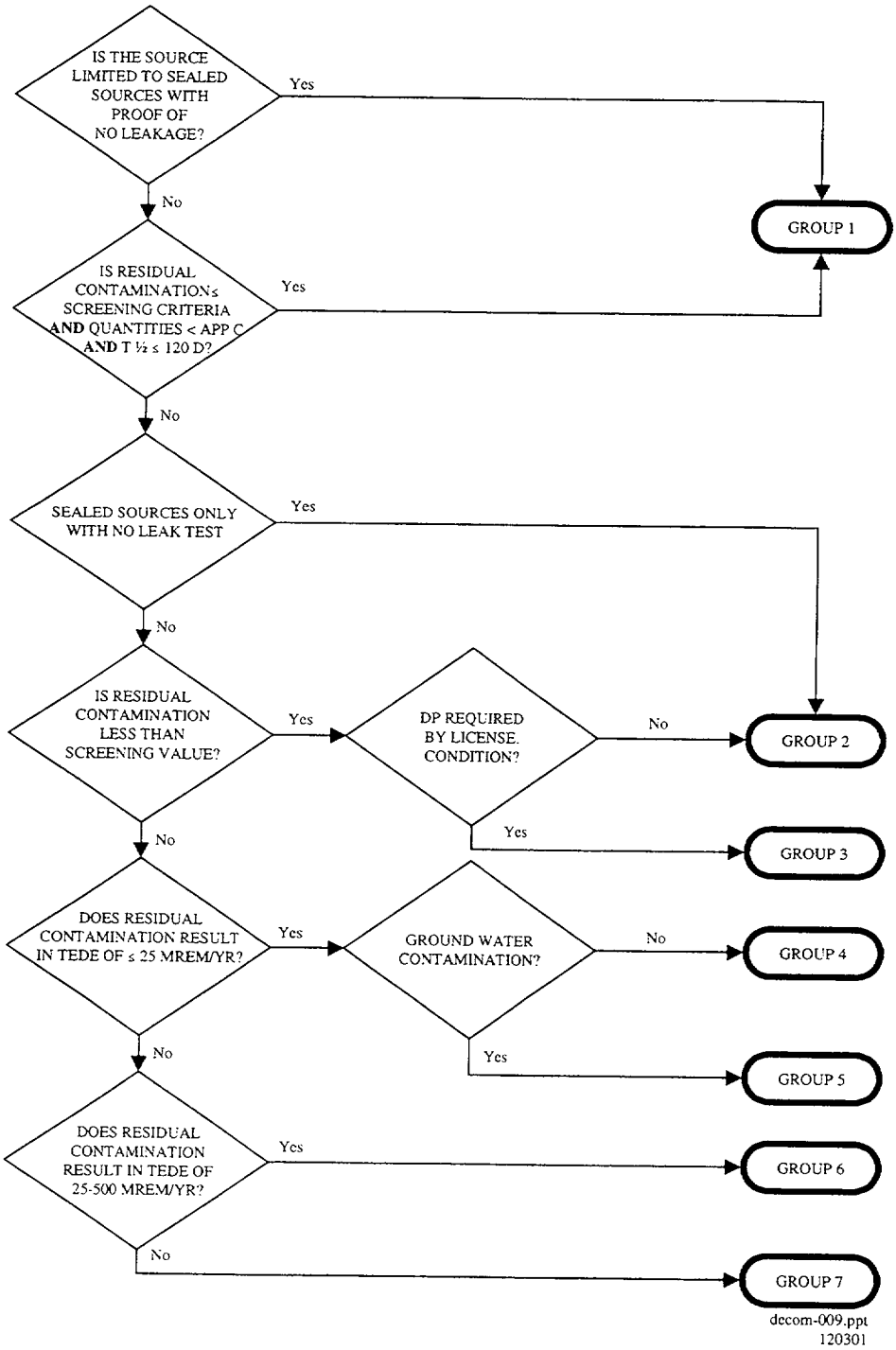

Figure 7.1 Determining the Appropriate Decommissioning Group.

7.3 GROUP 1: UNRESTRICTED RELEASE; NO DECOMMISSIONING PLAN REQUIRED

Group 1 facilities typically involve licensed material used in a way that would preclude its release into the environment, would not cause the activation of adjacent materials, or would not have contaminated work areas above the levels of the decommissioning screening criteria (see Appendix B). Activities that may fall into the Group 1 category are:

- Licensees who possessed and used only sealed sources, and whose most recent leak test results are current and demonstrate that the source(s) did not leak while in the licensee's possession; or
- The licensee possessed and used relatively short-lived radioactive material (i.e., $T_{1/2}$ less that or equal to 120 days) in an unsealed form and, within timeliness constraints, the maximum activity authorized under the license has decayed to less than the quantity specified in 10 CFR Part 20, Appendix C, **and** the licensee's survey, performed in accordance with 10 CFR Part 30.36, does not identify any residual levels of radiological contamination greater than decommissioning screening criteria.

7.4 GROUP 2: UNRESTRICTED RELEASE USING SCREENING CRITERIA; NO DECOMMISSIONING PLAN REQUIRED

Group 2 facilities may have residual radiological contamination present in building surfaces and soils from radioisotopes with a half-life greater than 120 days. However, licensees are able to demonstrate that their facilities meet the provisions of 10 CFR 20.1402 (Radiological criteria for unrestricted use) by applying the screening approach dose analysis described in Chapter 9.

Additionally, licensees in Group 2 typically possess historical records of material receipt, use, and disposal, such that quantifying past radiological material possession and use may be developed with a high degree of confidence. Furthermore, these licensees have radiological survey records that characterize the residual radiological contamination levels present within the facilities and at their sites. That is, they are able to demonstrate residual radiological contamination levels without more sophisticated survey procedures (greater than those used for operational surveys) or dose modeling. These licensees do not need to use site-specific parameters or establish site-specific DCGLs in order to demonstrate acceptability for release of their sites.

For Group 2 facilities, a decommissioning plan is not required, but licensees will have to demonstrate that the site meets the screening criteria assumptions described in Chapter 1. A DP is not required, because worker cleanup activities and procedures are consistent with those approved for routine operations, and no dose analysis is required.

Activities that may fall into the Group 2 category are:

- The licensee possessed and used only sealed sources, but the most recent leak tests indicate that the sources leaked; or
- The licensee used unsealed radioactive material with a half-life less than 120 days and, within timeliness contraints, the licensee's survey demonstrated that levels of radiological contamination on building surfaces or surface soils are less than decommissioning screening criteria.

7.5 GROUP 3: UNRESTRICTED RELEASE USING SCREENING CRITERIA; DECOMMISSIONING PLAN REQUIRED

NRC recognizes that circumstances exist where licensees possess prerequisite expertise, equipment and facilities to remediate their facilities, but have not incorporated remediation procedures into their license prior to license termination. A license amendment is necessary to authorize the activities for decommissioning. Group 3 facilities could meet the Group 2 criteria, but they need to submit a decommissioning plan, and their license needs to be amended to modify or add to existing procedures, in order to remediate buildings or sites.

For Group 3 facilities, licensees will also have to demonstrate that the site meets the screening criteria assumptions described in Chapter 1. A site-specific dose analysis is not required.

7.6 GROUP 4: UNRESTRICTED RELEASE WITH SITE-SPECIFIC DOSE ANALYSIS AND NO GROUND WATER CONTAMINATION; DECOMMISSIONING PLAN REQUIRED

Group 4 facilities have residual radiological contamination present in building surfaces and soils, but the licensee cannot meet, or chooses not to use, screening criteria, and the ground water is not contaminated. The licensees are able to demonstrate that residual radioactive material may remain at their site but within the levels specified in NRC's criteria for unrestricted use (10 CFR 20.1402, Radiological criteria for unrestricted use) by applying site-specific criteria in a comprehensive dose analysis.

A site DP is required and must characterize the location and extent of radiological contamination. The DP must also identify the land use, exposure pathways, and critical group for the dose analysis.

7.7 GROUP 5: UNRESTRICTED RELEASE WITH GROUND WATER CONTAMINATION; DECOMMISSIONING PLAN REQUIRED

Group 5 facilities have residual radiological contamination present in building surfaces, soils, and the ground water. The licensees are able to demonstrate that residual radioactive material may remain at their site but within the levels specified in NRC's criteria for unrestricted use (10 CFR 20.1402, Radiological criteria for unrestricted use) by applying site-specific criteria in a comprehensive dose analysis.

A site DP is required and must characterize the location and extent of radiological contamination. The DP must also identify the land use, exposure pathways, and critical group for the dose analysis.

7.8 GROUP 6: RESTRICTED RELEASE; DECOMMISSIONING PLAN REQUIRED

Group 6 facilities have residual radiological contamination present in building surfaces, soils, and possibly the ground water. The licensees are able to demonstrate that proposed residual radioactivity at the facility is in excess of the levels specified in NRC's criteria for unrestricted use but within the levels specified for restricted use (10 CFR 20.1403) by applying site-specific criteria in a comprehensive dose analysis.

A site DP is required and must characterize the location and extent of radiological contamination. The DP must also identify the land use, exposure pathways, institutional controls, and critical group for the dose analysis.

These sites require extensive NRC review and are typically handled on a case-by-case basis.

7.9 GROUP 7: RESTRICTED RELEASE USING ALTERNATE CRITERIA; DECOMMISSIONING PLAN REQUIRED

Group 7 facilities have residual radiological contamination present in building surfaces, soils, and possibly ground water. These licensees intend to decommission their facilities such that residual radioactive material remaining at their site is in excess of the levels specified in NRC's criteria for unrestricted use. The licensees will apply site-specific criteria in a comprehensive dose analysis in accordance with alternate criteria for license termination (10 CFR 20.1404). A site DP that identifies the land use, exposure pathways, institutional controls, and critical group for the dose analysis is required. These sites require extensive NRC review and are handled on a case-by-case basis. License termination must be approved by a vote of the NRC Commissioners.

8 GROUP 1 DECOMMISSIONING

NOTE: In addition to the guidance in this chapter, licensees are encouraged to contact NRC, or the appropriate Agreement State authority, to assure an understanding of what actions should be taken to initiate and complete the license termination process on a license-specific or facility-specific basis.

8.1 INTRODUCTION

Group 1 decommissioning activities involve licensees only using licensed material in a manner that would preclude release of the licensed material to the environment, would not cause the activation of adjacent materials, or would not contaminate work areas above the levels of the decommissioning screening criteria (Appendix B). Termination of these licenses would not require the licensee to submit a DP. Group 1 includes the following licensees:

- Licensees that possessed and used only sealed sources and whose most recent leak tests are current and demonstrate that the sealed sources did not leak while in the licensee's possession.
- Licensees that possessed and used relatively short-lived radioactive material (i.e., $T_{1/2}$ less than or equal to 120 days) in an unsealed form, the maximum activity authorized under the license has decayed to less than the quantity specified in 10 CFR Part 20, Appendix C, and the licensee's survey performed in accordance with 10 CFR Part 30.36 does not identify any residual levels of radiological contamination greater than decommissioning screening criteria.

8.2 LICENSEE ACTIONS

For Group 1 decommissioning, the following licensee actions are required:

- Notify NRC as required by 10 CFR 30.36(d), 40.42(d), and 70.38(d).
- Dispose of the licensed material in accordance with NRC requirements, usually by returning the material to the manufacturer.
- For other than sealed sources, perform a Final Status Survey (FSS) and submit the results in accordance with 10 CFR 30.36(k), 40.42(k), or 70.38(k), or demonstrate that the facility, or portion of the facility, meets NRC's criteria for unrestricted use by using the dose screening methodology described in Section 1.4.
- Guidance on surveys is found in Figure 8.1 below, Section 15.4 of this volume, and Consolidated NMSS Decommissioning Guidance, Volume 2.
- For all sealed sources, including those no longer in licensee's possession, provide to NRC results from the most recent leak tests demonstrating there has been no leakage.

- Transfer the decommissioning records discussed in 10 CFR 30.35, 30.36, and 30.51; 40.36, 40.42, and 40.61; or 70.25, 70.38, and 70.51, as appropriate, or affirm that they are not required to retain or transfer these records.
- Submit NRC Form 314, "Certificate of Disposition of Materials," or equivalent information to NRC. Written confirmation from the recipient listed on NRC Form 314 that the material has been transferred to them should be attached to the Form 314. An example of NRC 314 is shown in Appendix A.

SIMPLIFIED SURVEY PROCEDURES

In preparing for the FSS, the licensee should establish a method to identify individual measurement/sampling points on each surface in the indoor area that was involved in licensed material use. At a minimum, the licensee's termination survey should consist of:

- 100% scanning of all surfaces in the area of the facility where licensed material was used or stored, using an appropriate radiation detection instrument (including scan sensitivity);
- Evaluations for total and removable radioactive material at each area exhibiting elevated radiation levels, or at a frequency of one wipe comprising 100 cm^2 per 300 ft^2; and
- Evaluations of radiation levels at one meter above surfaces.
- Particular attention should be afforded any drains, air vents, or other fixtures or equipment that may have become contaminated during licensed material use. This is especially significant in situations where renovations have occurred and potentially contaminated areas may be inaccessible under current conditions.

Figure 8.1 Simplified Survey Procedures

8.3 NRC ACTIONS

For Group 1 decommissioning, the following are NRC actions:

- Determine that the facility meets the Group 1 criteria.
- After verifying the disposition of the licensed material, review the information submitted by the licensee to demonstrate that its facility is suitable for unrestricted use.
- If the licensee has submitted leak test results, verify that the type and number of sources on the license and NRC Form 314 are in agreement and the most recent leak test results are current and indicate that the sources did not leak.
- If an FSS is submitted, review it, paying particular attention to anomalies such as the use of inappropriate radiation survey and analytical instrumentation, incomplete evaluation of radioactive material use/storage areas, and spurious survey results.

- If the licensee's FSS does not appear valid or if the leak test results are inconclusive with respect to the condition of the sealed sources, contact the licensee.
- An environmental assessment for termination of the license is not required, since this action is categorically excluded under 10 CFR 51.22(c)20.
- Notify the licensee by license amendment after the NRC has verified the suitability of its facility for unrestricted use. This amendment shall be placed in the license docket file, and the license shall be terminated. The completed license amendment and transmittal letter shall be included in the official docket file for the license, and a copy shall be placed into the NRC's Agencywide Documents Access and Management System (ADAMS).
- Retire the records in accordance with current records management guidance (e.g., RMG 92-01 and 93-03, or see Volume 3). Retired records shall be included in the official docket file for the license, and a copy shall be placed into ADAMS.

9 GROUP 2 DECOMMISSIONING

NOTE: In addition to the guidance in this chapter, licensees are encouraged to contact NRC, or the appropriate Agreement State authority, to assure an understanding of what actions should be taken to initiate and complete the license termination process on a license-specific or facility-specific basis.

9.1 INTRODUCTION

Licensees who decommission under Group 2 did not have unmonitored releases into the environment and did not activate adjacent materials. These licensees would not be able to decommission under Group 1 because levels of persistent contamination of work areas, building surfaces, and limited surface soil contamination may exist.

Group 2 includes the following licensees:

- Licensees that can demonstrate compliance with 10 CFR Part 20.1402 (Radiological criteria for unrestricted use) using the screening methodology discussed in Section 1.4;
- Licensees that possess and use only sealed sources that cannot demonstrate current leak tight integrity; and
- Licensees who only possess radioactive material with half-lives of less than 120 days but fail the Group 1 criteria.

Licensees decommissioning under Group 2 would not be required to develop a DP (10 CFR 30.36(f)(1), 40.42(f)(1), and 70.38(f)(1)) for the following reasons:

- Decommissioning workers would not be entering areas normally occupied where surface contamination and radiation levels are significantly higher than routinely encountered during operation;
- Procedures would involve techniques applied routinely during cleanup or maintenance operations;
- Procedures would not result in significantly greater airborne concentrations of radioactive materials than are present during operation; and
- Procedures would not result in significantly greater releases of radioactive material to the environment than those associated with operation.

9.2 LICENSEE ACTIONS

Although submission of a DP is not required for decommissioning under Group 2, these licensees are required to determine the radiological status of their facility and demonstrate that their facility meets NRC's requirements for unrestricted use. This is accomplished by remediating the site as necessary, performing an FSS, and conducting dose evaluations using the screening methodology described in Section 1.4.

For Group 2 decommissioning, the following licensee actions are required:

- Notify NRC as required by 10 CFR 30.36(d), 40.42(d), and 70.38(d).
- Dispose of the licensed material in accordance with NRC requirements, usually by returning sealed sources to the manufacturer or disposing of licensed material as outlined in the NRC regulations.
- For all sealed sources, including sources no longer in the licensee's possession, provide to NRC results from the most recent leak tests.
- Transfer the decommissioning records discussed in 10 CFR 30.35, 30.36, and 30.51; 40.36, 40.42, and 40.61; or 70.25, 70.38, 70.51, 72.30, and 72.80, as appropriate, or affirm that they are not required to retain or transfer these records.
- Determine the radiological status of the facility and perform further remediation, if necessary, to meet NRC's screening criteria for unrestricted use (10 CFR 20.1402).
- Submit an FSSR, or demonstrate that the facility, or portion of the facility, meets NRC's criteria for unrestricted use by using the dose screening methodology described in Section 1.4. Guidance on surveys is found in Section 15.4, Volume 2 of this guidance, and Figure 8.1.
- Submit NRC Form 314, "Certificate of Disposition of Materials," or equivalent information to NRC. Written confirmation from the recipient listed on NRC Form 314 that the material has been transferred to them should be attached to the Form 314. An example of NRC 314 is shown in Appendix A.

In performing the decommissioning of its facility, the licensee should first identify any areas in the facility that were involved in licensed material use by reviewing facility records and conducting a survey of the licensed material use area. This survey should be similar to the routine contamination surveys conducted under the licensee's radiological safety plan. The licensee should then remediate all surfaces in the areas at the facility that were involved in licensed material use or storage and dispose of all radioactive material and waste as discussed in the NRC regulations in 10 CFR Part 20, Subpart K.

If an FSS is required to demonstrate that its facility is suitable for unrestricted use, the licensee should design the survey so it is of sufficient scope and quality to make this demonstration. More information on surveys is contained in Figure 8.1, Section 15.4 of this volume, and Volume 2 of this NUREG.

9.3 NRC ACTIONS

For Group 2 decommissioning, the following are NRC actions:

- Determine whether the decommissioning meets the Group 2 criteria summarized above.
- Determine whether a Technical Assistance Control number for the decommissioning action should be assigned and, if so, arrange for one to be assigned to the decommissioning.
- Ensure that the notification of cessation of operations is placed in the licensee's docket file.
- For the EA, consider using the license termination rule Generic EIS, as described in Section 15.7 of this guidance.
- Acknowledge, in writing, the receipt of the notification and inform the licensee of any additional information required to support the licensee's request to terminate the license.
- NRC staff should contact the licensee by telephone to determine the licensee's estimated decommissioning schedule and confirm that the schedule conforms with NRC requirements. This information will be useful in scheduling any confirmatory surveys or closeout inspections that NRC may undertake as part of the decommissioning of the facility and ensure that the licensee will conduct the decommissioning of its facility in accordance with the schedules discussed in 10 CFR Parts 30.36, 40.42, and/or 70.38.
- Upon receipt of the FSSR from the licensee, NRC staff shall perform an "acceptance" or "completeness" review to determine whether the FSSR contains sufficient type and quality of information to begin the in-depth technical review. Inform the licensee of the results of the acceptance review.
- Review the FSSR to ensure that it adequately demonstrates that the facility is suitable for unrestricted use. See Section 15.4 for a list of FSSR requirements and contents, and Volume 2 of this NUREG for additional information on surveys.
- Ensure that the licensee has submitted NRC Form 314 at the completion of the decommissioning operations.
- After verifying the disposition of the licensed material and ensuring that a satisfactory closeout inspection and a confirmatory survey were performed, if warranted, the staff will amend the license and inform the licensee that the license has been terminated.

- As the final step in terminating the license, notify the licensee by license amendment after NRC has verified the suitability of its facility for unrestricted use. This amendment shall be placed in the license docket file, and the license shall be terminated. The completed license amendment and transmittal letter shall be included in the official docket file for the license, and a copy shall be placed into ADAMS.
- Ensure that the licensee has transferred the decommissioning records discussed in 10 CFR Parts 30.35, 30.36, and 30.51; 40.36, 40.42, and 40.61; or 70.25, 70.38, and 70.51, as appropriate, or has affirmed that they are not required to retain or transfer these records.
- Retire the records in accordance with current management directives (e.g., RMG 92-01 and 93-03 or see Volume 3). Retired records shall be included in the official docket file for the license, and a copy shall be placed into ADAMS.

10 GROUP 3 DECOMMISSIONING

NOTE: In addition to the guidance in this chapter, licensees are encouraged to contact NRC, or the appropriate Agreement State authority, to assure an understanding of what actions should be taken to initiate and complete the license termination process on a license-specific or facility-specific basis.

10.1 INTRODUCTION

Group 3 is similar to Group 2 in site conditions, i.e., levels of persistent contamination of work areas, building surfaces, and limited surface soil contamination may exist. Additionally, the types of licensees to whom Group 3 apply are similar to those described in Group 2, above. However, licensees decommissioning under Group 3, unlike Group 2, have made a determination pursuant to 10 CFR 30.36(f)(1), 40.42(f)(1), and 70.38(f)(1) that they must develop a DP. (See Chapter 5 for a description of when a DP is required.) These licensees must develop a DP because they have not incorporated the necessary activities and procedures into their license prior to ceasing operations.

10.2 LICENSEE ACTIONS

Licensee actions are the same as those for Group 2 (see Section 9.2), except that Group 3 licensees need to submit a DP. Even though the submission of a DP is required for decommissioning under Group 3, these licensees, in most cases, will not be expected to submit the same level of detail as required for Groups 4-7. Chapters 16-17 and NUREG-1727 describe information necessary for the preparation of a DP. Licensees decommissioning under the provisions of Group 3 may find that most of the information below may be excerpted from their current license and that they may only need to develop the limited information not contained in their license.

NRC regulations at 10 CFR 30.36(g)(4)(ii) and (iii), 40.42(g)(4)(ii) and (iii), and 70.38(g)(4)(ii) and (iii) require that DPs contain "...a description of the planned decommissioning activities" and "...a description of the methods used to ensure protection of workers and the environment against radiation hazards during decommissioning." NRC regulations 10 CFR 72.54(g)(2),(3) and (6) require that DPs contain "...the choice of the alternative for decommissioning with a description of the activities involved," "...a description of the controls and limits on procedures and equipment to protect occupational and public health and safety," and "...a description of technical specifications and quality assurance provisions in place during decommissioning." Licensees decommissioning under Group 3 are required to demonstrate that their facility meets NRC's requirements for unrestricted use. Generally, this information is developed by the licensee after determining the radiological status of the facility and is presented to NRC for review and approval in the form of a license amendment request to authorize decommissioning in accordance with the DP.

The general outline of a Group 3 decommissioning plan should include information in Chapters 16-18 and NUREG-1727 as follows:

- Executive Summary
- Facility Operating History
  - — License Number/Status/Authorized Activities
  - — License History
  - — Previous Decommissioning Activities
  - — Spills
- Facility Description
  - — Site Location and Description
- Radiological Status of Facility
  - — Contaminated Structures
  - — Contaminated Systems and Equipment
  - — Surface Soil Contamination
- Dose Modeling Evaluations (Unrestricted Release using Screening Criteria)
  - — Building Surfaces
  - — Surface Soil
- Planned Decommissioning Activities
  - — Contaminated Structures
  - — Contaminated Systems and Equipment
  - — Soil
  - — Schedules
- Project Management and Organization
  - — Radiation Safety Officer
  - — Training
  - — Contractor Support

- Radiation Safety and Health Program
  - — Radiation Safety Controls and Monitoring for Workers
    - Workplace Air Sampling Program
    - Respiratory Protection Program
    - Internal Exposure Determination
    - Contamination Control Program
    - Instrumentation Program
  - — Health Physics Audits and Recordkeeping Program
- Environmental Monitoring Program
  - — Effluent Monitoring Program
  - — Effluent Control Program
- Radioactive Waste Management Program
  - — Solid Radioactive Waste
  - — Liquid Radioactive Waste
- Facility Radiation Survey
- Financial Assurance

10.3 NRC ACTIONS

10.3.1 UPON RECEIPT OF THE REQUIRED NOTIFICATION

NRC actions are the same as for Group 2 (see Section 9.3) except that the staff will also review the DP using the process explained in Chapter 5 and the criteria given in Chapters 16-18 and NUREG-1727.

Upon receipt of the required notification from the licensee, the NRC staff shall:

- Verify the decommissioning group and review required, acknowledge receipt of the notification, and file the notification as discussed in Chapter 5 of this volume.
- Ensure that the licensee has submitted the decommissioning records discussed in 10 CFR Parts 30.35, 30.36, and 30.51; 40.36, 40.42, and 40.61; 70.25, 70.38, and 70.51; or 72.30 and 72.54, as appropriate, or has affirmed that they are not required to retain or submit these records.

- Request that the Regional Office and Headquarters determine whether the lead office for the decommissioning will be the NRC Regional Office or NRC Headquarters.[5]
- Contact the licensee to discuss the decommissioning process and NRC's criteria for releasing licensed sites (Appendix D contains a checklist that may be used during the NRC staff's discussion with the licensee).
- Coordinate with any other groups that may have regulatory authority at the site. This may include State radiation and hazardous materials control authorities, regional radioactive waste compacts, the EPA, or the Occupational Safety and Health Administration (OSHA).
- Determine whether local citizen or environmental groups have an interest in the site, as well as the appropriate individuals to be included on the external distribution list for documents pertaining to the decommissioning. In the past, the NRC staff has found that local (State, county, town) regulatory, land use, or public works authorities, and State representatives or county executive offices can be useful in contacting these groups. See section 15.10 for information on the actions to be taken if local citizen or environmental groups have an interest in the site.
- If warranted by local citizen interest, determine that local libraries have Internet access and provide instructions to the interested local citizens on how to access documents through ADAMS.

10.3.2 UPON RECEIPT OF THE DP

Upon receipt of the DP from the licensee, the NRC staff should:

Perform an "acceptance" or "completeness" review of the DP to determine if it contains sufficient type and quality of information to begin the in-depth technical review of the DP using the Appendix D checklist.

Initiate initial processing of the decommissioning action using the Appendix C checklist.

[5] In general, lead office responsibility for Group 3 sites will remain with the NRC Regional office and be assumed by NRC Headquarters only for those decommissioning projects involving fuel cycle facilities or sites that may pose significant policy issues (e.g., on-site disposal of large volumes of thorium-contaminated waste). However, the NRC staff should discuss the decommissioning with NRC management, who may, if necessary, confer with NRC Headquarters to determine which office will assume the lead for management of the decommissioning.

ACCEPTANCE REVIEW

The staff will review the decommissioning plan to ensure that, at a minimum, the decommissioning plan contains the information in the Appendix D checklist. The staff will review the dose modeling portion of the decommissioning plan without assessing the technical accuracy or completeness of the information contained therein. The adequacy of the information will be assessed during the detailed technical review. The staff will review the decommissioning plan to determine if enough information is included and if the level of detail appears to be adequate for the staff to perform a detailed technical review, or the plan will be rejected if incomplete.

- Inform the licensee of the results of the acceptance review. If the DP is not acceptable, inform the licensee of the deficiencies;
- Once the DP is acceptable, prepare and publish a *Federal Register*[6] notice announcing the receipt of the DP.
- Review the DP as described in Chapter 16 of this volume, using the checklist in Appendix D.
- If the technical review indicates that the DP cannot be approved as submitted, inform the licensee of the need for supplementary information. Coordinate the resolution of the deficiencies with the licensee and any other appropriate organizations exercising regulatory authority at the facility;
- Document the review of the DP in a letter or an SER, using the Appendix G SER outline, as appropriate.

SAFETY EVALUATION

The staff will review the technical content of the information provided by the licensee to ensure that the licensee used defensible assumptions and models to calculate the potential dose to the average member of the critical group. The staff will also verify that the licensee provided enough information to allow an independent evaluation of the potential dose resulting from the residual radioactivity after license termination and provided reasonable assurance that the decommissioning option will comply with regulations.

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[6] 10 CFR 2.1205 discusses the public's opportunities to request hearings on licensing actions by the NRC staff, and 10 CFR 2.1205(c)(2)I-iii outlines the time frames for noticing license amendment requests in the *Federal Register*. Per 10 CFR 2.1205(c)(20)iii, a member of the public may request a hearing within 180 days of NRC granting an application (or amendment) unless the NRC staff has already noticed the receipt of the application (or amendment request) in the *Federal Register*. It is typically more efficient for the staff to notice the receipt of the DP in the FR prior to approval, and offer the public the opportunity to comment on it, than to wait until the DP has been approved by the staff, which may result in a delay in the commencement of decommissioning activities.

- For an EA, consider using the license termination rule generic EIS, NUREG-1496, as described in Section 15.7.3 of this guidance.
- During the review of the DP, hold a public meeting, if warranted based on discussions with NRC management, the licensee, other regulatory authorities, or interested members of the public. See section 15.10 (Decommissioning Communications Planning) for guidance on planning public meetings. Chapter 4 (Applicable Regulations) contains a list of guidance on public meetings.
- Upon approval of the DP, incorporate it into the license as a license amendment.

10.4 DOSE MODELING INFORMATION TO BE SUBMITTED

The licensee's dose modeling for unrestricted release using screening criteria is explained in NUREG-1727 and Volume 2 of this NUREG.

11 GROUP 4 DECOMMISSIONING

NOTE: In addition to the guidance in this chapter, licensees are encouraged to contact NRC, or the appropriate Agreement State authority, to assure an understanding of what actions should be taken to initiate and complete the license termination process on a license-specific or facility-specific basis.

11.1 INTRODUCTION

Facilities that decommission under Group 4 have used licensed material in a manner that resulted in its release into the environment, activated adjacent materials, or resulted in persistent contamination of work areas, but did not result in contamination of ground water. While these facilities have residual radiological contamination present in building surfaces and soils, the licensee cannot meet or chooses not to use screening criteria. The licensees are able to demonstrate that residual radioactive material may remain at their site but within the levels specified in NRC's criteria for unrestricted use (10 CFR 20.1402, Radiological criteria for unrestricted use) by applying site-specific criteria in a comprehensive dose analysis.

11.2 LICENSEE ACTIONS

These licensees should:

- Submit the notification required under 10 CFR 30.36(d), 40.42(d), 70.38(d), and 72.54(d).
- Transfer the decommissioning records discussed in 10 CFR Parts 30.35, 30.36, 30.51; 40.36, 40.42, 40.61; 70.25, 70.38, 70.51; 72.30, and 72.54, as appropriate, or affirm that they are not required to retain or transfer these records.
- Perform a preliminary assessment of the facility, including a document review and a scoping survey.
- Perform site characterization in sufficient detail to support the planned activities and demonstrate that there is no existing ground water contamination.[7]
- Submit a DP in accordance with 10 CFR 30.36(g), 40.42(g), 70.38(g), and 72.54(g) to NRC for review and approval as a license amendment request. Chapters 16 to 18 and NURG-1727 describe information necessary for the preparation of a DP. Appendix D contains an DP checklist.
- Submit an ER. Section 15.7 (NEPA Compliance) describes information necessary for the preparation of an ER.

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[7] Note that ground water must be monitored throughout remediation because these activities could cause ground water contamination.

- Perform the remediation using the approved DP and financial assurance mechanism (FA) (see Volume 3 of this guidance).
- Transfer or dispose of all radioactive material and waste resulting from the decommissioning in accordance with the approved DP and 10 CFR Part 20, Subpart K.
- Perform an FSS in accordance with the procedures approved in the DP.
- Submit the FSSR to NRC for review and approval.
- Submit NRC Form 314 to NRC. A sample Form 314 is shown in Appendix A.

11.3 NRC ACTIONS

11.3.1 UPON RECEIPT OF THE REQUIRED NOTIFICATION

Upon receipt of the required notification from the licensee, the NRC staff shall:

- Verify the decommissioning group and review required, acknowledge receipt of the notification, and file the notification as discussed in Chapter 7 of this volume.
- Ensure that the licensee has submitted the decommissioning records discussed in 10 CFR Parts 30.35, 30.36, and 30.51; 40.36, 40.42, and 40.61; 70.25, 70.38, and 70.51; or 72.30 and 72.54, as appropriate, or has affirmed that they are not required to retain or submit these records.
- Request that the Regional Office and Headquarters determine whether the lead office for the decommissioning will be the NRC Regional Office or NRC Headquarters.[8]
- Contact the licensee to discuss the decommissioning process and NRC's criteria for releasing licensed sites (Appendix D2 contains a checklist that may be used during the NRC staff's discussion with the licensee).
- Coordinate with any other groups that may have regulatory authority at the site. This may include State radiation and hazardous materials control authorities, regional radioactive waste compacts, the EPA, or the Occupational Safety and Health Administration (OSHA).

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[8] In general, lead office responsibility for Group 4 sites will remain with the NRC Regional office and be assumed by NRC Headquarters only for those decommissioning projects involving fuel cycle facilities or sites that may pose significant policy issues (e.g., on-site disposal of large volumes of thorium contaminated waste). However, the NRC staff should discuss the decommissioning with NRC management, who may, if necessary, confer with NRC Headquarters to determine which office will assume the lead for management of the decommissioning.

- Determine whether local citizen or environmental groups have an interest in the site, as well as the appropriate individuals to be included on the external distribution list for documents pertaining to the decommissioning. In the past, the NRC staff has found that local (State, county, town) regulatory, land use, or public works authorities, and State representatives or county executive offices can be useful in contacting these groups. See NUREG-1748 for information on the actions to be taken if local citizen or environmental groups have an interest in the site. Staff should also develop a specific site communication plan.
- If warranted by local citizen interest, arrange to establish a Local Public Document Room (LPDR) or, in lieu of establishing a formal LPDR, arrange with a local library to act as an informal LPDR.

11.3.2 UPON RECEIPT OF THE DP

Upon receipt of the decommissioning plan from the licensee, the NRC staff should:

- Perform an "acceptance" or "completeness" review of the DP to determine if it contains sufficient type and quality of information to begin the in-depth technical review of the DP using the Appendix D2 checklist.
- Initiate initial processing of the decommissioning action using the Appendix D checklist.
- Inform the licensee of the results of the acceptance review. If the DP is not acceptable, inform the licensee of the deficiencies;
- Once the DP is acceptable, prepare and publish a *Federal Register*[9] notice announcing the receipt of the DP.
- Review the DP as described in Chapter 16 of this volume, using the checklist in Appendix D.
- If the technical review indicates that the DP cannot be approved as submitted, inform the licensee of the need for supplementary information. Coordinate the resolution of the deficiencies with the licensee and any other appropriate organizations exercising regulatory authority at the facility;
- Document the review of the DP in an SER, using the Appendix G SER outline.
- For an EA, consider using the license termination rule generic EIS, NUREG-1496, as described in Section 15.7.3 of this guidance.

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[9] 10 CFR 2.1205 discusses the public's opportunities to request hearings on licensing actions by the NRC staff, and 10 CFR 2.1205(c)(2)I-iii outlines the time frames for noticing license amendment requests in the *Federal Register*. Per 10 CFR 2.1205(c)(20)iii, a member of the public may request a hearing within 180 days of NRC granting an application (or amendment) unless the NRC staff has already noticed the receipt of the application (or amendment request) in the *Federal Register*. It is typically more efficient for the staff to notice the receipt of the DP in the FR prior to approval, and offer the public the opportunity to comment on it, than to wait until the DP has been approved by the staff, which may result in a delay in the commencement of decommissioning activities.

- During the review of the DP, hold a public meeting, if warranted based on discussions with NRC management, the licensee, other regulatory authorities, or interested members of the public. See Chapter 4, Applicable Regulations, for a list of guidance on public meetings.
- Upon approval of the DP, incorporate it into the license as a license amendment.

11.3.3 DURING REMEDIAL ACTIVITIES

The NRC staff shall:

- Make every effort to visit the facility during each significant phase of the decommissioning (i.e., characterization, cleanup, final status survey). This visit may be coordinated with a scheduled inspection of the facility by qualified inspectors. See Section 15.3 for a discussion of inspections of facilities undergoing decommissioning.
- Maintain contact with other interested parties, such as other regulatory authorities and members of the public, and make every effort to keep these individuals or groups informed of the progress of the decommissioning.
- Ensure that all documents relating to the decommissioning are entered into ADAMS.
- As appropriate, coordinate the review and approval of modifications to the DP with any other groups exercising regulatory authority at the facility.

11.3.4 AFTER COMPLETION OF REMEDIATION

Upon receipt of the FSSR from the licensee, the NRC staff shall:

- Perform an "acceptance" or "completeness" review of the FSSR, if necessary, to determine whether it contains sufficient type and quality of information to begin the in-depth technical review of the FSSR.
- Inform the licensee of the results of the acceptance review. If the FSSR is not acceptable, inform the licensee of the deficiencies.
- If the acceptance review indicates that the FSSR is acceptable, perform the technical review of the FSSR in accordance with Section 15.4.4 of this volume and Volume 2.
- If the technical review indicates that the FSSR is unacceptable, inform the licensee of the deficiencies. Coordinate the resolution of the deficiencies with the licensee and any other appropriate organizations exercising regulatory authority at the facility.

Upon completion of the review and acceptance of the FSSR, the NRC staff shall:

- Conduct a confirmatory survey at the facility following the procedures discussed in Section 15.4.5.
- Upon approval of the confirmatory survey report (if required), the NRC staff shall verify that the licensed material has been disposed of in accordance with NRC requirements. This may be accomplished by having the licensee provide written confirmation from the recipient listed on NRC Form 314 that the material has been transferred to them, or by the NRC staff contacting the recipient listed on NRC Form 314 directly.
- The NRC staff shall also perform or arrange to have a closeout inspection performed at the facility as discussed in Section 15.3.
- After verifying the disposition of the licensed material and ensuring that a satisfactory closeout inspection was performed, the NRC staff will prepare a license amendment and inform the licensee that the license has been terminated.
- As the final step in terminating the license, the NRC staff shall complete the "Materials License Termination/Retirement Form" contained in Appendix A. The completed form shall be included in the official docket file for the license.

11.4 DOSE MODELING INFORMATION TO BE SUBMITTED

The licensee's dose modeling for unrestricted release using site-specific information should include the information listed below. For a complete discussion of dose modeling, see NUREG-1727 and Volume 2 of this NUREG.

- Source term information, including nuclides of interest, configuration of the source, and areal variability of the source. Three key areas of review for the source term assumptions are the: (1) configuration; (2) residual radioactivity spatial variability; and (3) chemical form(s).
- A description of the exposure scenario, including a description of the critical group.
- A description of the conceptual model of the site including the source term, physical features important to modeling the transport pathways, and the critical group.
- Identification, description, and justification of the mathematical model used (e.g., hand calculations, DandD Screen v1.0, RESRAD v6.0, etc.).
- A description of the parameters used in the analysis.
- A discussion about the effect of uncertainty on the results.
- Input and output files or printouts, if a computer program was used.

12 GROUP 5 DECOMMISSIONING

NOTE: In addition to the guidance in this chapter, licensees are encouraged to contact NRC, or the appropriate Agreement State authority, to assure an understanding of what actions should be taken to initiate and complete the license termination process on a license-specific or facility-specific basis.

12.1 INTRODUCTION

Facilities that decommission under Group 5 have used licensed material in a manner that resulted in its release into the environment, activated adjacent materials or resulted in persistent contamination of work areas, and resulted in contamination of ground water. Group 5 decommissioning includes licensees that intend to decommission their facilities in accordance with the NRC's criteria for unrestricted use as described in 10 CFR 20.1402.

Sites with ground water contamination and the following characteristics are in Group 5:

- The near surface ground water is either potable or allowed to be used for irrigation, and provides sufficient yields for those purposes;
- Aquifer volume is sufficient to provide the necessary yields; or
- Current and informed consideration of future land use patterns do not preclude ground water use (i.e., material either has a long half-life, with peak exposures occurring later than 100 years, or the site is in non-industrial areas).

Descriptions of water quality and quantity in the saturated zone should be based on the classification systems used by EPA or the State, as appropriate. For cases where the aquifer is classified as not being a source of drinking water and is adequate for stock watering and irrigation, the licensee does not need to consider the drinking water pathway (and generally, the fish pathway, depending on the model) but should still maintain the irrigation and meat/milk pathways.

12.2 LICENSEE ACTIONS

Group 5 decommissioning requires all the information specified in Chapter 11 plus a description of the extent of ground water contamination and proposed activities to remediate the ground water to meet criteria for unrestricted release.

The information supplied by the licensee should be sufficient to allow the staff to determine how the ground water characteristics of the site affect the doses to on- or off-site individuals during or at the completion of decommissioning. The following information should be included in the ground water hydrology section of the decommissioning plan (see Section 16.3 for details):

- A description of the saturated and unsaturated zones, including all potentially affected aquifers, the lateral extent, thickness, water-transmitting properties, recharge and discharge zones, and ground water flow directions and velocities;
- Descriptions for monitor wells, including location, elevation, screened intervals, depths, construction and completion details, and hydrogeologic units monitored;
- Physical parameters such as storage coefficients, transmissivities, hydraulic conductivities, porosities, and intrinsic permeabilities;
- A description of the unsaturated zone, including descriptions of the lateral extent and thickness of permeable and impermeable zones, potential conduits of anomalously high flux, and the direction and velocity of unsaturated flow;
- Information on all monitor stations, including location and depth;
- A description of physical parameters, including the spatial and stratigraphic distribution of the total and effective porosity; water content variations with time; saturated hydraulic conductivity; characteristic relationships between water content, pressure head, and hydraulic conductivity; and hysteretic behavior during wetting and drying cycles, especially during extreme conditions;
- A description of the numerical analyses techniques used to characterize the unsaturated and saturated zones, including the model type, justification, documentation, verification, calibration and other associated information. In addition, the description should include the input data, data generation or reduction techniques, and any modifications to these data; and
- The distribution coefficients of the radionuclides of interest at the site.

12.3 NRC ACTIONS

NRC[10] Actions are the same as in section 11.3, with the following additions:

12.3.1 UPON RECEIPT OF THE REQUIRED NOTIFICATION

Same as section 11.3.1.

[10] In general, lead office responsibility for Group 5 sites will be transferred from the NRC Regional office to NRC Headquarters. Regional staff and management should discuss the decommissioning with NRC Headquarters to determine which office will assume the lead for management of the decommissioning.

12.3.2 UPON RECEIPT OF THE DP

- An environmental assessment (EA) will typically be prepared.
- Staff will evaluate the licensee's description of the ground water hydrology:
  - — The testing and monitoring program and sample collection procedure;
  - — The rationale for choosing particular sampling locations;
  - — The adequacy of non-licensee-constructed monitoring devices used in the characterization;
  - — Aquifer tests and results derived from testing;
  - — Potential interactions of ground water with the residual radioactive material; and
  - — Major hydrologic parameters, aerial extent of aquifers, recharge-discharge zones, flow rates and directions, and travel times, including seasonal fluctuations and long-term trends.
- Staff will evaluate the licensee's conceptual model:
  - — Hydrogeologic processes and features, areas of anomalous physical parameters affecting regional processes, extent of aquifers and confining layers, and interactions between aquifers;
  - — Movement of ground water in the saturated and unsaturated zones;
  - — The numerical analyses of ground water data collected by the licensee for the site and vicinity. This will normally involve analytical or numerical modeling;
  - — The model type chosen for analysis is properly documented, verified, and calibrated and adequately simulates the physical system of the site and vicinity;
  - — The modeling strategy used by the licensee to assure that it is logical and defensible;
  - — The staff will review the adequacy of the model input data generation and reduction techniques. Modifications of input data required for calibration will be reviewed to ensure that the new values are realistic and defensible.

12.3.3 DURING REMEDIAL ACTIVITIES

Same as section 11.3.3.

12.3.4 AFTER COMPLETION OF REMEDIATION

Same as section 11.3.4.

Following its review of this information, the staff will determine whether the licensee's conclusions are adequate. Alternatively, the staff may decide to conduct an independent analysis. If the staff does conduct an independent analysis, it will compare the results with those derived by the licensee to determine if the licensee's results are adequate.

12.4 DOSE MODELING INFORMATION TO BE SUBMITTED

The licensee's dose modeling for unrestricted release using site-specific information should include the information listed in Section 11.4 and below. For a complete discussion of dose modeling, see NUREG-1727 and Volume 2 of this NUREG.

Dose modeling involving ground water contamination presents particular problems in the following areas:

- Configuration of the source and areal variability of the source;
- Exposure scenario, including a description of the critical group;
- Conceptual model of the site; and
- Mathematical model used.

13 GROUP 6 DECOMMISSIONING

NOTE: In addition to the guidance in this chapter, licensees are encouraged to contact NRC, or the appropriate Agreement State authority, to assure an understanding of what actions should be taken to initiate and complete the license termination process on a license-specific or facility-specific basis.

13.1 INTRODUCTION

Facilities that decommission under Group 6 have used licensed material in a manner that resulted in releases to the environment, activated adjacent materials, or resulted in persistent contamination of work areas or ground water. Group 6 decommissioning includes licensees that intend to decommission its facility in accordance with the NRC's criteria for restricted use as described in 10 CFR 20.1403. These sites require extensive NRC review and are typically handled on a case-by-case basis.

13.2 LICENSEE ACTIONS

Licensees should include all the relevant information required in Chapter 12, describing the extent of the residual contamination and proposed activities to remediate. Additionally, licensees must demonstrate that the site is acceptable for license termination under restricted conditions. This information should be sufficient to allow the staff to determine that:

- Further reductions in residual radioactivity would:
  - — Result in net environmental harm (a demonstration that the benefits of dose reduction are less than the cost of doses, injuries and fatalities); or
  - — Not be necessary because the proposed levels are ALARA. This analysis should include a complete cost-benefit calculation, because the potential dose exceeds 0.25 mSv/yr (25 mrem/yr) and is beyond the scope of the generic EIS for the LTR. Licensees should use estimates from their decommissioning funding plan as a baseline for ALARA calculations (see Section 17.7.3.5 or NUREG-1727);
- There are adequate institutional controls to limit TEDE to the public to less than 0.25 mSv/yr (25 mrem/year);
- There is sufficient financial assurance for an independent, third party to assume control of the site and perform necessary maintenance at no cost; and
- There is agreement by a competent party to assume control of and responsibility for maintenance of the site (see Sections 17.7.3.2 and 17.7.3.3).

13.3 DOSE MODELING INFORMATION TO BE SUBMITTED

Dose modeling is required for two conditions: when institutional controls (IC) are in place, and when ICs fail.

13.3.1 DOSE MODELS

The models must include the following information (see Volume 2 of this NUREG for a complete discussion):

- Configuration and areal variability of the source;
- Conceptual model of the site;
- Mathematical model used; and
- Exposure scenarios, including a description of the critical group(s), for the two separate conditions.

The results must demonstrate that with the ICs in place, the TEDE to the critical group is less than or equal to 0.25 mSv/yr (25 mrem/yr), and if the ICs fail, the TEDE to the critical group is ALARA and may not exceed either:

- 1.0 mSv/yr (100 mrem/yr); or,
- 5.0 mSv/yr (500 mrem/yr), provided that the licensee does all of the following:
- Demonstrates that further reductions in residual radioactivity to meet the 1.0 mSv/yr (100 mrem/yr) limit (see also Section 17.7.3.5):
  - — are not technically feasible;
  - — are prohibitively expensive; or
  - — would result in net environmental harm;
- Provides durable institutional controls (see below);
- Provides financial assurance for an independent third party to:
  - — verify institutional controls remain in place;
  - — conduct periodic inspections of the site at least once every five years; and
  - — assume control of the site and perform necessary maintenance.

13.3.2 INSTITUTIONAL CONTROLS

The licensee must demonstrate the adequacy of the proposed institutional controls and that the public has had opportunity to comment on them.

13.3.2.1 Control Adequacy

Requirements for demonstrating adequate institutional controls include:

- The proposed controls are adequate to limit the dose to the public under reasonably foreseeable conditions.
  - — For sites exceeding the 1.0 mSv/yr (100 mrem/yr) dose limit but meeting the 5.0 mSv/yr (500 mrem/yr) limit, and for sites with long-lived radionuclides such as uranium, controls must be durable, meaning they must be expected to last in perpetuity. State and Federal Agencies are examples of such acceptable organizations.
  - — For sites meeting the 1.0 mSv/yr (100 mrem/yr) limit that do not have long-lived radionuclides (e.g., uranium and thorium), the institutional controls may be of the conventional sort, such as deed restrictions that are legally enforceable by an independent party (e.g., County Zoning Board).
- There is adequate money available to the responsible party in a usable form in order to provide for control and maintenance activities for reasonably foreseeable conditions (see Volume 3 for more information).
- There is an agreement from the proposed control party that it is able and willing to assume responsibility for the site.

As part of the detailed evaluation of the DP, the staff's review should verify that the following information is included in the description of institutional controls that the licensee plans to use or has provided for the site:

- A description of the legally enforceable institutional control(s) and an explanation of how the institutional control is a legally enforceable mechanism;
- A description of any detriments associated with the maintenance of the institutional control(s);
- A description of the restrictions on present and future landowners;
- A description of the entities enforcing, and their authority to enforce, the institutional control(s);

- A discussion of the durability[11] of the institutional control(s);
- A description of the activities that the entity with the authority to enforce the institutional control(s) may undertake to do so;
- The manner in which the entity with the authority to enforce the institutional control(s) will be replaced if that entity is no longer willing or able to do so (this may not be needed for Federal or State entities);
- A description of the duration of the institutional control(s), the basis for the duration, the conditions that will end the institutional control(s), and the activities that will be undertaken to end the institutional control(s);
- A description of the plans for corrective actions that may be undertaken in the event the institutional control(s) fail; and,
- A description of the records pertaining to the institutional controls, how and where they will be maintained, and how the public will have access to the records.

13.3.2.2 Public Interaction

For sites proposing restricted release for license termination, the licensee shall comply with the provisions of 10 CFR 20.1403, which require the licensee to:

- Seek the advice of individuals and institutions in the community who may be affected by the decommissioning. Licensees shall seek advice from such affected parties regarding the following matters concerning the proposed decommissioning -
  - — Whether provisions for ICs proposed by the licensee:
    - Will provide reasonable assurance that the TEDE from residual radioactivity distinguishable from background to the average member of the critical group will not exceed 0.25 mSv (25 mrem) TEDE per year;
    - Will be enforceable; and,
    - Will not impose undue burdens on the local community or other affected parties.
  - — Whether the licensee has provided sufficient financial assurance to enable an independent third party, including a government custodian of a site, to assume and carry out responsibilities for any necessary control and maintenance of the site.

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[11] The Commission has stated (see Section B3.3 of the "Statements of Consideration" (62 FR 39058) to 10 CFR Part 20, Subpart E, "Radiological Criteria for License Termination") that stringent institutional controls would be needed for sites involving large quantities of uranium and thorium contamination. Typically, these would involve legally enforceable deed restrictions backed up by State and local government control or ownership, engineered barriers, and as appropriate, Federal ownership.

- To provide for sufficient opportunity for the public to participate, the licensee shall provide for:
  - — Participation by representatives of a broad cross section of community interests who may be affected by the decommissioning;
  - — An opportunity for a comprehensive, collective discussion on the issues by the participants represented; and,
  - — A publicly available summary of the results of all such discussions, including a description of the individual viewpoints of the participants on the issues and the extent of agreement or disagreement among the participants on the issues.
- Document in the DP how the advice of individuals and institutions in the community who may be affected by the decommissioning has been sought and incorporated, as appropriate, following analysis of that advice.

Additional details on required information for decommissioning with restricted release and how the staff evaluates them are contained in Volume 3 (Chapter 16 of SRP).

13.4 NRC ACTIONS

NRC[12] actions are the same as in section 12.3, with some additions.

13.4.1 UPON RECEIPT OF THE REQUIRED NOTIFICATION

Same as section 12.3.1.

13.4.2 UPON RECEIPT OF THE DP

- Prior to the detailed technical review of the DP, the staff will determine that the licensee has provided for adequate institutional controls;
- The staff will evaluate the licensee's financial assurance;
- Because the licensee plans to limit future land uses at the site, the staff must prepare an environmental impact statement (EIS). NUREG-1748 and section 15.7 discuss the process of preparing an EIS, the environmental information that should be considered by licensees in their environmental report, and the content of the EIS;

[12] In general, lead office responsibility for Group 6 sites will be transferred from the NRC Regional office to NRC Headquarters. Regional staff and management should discuss the decommissioning with NRC Headquarters to determine which office will assume the lead for management of the decommissioning.

- The staff will evaluate the licensee's ALARA analysis. Volume 2 of this guidance provides more details on completing ALARA analyses;
- The staff will evaluate the licensee's dose analysis (see Chapter 16 for details of the technical review); and,
- The staff will evaluate the licensee's interactions with the public (see section 17.8).

13.4.3 DURING REMEDIAL ACTIVITIES

Same as section 12.3.3.

13.4.4 AFTER COMPLETION OF REMEDIATION

Same as section 12.3.4.

Following its review of this information, the staff will determine whether the licensee's conclusions are adequate. If NRC staff conduct an independent analysis, they would compare staff results with the licensee's to determine if the licensee's results are adequate.

14 GROUP 7 DECOMMISSIONING

NOTE: In addition to the guidance in this chapter, licensees are encouraged to contact NRC, or the appropriate Agreement State authority, to assure an understanding of what actions should be taken to initiate and complete the license termination process on a license-specific or facility-specific basis.

14.1 INTRODUCTION

Group 7 facilities have residual radiological contamination present in building surfaces, soils, and possibly ground water. These licensees intend to decommission their facilities such that residual radioactive material remaining at their site is in excess of the levels specified in NRC's criteria for unrestricted use. These sites are not in Group 6 because they are not able to demonstrate that residual contamination will meet limits for restricted use at license termination and it is not feasible to make further reductions. The licensees will apply site-specific criteria in a comprehensive dose analysis in accordance with alternate criteria for license termination (10 CFR 20.1404). A site decommissioning plan that identifies the land use, exposure pathways, institutional controls, and critical group for the dose analysis is required. These sites require extensive NRC review and are handled on a case-by-case basis. License termination criteria must be specifically approved by a vote of the NRC Commissioners.

14.2 LICENSEE ACTIONS

Licensees should include all the relevant information required in Chapter 13 describing the extent of residual contamination and proposed activities to remediate it, and demonstrating that the site is acceptable for license termination under restricted conditions.

The information supplied by the licensee should be sufficient to allow the staff to determine whether the residual radioactive material at the site will result in a dose that exceeds 0.25 mSv/yr (25 mrem/yr) but will not exceed 1 mSv/yr (100 mrem/yr) (considering all man-made sources other than medical), when the radionuclide levels are at the DCGL and are ALARA, and instutional controls are in place. The information should also demonstrate that the financial assurance mechanism(s) are adequate for the site. Finally, the information should be adequate to allow the staff to determine if the institutional controls, site maintenance activities, and the manner in which advice from individuals or institutions that could be affected by the decommissioning was sought, obtained, evaluated, and, as appropriate, addressed in accordance with NRC requirements. The staff should verify that the following information is included in the discussion of why the licensee or responsible party is requesting license termination under the provisions of 10 CFR 20.1404:

- A summary of the dose in TEDE(s) to the average member of the critical group when the radionuclide levels are at the DCGL (considering all man-made sources other than medical);

- A summary of the evaluation performed pursuant to Section 16.7 of this guidance demonstrating that these doses are ALARA;
- An analysis of all possible sources of exposure to radiation at the site and a discussion of why it is unlikely that the doses from all man-made sources, other than medical, will be more than 1 mSv/yr (100 mrem/yr);
- A description of the legally enforceable institutional control(s) and an explanation of how the institutional control is a legally enforceable mechanism;
- A description of any detriments associated with the maintenance of the institutional control(s);
- A description of the restrictions on present and future landowners;
- A description of the entities enforcing and their authority to enforce the institutional control(s);
- A discussion of the durability[13] of the institutional control(s);
- A description of the activities that the party with the authority to enforce the institutional controls will undertake to do so;
- The manner in which the entity with the authority to enforce the institutional control(s) will be replaced if that entity is no longer willing or able to do so;
- A description of the duration of the institutional control(s), the basis for the duration, the conditions that will end the institutional control(s), and the activities that will be undertaken to end them;
- A description of the corrective actions that will be undertaken in the event the institutional control(s) fail;
- A description of the records pertaining to the institutional controls, how and where they will be maintained, and how the public will have access to the records;
- A description of how individuals and institutions that may be affected by the decommissioning were identified and informed of the opportunity to provide advice to the licensee;
- A description of the manner in which the licensee obtained advice from affected individuals, the local community, or institutions;
- A description of how the licensee provided for participation by a broad cross-section of community interests in obtaining the advice;
- A description of how the licensee provided for a comprehensive, collective discussion on the issues by the participants represented;

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[13] See Footnote 11.

- A copy of the publicly available summary of the results of discussions, including individual viewpoints of the participants on the issues and the extent of agreement and disagreement among the participants;
- A description of how this summary has been made available to the public; and,
- A description of how the licensee evaluated advice from individuals and institutions that could be affected by the decommissioning, and the manner in which the advice was addressed.

14.3 DOSE MODELING INFORMATION TO BE SUBMITTED

Same as section 13.3.

14.4 NRC ACTIONS

NRC[14] actions are the same as in section 13.3, with the following additions:

14.4.1 UPON RECEIPT OF THE REQUIRED NOTIFICATION

Same as section 13.3.1.

14.4.2 UPON RECEIPT OF THE DP

Because the licensee plans to limit future land uses at the site, the staff must prepare an EIS. NUREG-1748 and Section 15.7 discuss the process of preparing an EIS, environmental information that should be considered by licensees in their environmental report, and the content of the EIS.

- The staff shall seek comments from:
  - — State and local Government Agencies;
  - — Affected Indian Nations; and,
  - — EPA.
- Following its review of this information, the staff will determine whether the licensee's conclusions are adequate. The staff may decide to conduct an independent analysis, which would be compared to the licensee's results.

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[14] In general, lead office responsibility for Group 7 sites will be transferred from the NRC Regional office to NRC Headquarters. Regional staff and management should discuss the decommissioning with NRC Headquarters to determine which office will assume the lead for management of the decommissioning.

- After the DP review is complete, the staff will make a recommendation to the Commission.
- The Commission will approve the proposed limits and direct the staff to prepare the licensing action.

14.4.3 DURING REMDIAL ACTIVITIES

Same as section 13.3.3.

14.4.4 AFTER COMPLETION OF REMEDIATION

Same as section 13.3.4.

15 OTHER DECOMMISSIONING CONSIDERATIONS

15.1 INTRODUCTION

This chapter discusses various policies and procedures related to decommissioning. The topics include the following:

15.2 Financial Assurance

15.3 Decommissioning Inspections

15.4 Decommissioning Surveys

15.5 Partial Site Decommissioning

15.6 Site Decommissioning Management Plan sites

15.7 NEPA compliance

15.8 Nuclear Materials Management and Safeguards System

15.9 Decommissioning Contractors

15.10 Decommissioning Communications Planning

15.2 FINANCIAL ASSURANCE

15.2.1 INTRODUCTION

Financial assurance requirements help ensure that adequate funds will be available to pay for certain costs (e.g., decommissioning) in a timely manner. Financial assurance is achieved through the use of financial instruments. Some financial instruments provide a special account into which the licensee may prepay the applicable costs. Other financial instruments guarantee funding by a suitably-qualified third party, thereby providing "defense in depth" in the event the licensee is unable or unwilling to pay these costs when they arise. Licensees with assets that substantially exceed the cost of decommissioning may provide a self-guarantee for financial assurance. Financial assurance for decommissioning must be obtained prior to the commencement of licensed activities or receipt of licensed material, and it must be maintained until termination of the license. If the license is being terminated under restricted conditions, then financial assurance for site control and maintenance must be obtained prior to license termination. The amount of financial assurance obtained is often based on a site-specific cost estimate and must be increased if the cost estimate increases. Under NRC regulations, a number of different types of financial instruments may be used to demonstrate financial assurance, including trusts, letters of credit, surety bonds, and guarantees.

At the end of licensed operations, licensees must maintain all financial assurance established pursuant to 10 CFR Parts 30, 40, 70, or 72. NRC licensees must demonstrate financial assurance for decommissioning and, if applicable, for site control and maintenance following license

termination. Volume 3 of this guidance establishes a standard format for presenting the information to NRC that will: (1) aid the licensee in ensuring that the information is complete; (2) ensure that applicable requirements in 10 CFR Parts 30, 40, 70, and 72 have been met; and (3) achieve the intent of the regulations. This will ensure that the decommissioning of all licensed facilities will be accomplished in a safe and timely manner and that licensees will provide adequate funds to cover all costs associated with decommissioning and, if applicable, with site control and maintenance.

15.2.2 WHEN IS FINANCIAL ASSURANCE REQUIRED?

NRC's financial assurance requirements for decommissioning apply only to licensees authorized to possess or use certain quantities and types of licensed materials. The minimum possession or use thresholds that trigger the requirements vary, depending on the type of license and the types and quantities of materials authorized under the particular license. Any license that authorizes the possession or use of types or quantities of materials exceeding these thresholds is subject to NRC's decommissioning financial assurance requirements. Note that the relevant quantities and types of materials are those authorized under a particular license, even if a licensee does not currently or usually possess or use these same quantities and types of materials.

Table 15.1 Minimum License Thresholds to Demonstrate Financial Assurance

Type of License	Minimum License Threshold Requiring Financial Assistance
PART 30	Unsealed byproduct material with a half-life greater than 120 days in amounts greater than 103 times the applicable quantities of Appendix B to Part 30 or, for a combination of isotopes, if R divided by 103 is greater than 1 when R is defined as the sum of the ratios of the quantity of each isotope to the applicable value in Appendix B to Part 30; **OR** Sealed sources or plated foils with a half-life greater than 120 days in amounts greater than 1010 times the applicable quantities of Appendix B to Part 30 or, for a combination of isotopes, if R divided by 1010 is greater than 1 when R is defined as the sum of the ratios of the quantity of each isotope to the applicable value in Appendix B to Part 30.
PART 40	Source material in a readily dispersible form exceeding 10 millicuries (mCi).
PART 70	Unsealed special nuclear material in amounts greater than 103 times the applicable quantities of Appendix B to Part 30 or, for a combination of isotopes, if R divided by 103 is greater than 1 where R is defined as the sum of the ratios of the quantity of each isotope to the applicable value in Appendix B to Part 30.
PART 72	Any amount of spent fuel or high-level radioactive waste.

Licensees who exceed the minimum thresholds outlined above are required to demonstrate financial assurance for decommissioning that is acceptable to the NRC until decommissioning has been completed and the license has been terminated. When the license is terminated under restricted release conditions, financial assurance for site control and maintenance after license termination must also be provided. License applicants must have financial assurance in place prior to the receipt of licensed materials.

If the license is being terminated under restricted conditions pursuant to 10 CFR 20.1403, a licensee must provide financial assurance for site control and maintenance following license termination. This assurance must be in place before the license is terminated, and it must be sufficient to enable an independent third party to assume and carry out responsibilities for any necessary control and maintenance of the site.

FINANCIAL ASSURANCE MECHANISMS

Licensees may choose among a number of different mechanisms to comply with the financial assurance requirements for decommissioning (see volume 3 of this NUREG series for more information). The following financial assurance "methods" are specifically allowed under 10 CFR Parts 30, 40, 70, or 72:

- Prepayment;
- Surety, insurance, or guarantee;
- External sinking fund coupled with a surety method or insurance; and
- Statement of intent by a Federal, State, or local Government.

15.2.3 DECOMMISSIONING PLAN

At the end of licensed operations, licensees must maintain all decommissioning financial assurance established pursuant to 10 CFR 30.35, 40.36, 70.25, or 72.30. In addition, licensees that submit a decommissioning plan must demonstrate financial assurance pursuant to 10 CFR 30.36, 40.42, 70.38, or 72.54.

The decommissioning financial assurance demonstration must include:

- An updated, detailed cost estimate for decommissioning and, if the license is being terminated under restricted conditions, for control and maintenance of the site following license termination;
- One or more financial assurance mechanisms (including supporting documentation);

- A comparison of the cost estimate to the level of coverage provided by the financial assurance mechanisms and, if the license is being terminated under restricted conditions, for control and maintenance of the site following license termination; and
- If applicable, a description of the means to be employed for adjusting the cost estimate and associated funding level over any storage or surveillance period.

Volume 3 of this NUREG provides guidance to licensees on preparing the financial assurance demonstration that is to be included as part of a decommissioning plan.

Table 15.2 Decommissioning Group Financial Assurance Needs

Decommissioning Group	Financial Assurance Needs
1	Not normally required
2	Not likely to be required
3-7	Decommissioning Funding Plan required as part of DP

15.2.4 NRC REVIEW

The NRC staff will evaluate the decommissioning financial assurance demonstrations submitted by licensees pursuant to the requirements in 10 CFR Parts 30, 40, 70, and 72. The staff's review ensures that sufficient funds will be available to carry out decommissioning activities and site control and maintenance (if applicable) in a safe and timely manner. Volume 3 provides specific guidelines on the review process. In general, the staff will review:

- The accuracy and appropriateness of the methods used to estimate decommissioning costs and, if the license is being terminated under restricted conditions, the costs of site control and maintenance;
- The acceptability of the financial assurance mechanism(s) for decommissioning and, if the license is being terminated under restricted conditions, for site control and maintenance; and
- The means identified in the decommissioning plan for adjusting the cost estimate and associated funding level over any storage or surveillance period.

The staff will make a quantitative evaluation of the licensee's: (1) cost estimate or certification amount; and (2) financial assurance mechanism(s).

NRC maintains control and security of the financial instruments. The staff follows NRC Management Directive 8.12, "Decommissioning Financial Assurance Instrument Security Program," to ensure security and control of the instrument. In the event a licensee defaults before completing the decommissioning, the management directive specifies authority for drawing on the instrument. Policy and Guidance Directive PG 8-11, "NMSS Procedures for

Reviewing Declarations of Bankruptcy," specifies bankruptcy procedures. In the event of a bankruptcy, the staff shall follow the procedures in the policy and guidance directive to attempt to ensure control of the radioactive material and maximum use of any remaining licensee resources for protection of the public.

15.2.5 REFERENCES

- NRC Management Directive 8.12, "Decommissioning Financial Assurance Instrument Security Program."
- Policy and Guidance Directive PG 8-11, "NMSS Procedures for Reviewing Declarations of Bankruptcy."

15.3 DECOMMISSIONING INSPECTIONS

15.3.1 INSPECTION POLICY

Licensees undergoing decommissioning will be periodically inspected. Therefore, it is important for licensees to understand the potential enforcement options available to NRC during the course of these periodic inspections. NUREG-1600, "General Statement of Policy and Procedure for NRC Enforcement Actions," describes the Commission's current Enforcement Policy for materials licensees.

The Atomic Energy Act of 1954, as amended, establishes "adequate protection" as the standard of safety on which NRC regulations are based. In the context of NRC regulations, safety means avoiding undue risk or, stated another way, providing reasonable assurance of adequate protection to workers and the public in connection with the use of source, byproduct, and special nuclear materials.

While safety is the fundamental regulatory objective, compliance with NRC requirements plays an important role in giving NRC confidence that safety is being maintained. NRC requirements, including technical specifications, other license conditions, orders, and regulations, have been designed to ensure adequate protection — which corresponds to "no undue risk to public health and safety" — through acceptable design, construction, operation, maintenance, modification, and quality assurance measures. In the context of risk-informed regulation, compliance plays a very important role in ensuring that key assumptions used in underlying risk and engineering analyses remain valid.

While adequate protection is presumptively assured by compliance with NRC requirements, circumstances may arise where new information reveals that an unforeseen hazard exists or that there is a substantially greater potential for a known hazard to occur. In such situations, NRC has the statutory authority to require licensee action above and beyond existing regulations to maintain the level of protection necessary to avoid undue risk to public health and safety.

Based on NRC's evaluation of noncompliance, the appropriate action could include refraining from taking any action, taking specific enforcement action, issuing orders, or providing input to other regulatory actions or assessments, such as increased oversight (e.g., increased inspection). Since some requirements are more important to safety than others, NRC endeavors to use a risk-informed approach when applying NRC resources to the oversight of licensed activities, including enforcement activities.

The primary purpose of NRC's Enforcement Policy is to support NRC's overall safety mission in protecting the public health and safety and the environment. Consistent with that purpose, the policy endeavors to:

- Deter noncompliance by emphasizing the importance of compliance with NRC requirements; and
- Encourage prompt identification and prompt, comprehensive correction of violations of NRC requirements.

Therefore, licensees, contractors, and their employees who do not achieve the high standard of compliance that NRC expects will be subject to enforcement sanctions. NRC hold the licensee ultimately responsible, including the performance of any contractor. Each enforcement action is dependent on the circumstances of the case. However, in no case will licensees who cannot achieve and maintain adequate levels of safety be permitted to continue to conduct licensed activities.

15.3.2 DECOMMISSIONING INSPECTIONS

At the onset of decommissioning, a site-specific inspection plan and inspection schedule will be developed by the NRC inspection staff (or other staff having licensing authority). The Plan and Schedule are based on planned site characterization, remediation, final and confirmatory surveys, and other decommissioning activities to be conducted at the facility. Typically, this site specific plan [commonly referred to as the Master Inspection Plan (MIP)] is coordinated with the licensee prior to being finalized. The purposes of this coordination are to ensure that inspections are performed at times when significant decommissioning activities are underway and to inform the licensee of the areas of the licensee's program that will be inspected. An example of a MIP is shown in Appendix F.

The Regions are taking the following actions to increase efficiency in the decommissioning inspection program:

- Linking inspections to the licensee's on-site activities, so that inspectors can make side-by-side observations and measurements during licensee-conducted surveys.
- Interacting with the licensees to ensure complete and appropriate submittals.

- Conducting inspections only at sites that are actively being remediated.
- Inspecting "smarter," and, as a consequence, reducing on-site inspection time and limiting the scope and depth of inspections to examining key decommissioning activities.

15.4 DECOMMISSIONING SURVEYS

Following the decision to cease operations, a number of surveys will be needed to determine the site radiological status, monitor progress during remediation, and confirm that the site meets the radiological release criteria.

15.4.1 SITE CHARACTERIZATION SURVEY

Licensees conduct site characterization surveys to determine the type and extent of radiological contamination of structures and environmental media. This information is typically provided as part of the DP. The staff reviews the information in the DP to determine whether or not there is sufficient information to permit planning for site remediation that will be effective and will not endanger the remediation workers, to demonstrate that it is unlikely that significant quantities of residual radioactivity have gone undetected, and to provide information that will be used to design the final status survey. Volume 2 of this guidance discusses the information to be submitted by the licensee and provides details of the staff's review.

Generally, the type and scope of the characterization survey information are less detailed than those required for a final radiological survey. However, licensees may use characterization survey data to support the final radiological survey, as long as they can demonstrate that non-impacted areas at the site have not been adversely impacted by decommissioning operations, and the characterization survey data are of sufficient scope and detail to meet the information needs of a final survey (see Volume 2).

The regulatory requirements for site characterization surveys are contained in 10 CFR 30.36(g)(4)(i), 40.42(g)(4)(i), 70.38(g)(4)(i), and 72.54(g)1.

15.4.2 IN-PROCESS SURVEYS

These surveys, conducted during remediation, will assist the licensee in determining when remedial actions have been successful and when the final status survey may commence. In addition, information from these surveys may be used to provide the principal estimate of contaminant variability that will be used to calculate the final status survey sample size in a remediated survey unit. Volume 2 discusses the information to be submitted by the licensee and provides details of the staff's review. The NRC surveys are conducted in accordance with Inspection Procedure 87104, "Decommissioning Inspection Procedures for Materials Licenses."

The regulatory requirements for in-process surveys are contained in 10 CFR 30.36(g)(4)(ii), 40.42(g)(4)(ii), and 70.38(g)(4)(ii).

15.4.3 FINAL STATUS SURVEY

Licensees wishing to terminate their licenses must demonstrate to NRC that residual radioactive material at their facility attributable to past licensed operations does not exceed NRC criteria for release of the facility. To the extent that unlicensed sources above background levels of radiation are commingled with licensed material it is also remediated in decommissioning, and would be included in the source term for dose calculations. The final radiation survey demonstrates that the facility meets NRC's criteria for release and termination of the license.

The staff will review the final status survey design, as part of the DP review, to determine whether the survey design is adequate for demonstrating compliance with the radiological criteria for license termination. Volume 2 of this guidance discusses the information to be submitted by the licensee and provides details of the staff's review.

NRC regulations require that decommissioning plans include a description of the planned final radiological survey. Note, some survey methods, such as MARSSIM, require that certain information needed to develop the final radiological survey be developed as part of the remedial activities at the site and should be submitted in accordance with the instructions in Volume 2.

The NRC staff, in conjunction with other Federal Agencies, developed a comprehensive manual for conducting final status surveys (Multi-Agency Radiological Survey and Site Investigation Manual (MARSSIM), NUREG-1575). The purpose of MARSSIM is to describe the procedures for designing and conducting surveys to demonstrate that the residual radioactive material at a facility meets NRC's criteria for release of the facility and termination of the facility license.

There are limitations to the applicability of MARSSIM; the methodology currently cannot be applied to volumetric or ground water contamination (see Table 1.1 in NUREG-1575).

Licensees may submit information on facility radiation surveys in one of the following ways:

- Method 1

  Licensees may submit the information on the release criteria, site characterization survey, and remedial action support surveys, along with a commitment to use the MARSSIM approach in developing the final radiological survey. See Volume 2 of this guidance for further details.

- Method 2

  For Groups 1-3, a simplified survey may be used, as discussed in Chapters 8-10.

- Method 3

  Site conditions for groups 4 through 7 are beyond the scope of MARSSIM's statistical applicability. A site-specific approach should be developed. (See Section 2.6 of NUREG-1575 for alternate statistical methodologies, and sections 4.2.4 and 6.5.5 of NUREG-5849 for general context). Licensee should coordinate approach with NRC staff, based on site conditions, and historical site assessment.

- Method 4

  The licensee may propose other survey methodologies, as appropriate, as part of their DP. Use of an alternate methodology will require an in-depth NRC technical review.

The regulatory requirements for final status surveys are contained in 10 CFR 20.1501(a), 30.36(g)(4)(iv), 40.42(g)(4)(iv), 70.38(g)(4)(iv), and 72.54(g)4.

15.4.4 FINAL STATUS SURVEY REPORT

The results of final status surveys are documented in a detailed report that becomes part of the licensee's application to terminate the license. The purpose of the staff's review is to verify that the results of the final status survey demonstrate that the site, area, or building meets the radiological criteria for license termination. Volume 2 of this NUREG contains an example of an FSSR and provides guidance on the acceptable format and content of this report. Volume 2 also contains guidance for reviewing FSSRs.

The regulatory requirements for FSSRs are contained in 10 CFR 20.1402, 20.1403, 20.1501, 30.36(j)(2), 40.42(j)(2), 70.38(j)(2), and 72.54(I)(2).

15.4.5 CONFIRMATORY SURVEYS

After acceptance of the licensee's FSSR, NRC may conduct a confirmatory survey. Inspection Procedure 83890, "Closeout Inspection and Survey," discusses the procedures to be followed to determine whether a confirmatory survey is required at a licensed facility and the procedures for performing confirmatory surveys. NRC staff shall assign higher priority for conducting confirmatory surveys at sites that may pose a greater potential threat to the public health and safety. The confirmatory survey develops radiological data of the same type as that presented by the licensee, but it is usually limited in scope to spot-checking conditions at selected site locations, comparing findings with those of the licensee, and performing independent statistical evaluations of the data developed by the two surveys. An objective of the confirmatory survey is to verify the accuracy of the licensee's measurement technique. Only limited statistical information is developed to compare with the information submitted by the licensee. NRC uses the report of this survey to support a decision on the licensee's application to terminate a license and release the site. NRC's regulations do not include specific requirements for the confirmatory survey.

Any decommissioning facility could undergo a confirmatory survey. NRC has implemented a risk-informed process that assigns higher priority for conducting confirmatory surveys at sites that may pose a greater potential threat to the public health and safety. NRC's approach assumes that in-process inspections are more efficient than one-time confirmatory surveys. This approach would allow the release of some facilities from regulatory control based solely on past operations and performance, NRC's confidence that the facility was adequately remediated by the licensee, and a satisfactory closeout inspection.

If a confirmatory survey will be performed by an NRC contractor, the staff licensing project manager shall coordinate NRC activities with DWM. Volume 2 of this NUREG contains further guidance on confirmatory surveys.

15.5 PARTIAL SITE DECOMMISSIONING

A licensee that has submitted a DP that has not yet been approved or a licensee that has an approved DP may opt to release a portion of its site early. For the case of partial site release, the licensee must submit a request for a license amendment and follow the decommissioning process (characterize contamination, surveys, etc.) described in Chapter 5.

A site enters into partial site decommissioning in one of two ways:

- The licensee requests a portion of its facility be removed from the license; or
- A licensed facility is required per 10 CFR 30.36(d)(1-4), 40.42(d)(1-4), 70.38(d)(1-4), and 72.54(d)(1-3) to begin decommissioning at a portion of its facility (see below and Figure 5.1).

15.5.1 RECORDS

10 CFR 30.35(g), 40.36(f), 70.25(g), and 72.30(d) describe the requirements for the maintenance of records pertaining to decommissioning licensed facilities that would also apply to decommissioning a portion of a licensed facility (note that partial facility decommissioning would also be accomplished using the appropriate decommissioning group discussed in previous chapters).

15.5.2 SPECIFIC LICENSES

Typically, a specific licensee's facilities are identified in its license, and thus an amendment to the license is required prior to releasing the building or area for unrestricted release. Licensees with a single address or location of use incorporating multiple sites or buildings, such as a research facility with licensed material usage in several buildings, and who have determined that the provisions of 30.36(d) apply, may be required to develop a DP for each area of use (see Chapters 8-14 for applicable Decommissioning Groups). If a DP were required, or if several

areas were to be decommissioned, a single plan that incorporates the decommissioning of each of these areas may be acceptable.

If only a portion (i.e., a single building or an outdoor area) of a licensed facility is to be decommissioned, the DP, if required, should address the portion of the property that will be removed from the license. In addition, the DP should incorporate measures to ensure that the area being decommissioned is separated from the area that will remain as a controlled area. For example, this may be accomplished by erecting a fence, or establishing administrative controls between the two portions of the site. The DP should address not only the decommissioning of the portion of the site but also the measures that will ensure that the decommissioned area does not become recontaminated by future licensed activities. At the completion of the decommissioning operations, the license will be amended to indicate that radioactive material use is no longer authorized in that portion of the facility that was decommissioned.

Upon final decommissioning of the site, the licensee will consider residual contamination and any dose contribution from all previous site releases when computing the final dose. The total dose contribution must meet the site's final release criteria. See Volume 2 of this NUREG for more information.

15.5.3 BROAD SCOPE LICENSES

Broad scope licensees pursuant to 10 CFR Part 33 are authorized to internally establish, terminate, and resume uses of licensed materials at separate locations (e.g., individual laboratories within a building). Typically, these licensees are not required to notify NRC as described in 10 CFR 30.36(d), because a decision has not been made to permanently cease principal activities at the entire site or in any separate building. Broad scope licensees also have license requirements incorporated into their operational program for the release of existing and approval of new material use areas. Furthermore, broad scope licensees generally would not have to submit a decommissioning plan and would not request an amendment to their license to describe changes in areas of use. Broad scope licensees who issue internal approvals would only be required to maintain records of the decommissioning for review by NRC inspectors, per 10 CFR 30.35(g).

However, two specific provisions of 10 CFR Part 30, Section 30.36, "Expiration and termination of licenses and decommissioning of sites and separate buildings or outdoor areas," apply to broad scope licensees, i.e., 10 CFR 30.36(d)(2) and (4):

- (2) The licensee has decided to permanently cease principal activities, as defined in this part, at the entire site or in any separate building or outdoor area that contains residual radioactivity such that the building or outdoor area is unsuitable for release in accordance with NRC requirements; or

- (4) No principal activities have been conducted for a period of 24 months in any separate building or outdoor area that contains residual radioactivity such that the building or outdoor area is unsuitable for release in accordance with NRC requirements.

A key qualifier, cited in the above subsections, is the emphasis placed on the presence of radiological contamination in excess of NRC unrestricted release limits in licensed facilities (separate buildings or areas). Therefore, broad scope licensees who remediate their facilities to meet operational radiological release limits (specified in their license) may find that information on areas where past licensed activities were conducted do not need to be provided to NRC as required in 10 CFR 30.36, and would need only to maintain records (10 CFR 30.35(g)) for NRC inspection. Since licensees must account for dose consequences for all past areas of use upon license termination, licensees who elect not to notify NRC may wish to contact NRC prior to relinquishing control of a building or area, if prior to license termination. Licensees are also encouraged to review Section 15.4, "Decommissioning Surveys," to ensure the operational release surveys contain sufficient information to satisfy FSS requirements at license termination.

However, just as required for a specific licensee, if a broad scope licensee were to identify a building or area in excess of the NRC unrestricted release criteria, or if the remediation would require use of procedures not approved in their license, or if the remediation would have adverse dose consequences upon workers, the public, or the environment, they would also be required to notify NRC, as well as to make a determination as to whether or not a DP is required.

15.6 SITE DECOMMISSIONING MANAGEMENT PLAN SITES

In March 1990, NRC established the Site Decommissioning Management Plan (SDMP) program to help ensure the timely cleanup of sites warranting special attention by the Commission. The SDMP program was implemented to identify and resolve the issues associated with the remediation of numerous licensed, formerly licensed, and unlicensed sites contaminated with residual radioactive material in excess of NRC's criteria.

These sites were deemed to warrant special attention by the Commission because of the limited progress made in completing the remediation of the site and the termination of the facility license. SDMP sites present unique decommissioning challenges and typically have buildings, former waste disposal areas, large volumes of tailings, ground water contamination, and soil contaminated with uranium or thorium or other radionuclides. Sites may be added or removed from the SDMP.

For a site to be placed on the original SDMP, it had to meet one of the following five criteria:

1. Problems with a viable responsible organization (e.g., inability to pay for, or unwillingness to perform, decommissioning);
2. Presence of large amounts of soil contamination or unused settling ponds or burial grounds that may be difficult to dispose of;

3. Long-term presence of contaminated, unused facility buildings;
4. License previously terminated, but residual contamination exceeds unrestricted use limits; or
5. Contamination or potential contamination of the ground water from onsite wastes.

The following criteria are used to add new sites to the SDMP list:

1. Restricted-use sites; or
2. Complex unrestricted-use sites (sites requiring detailed site-specific dose modeling, sites subject to heightened public, State or Congressional interest; or sites with questionable financial viability).

The Commission established these general criteria for including sites in the SDMP program as guidelines to the staff. The objective is to place only those sites with difficult decommissioning issues on the SDMP to ensure that they receive adequate NRC staff and management attention, not to list the sites that require less intensive efforts. Regional Offices should forward information on sites meeting the inclusion criteria to DWM. The decision to include a site in the SDMP program will be made by DWM after consultation with the appropriate Regional Office.

NRC will address the timing of SDMP site cleanups on a case-by-case basis. In implementing this approach, NRC will establish specific and enforceable milestones for each phase of decommissioning through license amendments or orders. These schedules should be developed in conjunction with the licensee and provide flexibility for the licensee to demonstrate good cause for delaying cleanup, based on technical and risk-reduction considerations or for reasons beyond the licensee's control.

Sites are removed from the SDMP when the licensee completes the decommissioning of the site in accordance with an approved DP and adequately demonstrates to NRC that the site meets the cleanup levels described in the plan. Prior to removing a site from the SDMP, NRC staff shall prepare a Commission paper outlining the site history and decommissioning, including a staff-generated dose assessment, and inform the State and Regional EPA Office of the intent to remove the site from the SDMP. If NRC terminates the license after removal from the SDMP, the licensee will be relieved from any further obligation to NRC, as long as the licensee decommissioned the site in full accordance with the approved decommissioning plan.

15.7 NEPA COMPLIANCE

The National Environmental Policy Act (NEPA) of 1969 requires Federal Agencies, as part of their decision-making process, to consider the environmental impacts of actions under their jurisdiction. Both the Council on Environmental Quality (CEQ) and NRC have promulgated regulations to implement NEPA requirements. CEQ regulations are contained in 40 CFR Parts

1500 to 1508, and NRC requirements are provided in 10 CFR Part 51. The NEPA review (also referred to as the environmental review) process for decommissioning is initiated by a licensee's request for a license amendment to decommission. A flow chart illustrating the NEPA process is shown in Figure 15.2.

Most decommissioning actions are in Group 1 and have little, if any, significant impact on the environment. For Group 1, compliance with NEPA involves a determination that the action qualifies as a categorical exclusion (CATX). For Groups 2, 3, 4, and 5, the NRC staff typically prepares an environmental assessment (EA). For Groups 6 and 7, potentially significant impacts may result from the proposed decommissioning actions, and a detailed environmental review and preparation of an Environmental Impact Statement (EIS) is required. See Table 15.3 for a listing of NEPA actions appropriate for each decommissioning group.

NUREG-1748 (Environmental Review Guidance for Licensing Actions Associated with NMSS Programs) (NMSS Environmental Guidance) provides general procedures for the environmental review of licensing actions for materials facilities regulated by the Office of Nuclear Material Safety and Safeguards (NMSS). The NMSS environmental guidance includes:

- Whether a licensee's request is a CATX or whether the staff needs to prepare an EA or EIS;
- Early planning for an EA or EIS;
- Methods of using previous environmental analyses related to the proposed action;
- The EA process, including preparation and content of the EA, agencies to be consulted, and preparation of the Finding of No Significant Impact (FONSI);
- The process of preparing an EIS, from developing a project plan, through scoping, consultations, and public meetings, to preparing the Record of Decision;
- The content of the EIS; and
- Environmental information that should be considered by licensees in their environmental report (ER).

Table 15.3 Decommissioning Groups and Associated NEPA Actions

GROUP	DESCRIPTION OF GROUP	NEPA ACTION
1	Licensed material used in a manner that would preclude releases to the environment. No decommissioning plan (DP) required. (Limited to sealed sources and small quantities of short half-life materials.)	An environmental assessment (EA) for termination of the license is not required, since this action is categorically excluded under 10 CFR 51.22(c)20.
2	Would not typically be expected to result in unmonitored releases into the environment. Dose screening methodology or final status survey report (FSSR) required. No DP required.	An EA will be required. Consider relying on the license termination rule GEIS, as described in Section 15.7.3 of this guidance.
3	Dose screening methodology. DP required.	Same as Group 2.
4	Typically results or has resulted in releases into the environment. Volumetric contamination without existing ground water contamination, and surface and soil contamination that does not meet screening criteria. Licensee plans unrestricted use.	Same as Group 2.
5	Licensed material used in a manner that resulted in releases into the environment, including ground water contamination. Licensee plans unrestricted use.	An EA will be required. If ground water is contaminated and a FONSI cannot be determined, an EIS may be necessary.
6	Licensed material used in a manner that resulted in releases into the environment. Licensee plans restricted use.	Because the licensee plans to limit future land uses at the site, the staff must prepare an environmental impact statement (EIS). NUREG-1748 discusses the process of preparing an EIS, environmental information that should be considered by licensees in their environmental report, and the content of the EIS.
7	Licensed material used in a manner that resulted in releases into the environment. Licensee plans restricted use and requests use of the alternate criteria in 10 CFR 20.1404.	Same as Group 6.

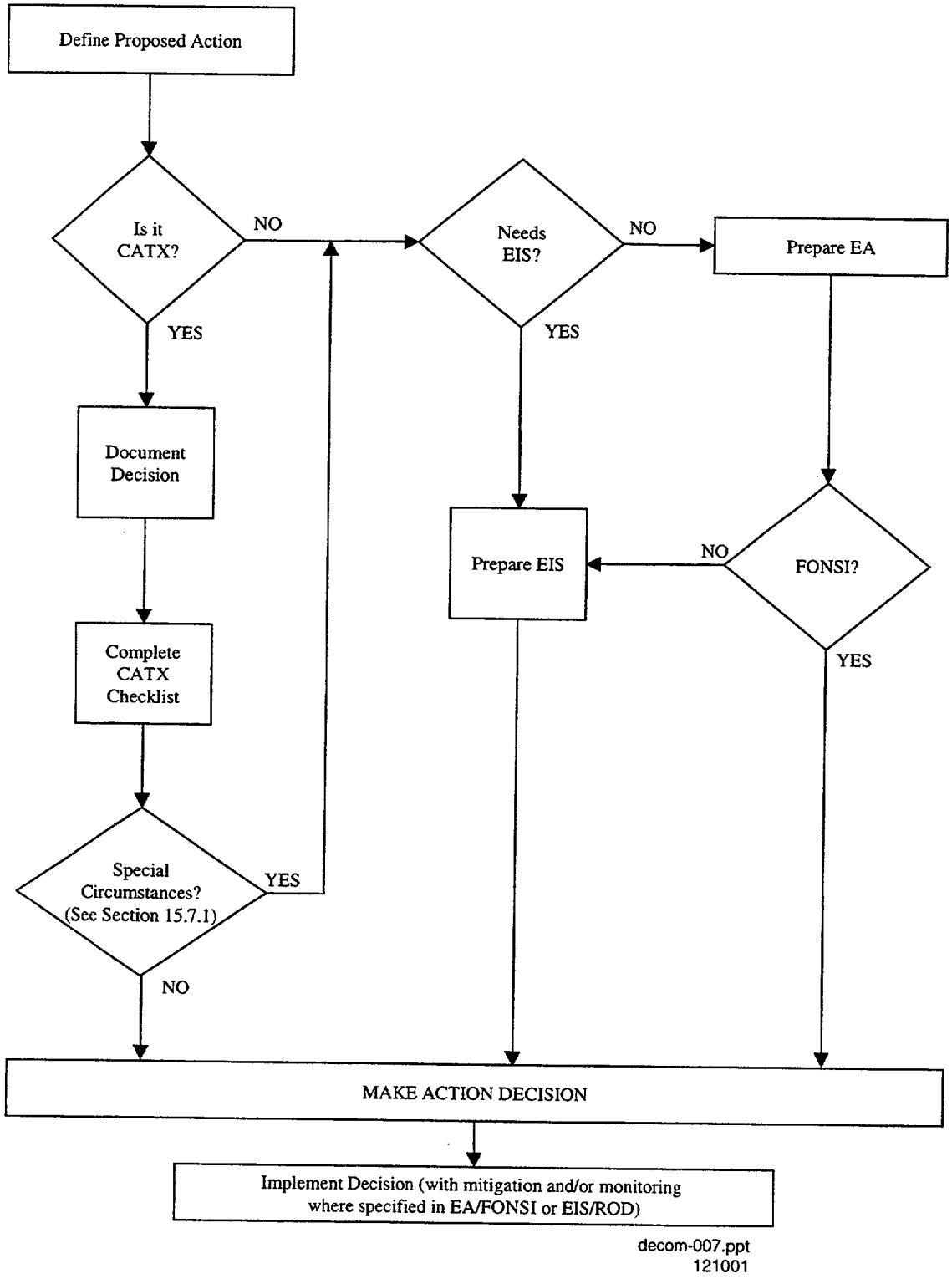

Figure 15.1 NEPA Screening Process.

15.7.1 CATEGORICAL EXCLUSION

When a request for decommissioning is received from a licensee, NRC first determines whether a CATX is applicable for the proposed action. CATXs are categories of actions that NRC, in consultation with CEQ, has determined do not individually or cumulatively have a significant effect on the environment. Criteria for identifying a CATX and a list of actions eligible for CATX are provided in 10 CFR 51.22. Group 1 license termination actions qualify for a categorical exclusion under 10 CFR 51.22 (c)(20). An EA or EIS is only prepared when there is a potential for environmental impacts from the decommissioning of the facility.

For a CATX, the finding should be documented in the staff's technical or safety review or in the response to the licensee. For example, the staff could state in the letter to the licensee that "An environmental assessment for this action is not required, since this action is categorically excluded under 10 CFR 51.22(c)(20), because licensed operations have been limited to the use of small quantities of short-lived radioactive materials." The proposed action is subject to no further NEPA review, but it is still evaluated for compliance with NRC radiation protection regulations and other applicable regulations.

Further guidance on CATXs, including a CATX checklist, is contained in the NMSS environmental guidance (NUREG-1748). The licensing project manager should consider completing the checklist in NUREG-1748 to ensure that no special circumstances exist that would require preparation of an EA. Special circumstances in which a CATX may not apply for decommissioning include (1) decommissioning activities that could significantly affect the natural or cultural environment, (2) activities that could generate a great deal of public interest, or (3) a high level of uncertainty about the decommissioning's environmental effects.

15.7.2 ENVIRONMENTAL ASSESSMENT

If no CATX applies, NRC typically prepares an EA (10 CFR 51.21 and 51.30). An EA is a concise, publicly-available document that serves to provide sufficient evidence and analysis for determining whether to prepare an EIS or a FONSI. EAs are prepared by licensing project managers. If it is determined that no significant impacts exist, the FONSI (10 CFR 51.32 to 51.35) is prepared for publication in the *Federal Register* (10 CFR 51.119). Appendix H contains an example of an EA and FONSI.

If the EA reveals the proposed action may significantly affect the environment and cannot be mitigated, the development of an EA is discontinued, and the process to develop an EIS is initiated. If the action under review is certain to result in significant impacts, the EA can be skipped, and the environmental review to support the action should move directly to an EIS.

An EA must be prepared for proposed actions that are not:

- Exempt from NEPA;
- Categorically excluded (10 CFR 51.22);
- Covered in an existing EIS or other environmental analysis; or
- Required to have an EIS prepared (10 CFR 51.21).

The license amendment request is accompanied by environmental information needed to conduct the environmental analysis. This information can also be provided in an ER submitted by the licensee. The general requirements for an ER are described in 10 CFR 51.45. When the environmental information is submitted, NRC staff will conduct an acceptance review to determine whether: (1) the requested action will require an EA or EIS; and (2) the information is complete and will support the required environmental analyses.

EAs and EISs (i.e., NEPA documents) focus on the potential environmental impacts of the proposed action. NRC also prepares an SER to evaluate the safety of the proposed action and compliance with NRC regulations. (Appendix G contains an SER outline and template.) The safety and environmental reviews are conducted in parallel. Although there is some overlap between the content of an SER and the NEPA document, the intent of the documents is different. The NEPA document usually includes a summary of the SER findings to aid in the decision process. Much of the information describing the affected environment is also applicable to the SER (e.g., traffic patterns, demographics, geology, and meteorology), and the NRC staff should ensure consistency between the NEPA document and the SER, preferably by references to each other.

15.7.3 ABBREVIATED EA – RELYING ON THE LICENSE TERMINATION RULE GENERIC EIS

The NRC staff may be able to rely on the 1997 "Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities" (GEIS, NUREG-1496), to satisfy NEPA obligations for decommissioning sites where the licensee proposes to release the site for unrestricted use. To determine if the GEIS can be applied to a specific decommissioning site, perform the following steps:

- Determine if the screening values are applicable to the decommissioning site, as discussed in section 1.4. If the screening values can be used, the GEIS applies to the site.
- If the screening values cannot be used, compare the site conditions to the models used in the GEIS. Appendix E should be used to determine if the generic analysis in the GEIS encompasses the range of environmental impacts at the site. Appendix E contains (1)

checklists for structures and soil that indicate whether the GEIS is applicable and (2) tables that show the parameters used for the reference facilities studied in the GEIS.

- If the GEIS does apply to the decommissioning site, NEPA compliance can be demonstrated in an abbreviated EA. The abbreviated EA will:
  - — Briefly characterize the contamination and remediation activities;
  - — Reference the appropriate licensee documents, and direct the reader to the licensee's decommissioning plan for a more thorough description of the contamination and remediation activities; and
  - — Describe the affected environment (including location, climate, geology, hydrology, cultural resources, and ecology) to demonstrate that NRC has looked for any site-specific impacts that are not covered by the GEIS. Special environmental or cultural issues may be associated with a decommissioning action, which may require a particular analysis.

- Add the following statement to the EA:

  The NRC staff has reviewed the decommissioning plan for the XYZ facility and examined the impacts of decommissioning. Based on its review, the staff has determined that the environmental impacts associated with the decommissioning of the XYZ facility are bounded by the impacts evaluated by the GEIS or the NRC Final EIS related to construction and operation of XYZ facility, dated ____, 20__. The staff also finds that the proposed decommissioning of XYZ is in compliance with 10 CFR 20.1402, the radiological criteria for unrestricted use.

- Since impacts on plant and animal populations could occur, the project manager or the licensee will need to contact the U.S. Fish and Wildlife Service for a list of threatened and endangered species and determine the impacts, if any, of the decommissioning activities on these species. The State would also need to be consulted about possible impacts on State-listed species.
- The State Historic Preservation Officer will need to be contacted to determine if there are any historic properties that could be impacted by the decommissioning activities.

If a FONSI has been made and there is no potential for off-site impacts, environmental justice issues need not be considered (environmental justice is disproportionately high and adverse human health or environmental effects on minority and low-income populations).

15.7.4 ENVIRONMENTAL IMPACT STATEMENT

If there are potentially significant impacts, an EIS must be prepared. An EIS provides decision makers and the public with a detailed and objective evaluation of significant environmental impacts, both beneficial and adverse, likely to result from a proposed action and reasonable alternatives. In contrast to the brief analysis in an EA, the EIS includes a more detailed

interdisciplinary review. The EIS provides sufficient evidence and analysis of impacts to support the final NRC action in the Record of Decision (for NRC, the issuance of the license amendment). The NMSS environmental guidance (NUREG-1748) discusses the EIS process and preparation of the ER and EIS documents. Except for rulemaking EISs, all NMSS EISs are prepared by the EPAB. Decommissioning of facilities that plan to use the restricted release criteria (10 CFR 20.1403-1404) for license termination typically require an EIS.

An EIS must be prepared for proposed actions that:

- Are major Federal actions significantly affecting the quality of the human environment (10 CFR 51.20(a)(1));
- The Commission, as a matter of its discretion, has determined that an EIS should be prepared (10 CFR 51.20(a)(2));
- Are of the type listed in 10 CFR 51.20(b); or
- Are determined to require an EIS by the NRC manager responsible for authorizing the action, based either on the results of an EA or on other information indicating potentially significant impacts.

15.7.5 EA AND EIS CONSIDERATIONS SPECIFIC TO DECOMMISSIONING

For decommissioning actions, the proposed action is to remove a facility safely from service and reduce residual radioactivity to a level that permits release of the property for unrestricted use or under restricted conditions, and termination of the license. NRC's purpose is to fulfill its responsibilities under the Atomic Energy Act, which is to make a decision on a proposed license amendment for decommissioning that ensures protection of the public health and safety. The objective of the proposed action is to ensure that the decommissioning of the facility meets the license termination criteria in 10 CFR Part 20, Subpart E.

The EA or EIS is required to consider all reasonable alternatives, including the licensee's decommissioning proposal and the no-action alternative. Because decommissioning is required by regulation and is necessary to protect the public, the no-action alternative may not be a reasonable alternative. However, NEPA regulations require analysis of the no-action alternative because it provides a benchmark, enabling decision makers to compare the magnitude of environmental effects of the action alternatives. For decommissioning sites, the no-action alternative does not require a detailed analysis.

Reasonable alternatives could include other means to decommission the facility or decommissioning only part of it. Local, State, Tribal or Federal laws (for example, a local law

that prohibits on-site disposal of radioactive waste) do not necessarily render an alternative unreasonable, although such conflicts must be considered and discussed in the EA or EIS.

A complete list of impacts to be considered is contained in the environmental guidance (NUREG-1748). The following is a list of some typical decommissioning impacts:

- Construction impacts such as fugitive dust emissions, vehicle and equipment exhaust emissions, and noise;
- Hazardous and radioactive emissions;
- Ground water contaminant plumes;
- Doses to the public from transporting radioactive materials to disposal sites; and
- Land use and aesthetic impacts from construction of a disposal cell.

15.8 NUCLEAR MATERIALS MANAGEMENT AND SAFEGUARDS SYSTEM

The Nuclear Materials Management and Safeguards System (NMMSS) serves as the U.S. Government's information system containing current and historic data on the possession and shipment of certain source and special nuclear material. NMMSS satisfies the requirements of the Atomic Energy Act of 1954, as amended for:

> "a program for Government control of the possession, use and production of atomic energy and special nuclear material, whether owned by the Government or others, so directed as to make the maximum contribution to the common defense and security and the national welfare, and to provide continued assurance of the Government's ability to enter into and enforce agreements with nations or groups of nations for the control of special nuclear materials..."

It is also used to satisfy treaty obligations to the International Atomic Energy Agency and a variety of agreements for nuclear cooperation for a state system of accountancy of source and special nuclear materials. Transaction, Inventory and Material Balance data from over 1000 facilities, which are either operated by DOE or regulated by the NRC, are reported to NMMSS.

When decommissioning a license in preparation for license termination, NRC staff should request the NRC NMMSS project manager (in the Fuel Cycle Facilities Branch, Divison of Fuel Cycle Safety and Safeguards, NMSS), to confirm that all NMMSS material has been properly accounted between the license and the NMMSS database. This process can take as little as two days to complete, and it should be conducted for all licenses that were issued to possess materials in the following minimum quantities of materials:

Table 15.4 NMMSS Reportable Quantities

Isotope or Element	Reportable Quantity
Plutonium-238	0.1 gram
Plutonium	1 gram
Enriched Uranium	1 gram Uranium-235
Uranium-233	1 gram Uranium-233
Foreign-Origin Thorium	1 kilogram
Foreign-Origin Natural Uranium	1 kilogram
Foreign-Origin Depleted Uranium	1 kilogram

A statement to this effect should be included in the SER, either in the "Radiological Status of the Facilty," or the "Radioactive Waste Management" section.

15.9 DECOMMISSIONING CONTRACTORS

It should be noted that Group 1 and 2 licensees may consider using Decommissioning Service Contractors who are licensed to perform decommissioning activities, without amending their license, if the Service Licensee's license allows such activities. For Groups 3 and 4, Decommissioning Service Contractors may be able to perform work under their license (consult with NRC for a determination). Decommissioning Service Contractors would not typically be used under the contractor's license for Groups 5 - 7. These higher Group decommissioning activities typically are done under the authority of the licensee's license, since the requirements of a DP must include public involvement, and the need for safety and environmental assessments. The site owner remains responsible for the eventual release of a site regardless of who the owner hires to perform specific activities.

Appendix K contains the final policy and guidance directive on licensing site remediation contractors to operate under their own license at temporary job sites. The guidance includes example license conditions for service licenses.

15.10 DECOMMISSIONING COMMUNICATION PLANNING

For complex sites, the NRC project manager should develop a communication plan following the "Policy and Procedures Guide for Developing NMSS Communication Plans" for developing individual communication plans for decommissioning activities. Communication plans cover topics such as applying public outreach tools and techniques, identifying stakeholders, and estimating costs and schedules for public outreach meetings.

The ADAMS Document Processing Instruction Template NRC-001, "Meeting Related Documents for NRC Staff-Level Offices" instructs the staff in the preparation of all meeting related documents. These documents include meeting notices, agenda, handouts, summaries, etc. NRC's web site (http://www.nrc.gov/NRC/PUBLIC/meet.html) is the official forum to announce meetings open to the public. NUREG-1748 contains detailed guidance concerning public meetings associated with an EIS.

PART II: DECOMMISSIONING PLANS

16 DECOMMISSIONING PLANS: SITE DESCRIPTION

U.S. Nuclear Regulatory Commission (NRC) regulations require that a licensee must submit a decommissioning plan to support the decommissioning of its facility when it is required by license condition, or if NRC has not approved the procedures and activities necessary to carry out the decommissioning and these procedures could increase the potential health and safety impacts to the workers or the public. Chapters 16 through 18 provide a description of the contents of specific decommissioning plan modules, as well as evaluation and acceptance criteria for use in reviewing decommissioning plans and other information submitted by licensees to demonstrate that the facility is suitable for release in accordance with NRC requirements.

The information in this and the following two chapters is taken directly from the Standard Review Plan (NUREG-1727). The SRP was developed specifically for reviewing decommissioning plans written to comply with the License Termination Rule. There has been some minor editing to remove redundancy and use consistent terminology in this document, but the essential information is the same. The difference in writing styles between the documents is because of different objectives and different authors for the documents. While there is some difference in writing style, this was the most efficient means to capture the contents of the SRP, which was recently finalized after significant public comment.

This chapter addresses the general description of the site and its current radiological condition; the next chapter is the decommissioning process (e.g. activities, management, and QA); and the third is devoted to changes after submission of a DP. Discussions of SRP topics of dose modeling, ALARA, surveys, and finanical assurance are found in Volumes 2 and 3 of this NUREG. The NEPA guidance found in the SRP is superseded by this volume and NUREG-1748.

The topical contents of Chapters 16-18, excerpted from the SRP, are as follows:

Chapter 16: Decommissioning Plans: Site Description
16.1 Executive Summary
16.2 Facility Operating History
16.3 Facilty Description
16.4 Radiological Status of the Facility

Chapter 17: Decommissioning Plans: Program Organization
17.1 Planned Decommissioning Activities
17.2 Project Management and Organization
17.3 Radiation Safety and Health Program During Decommissioning
17.4 Environmental Monitoring and Control Program
17.5 Radioactive Waste Management Program
17.6 Quality Assurance Program

Chapter 18: Modifications to Decommissioning Programs and Procedures

DISCLAIMER

This guidance is being issued to describe and make available to the public methods acceptable to the NRC staff in implementing specific parts of the Commission's regulations, to delineate techniques and criteria used by the staff in evaluating decommissioning plans, and to provide guidance to licensees. This guidance is not a substitute for regulations, and compliance with it is not required. Methods and solutions different from those set out in this guidance will be acceptable, if they provide a basis for concluding that the decommissioning plan is in compliance with the Commission's regulations.

16.1 DECOMMISSIONING PLAN EXECUTIVE SUMMARY

NRC staff will review the general information supplied by the licensee to determine if the decommissioning objective and general decommissioning schedule comply with the NRC's requirements. Expected contents are listed below.

The purpose of the staff's review of the "Executive Summary" is to determine, in a general manner, whether the licensee's submitted decommissioning plan provides an adequate demonstration that the licensee understands, and has complied with, the requirements of 10 CFR 20.1400-1404, 30.36, 40.42, 70.38, and 72.54 for decommissioning and license termination. The staff will not perform a technical review of any information in the "Executive Summary."

16.1.1 REVIEW PROCEDURES

Safety Evaluation

The material to be reviewed is informational in nature, and no specific detailed technical analysis is required. The staff will verify that the specific information (e.g., licensee's name and address) is correct. The staff will make a qualitative assessment as to a) the licensee's compliance with the requirements of 10 CFR 20.1402, regarding the estimated dose to the public from residual radioactive material at the completion of decommissioning and the method that the estimated dose from residual radioactivity was determined; b) the requirements of 10 CFR 20.1403 or 20.1404, if the decommissioning alternative proposed by the licensee is license termination under restricted conditions or using alternate criteria, and; c) if the decommissioning schedule summary is reasonable.

16.1.2 ACCEPTANCE CRITERIA

Regulatory Requirements

10 CFR 20.1400-1404, 30.36, 40.42, 70.38, 72.54

Information to be Submitted

The information supplied by the licensee should provide contributory evidence as to the licensee's understanding of the technical and institutional requirements for the decommissioning of licensed nuclear facilities. The staff's review should verify that the following information is included in the "Executive Summary":

- The name and address of the licensee or owner of the site;
- The location and address of the site;
- A brief description of the site and immediate environs;
- A summary of the licensed activities that occurred at the site, including the number and type of license(s); when the facility began and ceased using licensed material, and the types and activities of licensed material authorized and used under the license(s);
- The nature and extent of contamination at the site;
- The decommissioning objective proposed by the licensee (i.e., restricted or unrestricted use);
- The DCGLs for the site, the corresponding doses from these DCGLs, and the method by which the DCGLs were determined;
- A summary of the ALARA evaluations performed to support the decommissioning;
- If the licensee requests license termination under restricted conditions, the restrictions the licensee intends to use to limit doses as required in 10 CFR 20.1403 or 20.1404, and a summary of institutional controls and financial assurance arrangements for the site;
- If the licensee requests license termination under restricted conditions, or using alternate criteria, a summary of the public participation activities undertaken by the licensee to comply with 10 CFR 20.1403(d) or 20.1404(a)(4);
- The proposed initiation and completion dates of decommissioning;
- Any post-remediation activities (such as groundwater monitoring) that the licensee proposes to undertake prior to requesting license termination; and
- A statement that the licensee is requesting that its license be amended to incorporate the decommissioning plan.

16.1.3 EVALUATION FINDINGS

Evaluation Criteria

The staff should verify that the information summarized in "Information to be Submitted," above, is included in the Executive Summary. The staff's review should verify that the decommissioning alternative and activities proposed by the licensee are or will be in compliance with the requirements of 10 CFR 20.1402 or 20.1403 as appropriate and that the decommissioning timeframe appears to be reasonable.

16.2 DECOMMISSIONING PLAN FACILITY OPERATING HISTORY

Licensees who must provide a DP to the NRC will submit information to determine if the description of the operating history of the facility is adequate to allow NRC to fully understand the types of radioactive material (and for Part 70 licenses, the hazardous chemicals produced from radioactive material) used at the site, the nature of the authorized use of radioactive materials at the site, and the activities at the site that could have contributed to residual radioactive material being present at the site. This information should include the license number(s) and status of the license(s) held by the licensee descriptions of:

- the activities authorized under the current license;
- past authorized activities using licensed radioactive material at the site;
- all previous decommissioning or remedial activities at the site;
- descriptions the locations of all spills and releases of radioactive material at the site; and,
- all previous burials of radioactive material, including those where the material was subsequently exhumed.

NRC staff will verify that the specific information (license numbers, status and current authorized activities) is correct. In some instances the information described in the following sections may not be available, especially for older facilities. Lack of complete information on the past facility operations would not generally be sufficient justification for rejecting the decommissioning plan. Rather, the staff will make a qualitative assessment as to whether the licensee's descriptions of authorized activities, past operating activities, spills, and previous burials are adequate to serve as the basis for evaluating the accuracy of the descriptions of the radiological status of the facility and if the decommissioning activities proposed by the licensee to remediate the facility can be conducted safely.

16.2.1 LICENSE NUMBER/STATUS/AUTHORIZED ACTIVITIES

The need for the licensee to determine and evaluate past license activities is to verify that the number and types of licenses and the status of each license are accurate and to insure that the licensee is confident with their past use of radioactive material at the site. This will allow the NRC staff to evaluate the licensee's determination of the radiological status of the facility and the licensee's planned decommissioning activities, to ensure that the decommissioning can be conducted in accordance with NRC requirements.

Information to be Submitted

The information supplied by the licensee should be sufficient to enable the NRC staff to fully understand what licensed activities are currently being performed by the licensee. The NRC staff's review should verify that the following information is included in the "Authorized Activities" section of the decommissioning plan:

- The radionuclides and maximum activities and quantities of radionuclides authorized and used under the current license;
- The chemical forms of the radionuclides authorized and used under the current license;
- A detailed description of how the radionuclides are currently being used at the site;
- The location(s) of use and storage of the various radionuclides authorized under current licenses;
- A scale drawing or map of the building or site and environs showing the current locations of radionuclide use at the site; and
- A list of amendments to the license since the last license renewal.

NRC EVALUATION FINDINGS

NRC staff review will verify that the number and type of licenses and the status of each license are accurate by comparing the information presented in the decommissioning plan with current NRC license and past inspection information. The staff should verify that the information summarized under "Information to be Submitted," above, is included in the licensee's description of the authorized activities under the license. The staff should verify that this information is correct by comparing it with current NRC license information.

16.2.2 LICENSE HISTORY

As indicated above, the purpose of the development of a detailed history is to ensure that the licensee has thoroughly evaluated and documented previous uses of radioactive material at the site, so that NRC staff can evaluate whether the licensee's determination of the radiological status of the facility is adequate and that the licensee's planned decommissioning activities are appropriate to ensure that the decommissioning can be conducted in accordance with NRC requirements.

INFORMATION TO BE SUBMITTED

The information supplied by the licensee should be sufficient to enable the staff to fully understand what licensed activities were performed by the licensee in the past. The staff's review should verify that the following information is included in the license history section of the facility decommissioning plan:

- The radionuclides and maximum activities of radionuclides authorized and used under all previous licenses;
- The chemical forms of the radionuclides authorized and used under all previous licenses;
- A detailed description of how the radionuclides were used at the site;
- The location(s) of use and storage of the various radionuclides authorized under all previous licenses as described in 10 CFR 30.35(g), 40.36(f), 70.25(g), 72.30(d); and
- A scale drawing or map of the site, facilities and environs showing previous locations of radionuclide use at the site as described in 10 CFR 30.35(g), 40.36(f), 70.25(g), 72.30(d).

16.2.3 PREVIOUS DECOMMISSIONING ACTIVITIES

The purpose of the review of the license's previous decommissioning activities is to provide the NRC staff with information that will aid the staff in evaluating the licensee's determination of the radiological status of the facility and whether previous decommissioning activities are sufficient to comply with current NRC criteria for license termination.

INFORMATION TO BE SUBMITTED

The information supplied by the licensee should be sufficient to enable the staff to fully understand what decommissioning activities were performed by the licensee in the past. The staff's review should verify that the following information is included in the previous decommissioning activities section of the decommissioning plan:

- A list or summary of areas at the site that were remediated in the past;
- A summary of the types, forms, activities and concentrations of radionuclides that were present in previously remediated areas;
- The activities that caused the areas to become contaminated;
- The procedures used to remediate the areas and the disposition of radioactive material generated during the remediation;
- A summary of the results of the final radiological evaluation of the previously remediated area, including the locations and average radionuclide concentrations in the previously remediated areas; and
- A scale drawing or map of the site, facilities and environs showing the locations of previous remedial activity.

16.2.4 SPILLS

The purpose of the review of the licensee's description of spills that have occurred at the site is to provide the NRC staff with information that will aid in the staff's evaluation of the licensee's determination of the radiological status of the facility. In this context, a "spill" is defined as an uncontrolled release of radioactive material at the site that results in radioactive material being present in the site environs or any unusual occurrences involving the spread of contamination in and around the facility, equipment, or site. Note that controlled releases, such as liquid effluents released to surface water bodies in accordance with 10 CFR 20 Appendix B, would not be considered a "spill." However, the point of release may need to be evaluated to determine the radiological status of the point of release as well as the radiological status of surrounding environs.

Information to be Submitted

The information supplied by the licensee should be sufficient to enable the staff to determine whether spills that have occurred at the facility in the past could impact on the current radiological status of the facility. The staff's review should verify that the following information is included in the spills section of the decommissioning plan (note that this information may be presented with the information discussed in Section 16.2.3, "Previous Decommissioning Activities," above):

- A summary of areas at the site where spills (or uncontrolled releases) of radioactive material occurred in the past;
- The types, forms, activities and concentrations of radionuclides involved in the spill or uncontrolled release, and
- A scale drawing or map of the site, facilities, and environs, showing the locations of spills.

16.2.5 PRIOR ON-SITE BURIALS

The purpose of the review of the licensee's description of prior on-site burials is to provide the staff with information that will aid in the staff's evaluation of the licensee's determination of the radiological status of the facility.

ACCEPTANCE CRITERIA

Regulatory Requirements

- 10 CFR 20.2002, 30.35(g)(3)(iii), 40.36(f)(3)(iii), 70.25(g)(3)(iii);
- 10 CFR 30.36(g)(4)(i), 40.42(g)(4)(i), 70.38(g)(4)(i) and 72.54(g)(1)

Information to be Submitted

The information supplied by the licensee should be sufficient to enable the staff to determine whether previous burials at the facility could impact on the current radiological status of the facility. Note that all radioactive material at the site would be included in the staff's evaluation of the doses from residual radioactive material and as such would be included in any dose

assessments that are performed for the facility. The staff's review should verify that the following information is included in the previous burials section of the decommissioning plan:

- A summary of areas at the site where radioactive material has been buried in the past;
- The types, forms, activities and concentrations of waste and radionuclides in the former burial(s); and
- A scale drawing or map of the site, facilities and environs showing the locations of former burials.

16.2.6 EVALUATION FINDINGS

The staff should verify that the information summarized under "Information to be Submitted," above, is included in the licensee's description of former burials at the site. The staff should verify that this information is correct by comparing it to historical NRC license information, as well as information submitted pursuant to 10 CFR 20.302, 20.304, 20.2002, 30.35(g)(3)(iii), 40.36(f)(3)(iii), 70.25(g)(3)(iii) and NUREG-1101, Volume 1 ("On-site Disposal of Radioactive Waste," March 1986). Note that the information required pursuant to 30.35(g)(3)(iii), 40.36(f)(3)(iii), and 70.25(g)(3)(iii) may not be submitted to NRC until license termination. However, the licensee should include or use a summary of this information in developing this section of the decommissioning plan.

16.3 DECOMMISSIONING PLAN FACILITY DESCRIPTION

Site Complexity

This section of the decommissioning guidance was developed to provide guidance on the types of information that would be required for the most complex decommissioning sites. These sites could require complicated site-specific dose modeling, contain residual contamination at depths exceeding 15-30 cm, and/or have onsite disposal cells for radiologically contaminated waste. Less complex sites would not need to include all of the information described below in their decommissioning plans. Note that some of this information overlaps information required for the environmental review (see NUREG-1748). The NRC staff and the licensee should work together to establish the amount and type of information needed to support the decommissioning plan for each individual facility and the best method to provide NRC with the information.

The licensee will supply information to support staff analysis of the description of the facility and environs. This information should allow NRC staff to: (1) evaluate the licensee's estimation of doses to on- and off-site populations during and at the completion of decommissioning; (2) evaluate the licensee's estimation of the impacts of the proposed

decommissioning activities on the site, and its surrounding areas, and for restricted-release sites; (3) evaluate the licensee's estimation of the impacts of the environment on the site (e.g., in the event of floods, tornadoes and earthquakes). This information should include a description of the site and environs; a description of the current population distribution; a summary of current and potential future uses of land in and around the site; descriptions of the site meteorology, geology, seismology, climatology, surface and groundwater hydrology, geotechnical characteristics, and descriptions of the natural and water resources at the site. A description of the ecology of the site, a description of minority and low-income populations, and a summary of all endangered species at the site, may be required for NRC staff to complete the NEPA analysis (See Section 15.7 of this NUREG, and NUREG-1748, for additional guidance on NEPA).

REVIEW PROCEDURES

Safety Evaluation

The staff will verify that the provided site-specific information is complete and accurate. The staff will make a qualitative assessment as to whether the licensee's descriptions of the site and environs and summary of current and potential future land uses are adequate to serve as the bases for evaluating the licensee's estimated dose.

16.3.1 SITE LOCATION AND DESCRIPTION

The purpose of the review of the description of the site location and description is to verify that sufficient information is presented to allow the NRC staff to understand the physical characteristics of the site and relationship of the site to surrounding areas. This will aid the staff in evaluating the licensee's dose estimates and planned decommissioning activities to ensure that the decommissioning can be conducted in accordance with NRC requirements.

ACCEPTANCE CRITERIA

Regulatory Requirements

10 CFR 30.36(g)(4)(i), 40.42(g)(4)(i), 70.38(g)(4)(i) and 72.54(g)(1)

Information to be Submitted

The information supplied by the licensee should be sufficient to allow the staff to fully understand the physical characteristics of the site. The staff's review should verify that the following information is included in the description of the site description and location section of the decommissioning plan:

- The size of the site in acres or square meters;
- The State and county in which the site is located;
- The names and distances to nearby communities, towns and cities;
- A description of the contours and natural features of the site;
- The elevation of the site;
- A description of the man-made features of the site, such as buildings, roads, and settling ponds;
- A description of property surrounding the site, including the location of all off-site wells used by nearby communities or individuals;
- The location of the site relative to prominent features such as rivers and lakes. To facilitate presentation of this information, U.S. Geological Survey (USGS) topographic maps may be provided;
- A map that shows the detailed topography of the site using a contour interval (such as 2 feet or 1 meter) and including plot plans, the locations of characterization borings and monitoring wells, and the positions and types of geologic characterization activities;
- The location of the nearest residences and all significant facilities or activities near the site; and
- A description of the facilities (e.g., buildings, parking lots, and fixed equipment) at the site.

EVALUATION FINDINGS

The staff should verify that the information summarized under "Information to be Submitted," above, is included in the licensee's description of the site and environs. The staff's review should verify, to the maximum extent practicable, that the information supplied by the licensee is accurate by comparing it with licensing and inspection information maintained in NRC files.

16.3.2 POPULATION DISTRIBUTION

The purpose of the review of the description of the population distribution is to determine if the licensee has supplied sufficient information on the makeup and distribution of the population in the vicinity of the site to allow the NRC staff to evaluate the licensee's estimate of doses to off-site individuals during and at the completion of decommissioning.

ACCEPTANCE CRITERIA

Regulatory Requirements

10 CFR 30.36(g)(4)(i), 40.42(g)(4)(i), 70.38(g)(4)(i) and 72.54(g)(1)

Information to be Submitted

The information supplied by the licensee should be sufficient to allow the staff to determine the population makeup and distribution in the vicinity of the site. The staff's review should verify that a summary of current and projected populations in the vicinity of the site, by principal compass sectors, is included in the decommissioning plan. This summary should be sufficiently detailed to allow the determination of doses to off-site individuals via atmospheric pathways. The decommissioning plan should include the following:

- A summary of the current population in and around the site, by compass vectors; and
- A summary of the projected population in and around the site, by compass vectors.

EVALUATION FINDINGS

The staff should verify that the information summarized under "Information to be Submitted," above, is included in the licensee's description of the distribution of populations around the site. The staff will verify the licensee's population data against available independent population data (e.g., information from the Census Bureau including any special census that may have been conducted, local and State Agencies, and regional Councils of Government). The staff will evaluate projected population information by comparing it to projections made by local planning boards or offices.

16.3.3 CURRENT/FUTURE LAND USE

The purpose of the description of current and future land use is to provide the staff with information that will aid in evaluating the licensee's estimates of doses to on- and off-site individuals during and at the completion of decommissioning.

ACCEPTANCE CRITERIA

Regulatory Requirements

10 CFR 30.36(g)(4)(i), 40.42(g)(4)(i), 70.38(g)(4)(i) and 72.54(g)(1)

Information to be Submitted

The information supplied by the licensee should be sufficient to allow the staff to understand what current land uses are and what local, regional, or State planning boards or offices anticipate the future land uses will be at the site. The staff's review should verify that the licensee has used all available data on land use, plans and trends in land use, land use controls (such as zoning), potential for growth, or other factors likely to inhibit or stimulate growth in the area by comparing it with publically available information from local, regional or State land use planning boards or offices. The decommissioning plan should include a description of the current land uses in and around the site and a summary of anticipated land uses.

EVALUATION FINDINGS

The staff should verify that the information summarized under "Information to be Submitted," above, is included in the licensee's discussion of current and future land use. The staff should verify, to the extent practicable, that this information is correct by comparing it to publically available information on current land use in the vicinity of the site, land use trends in and around the site, and expected future uses of the land in and around the site.

16.3.4 METEOROLOGY AND CLIMATOLOGY

The purpose of the review of the licensee's description of meteorology and climatology is to determine if the licensee has provided sufficient information to allow the NRC staff to evaluate the licensee's estimations of doses to on- and off-site individuals during and at the completion of decommissioning operations.

ACCEPTANCE CRITERIA

Regulatory Requirements

10 CFR 30.36(g)(4)(i), 40.42(g)(4)(i), 70.38(g)(4)(i) and 72.54(g)(1)

Regulatory Guidance

RegGuide 1.23 "Onsite Meteorological Programs" (Safety Guide 23)

Information to be Submitted

The information supplied by the licensee should be sufficient to allow the staff to determine how local weather patterns will affect the estimation of doses to on- and off-site individuals during and at the completion of decommissioning operations. The staff's review should verify that the following information is included in the climatology and meteorology section of the decommissioning plan:

- A description of the general climate of the region with respect to types of air masses, synoptic features (high- and low-pressure systems and frontal systems), general air-flow patterns (wind direction and speed), temperature and humidity, precipitation, and relationships between synoptic-scale atmospheric processes and local meteorological conditions;
- Seasonal and annual frequencies of severe weather phenomena, including tornadoes; water spouts, thunderstorms, lightning, hail, and high air pollution potential;
- Weather-related radionuclide transmission parameters, including average and extreme wind vectors, and average and extreme duration and intensity of precipitation events;
- Routine weather-related site deterioration parameters, including precipitation intensity and duration, wind vectors, and temperature and pressure gradients;
- Extreme weather-related site deterioration parameters, including tornadoes, water spouts, thunderstorms, hail, and extreme air pollution (from offsite sources);

- A description of the local (site) meteorology in temperature, atmospheric water vapor, precipitation, fog, atmospheric stability and air quality; and
- The National Ambient Air Quality Standards Category of the area in which the facility is located, and, if the facility is not in a Category 1 zone, the closest and first downwind Category 1 Zone.

EVALUATION FINDINGS

The staff will review the licensee's description of the site climatology and meteorology for completeness and adequacy of basic data. The wind and atmospheric stability data should be based on onsite data. The other summaries should be based on nearby representative stations with long record retention periods. When off-site data are used, the staff will determine how well the data represent site conditions and whether more representative data are available. The staff will use National Oceanic and Atmospheric Administration (NOAA) (U.S. Department of Commerce) State meteorological summaries ("State Climatological Summary"), local climatological data ("Local Climatological Data Annual Summary with Comparative Data"), and NOAA Environmental Data Service summaries pertinent to the site to evaluate the representativeness of stations and periods of record. The staff should be familiar with all primary meteorological data collection locations. The staff will ensure that all topographic maps and topographic cross-sections presented by the licensee are legible and well-labeled so that the information needed during the review can be readily extracted. Points of interest such as facility structures, site boundary, and buffer zone should be marked on all maps and diagrams.

The staff will compare the licensee's assessment of the effect of topography with standard assessments such as those presented in "Meteorology and Atomic Energy - 1968" (Slade, 1968) and decide whether the standard regulatory atmospheric diffusion models are appropriate for this site. The staff will review for completeness and authenticity the general climatic description of the region in which the site is located. Climatic parameters such as air masses, general air flow, pressure patterns, frontal systems, and temperature and humidity conditions reported by the licensee will be checked against standard references (Thom, 1968; U.S. Department of Commerce, 1968) for appropriateness with respect to location and period of record. The staff will verify the licensee's description of the role of synoptic-scale atmospheric processes on local (site) meteorological conditions against the descriptions provided in "Climatic Atlas of the United States" and "Local Climatological Data - Annual Summary With Comparative Data" (both published by the U.S. Department of Commerce).

Because meteorological averages and extremes can only be obtained from stations in the region of the site that have long record retention periods, and the stations are not usually very close to the site, the staff will first determine the representativeness of the data to site conditions and then ascertain the adequacy of the stations and their data. The staff will verify: (1) recorded meteorological averages and extremes using standard publications such as "Storm Data," published by the U.S. Department of Commerce; (2) other averages and extremes using "State Climatological Summaries" and "Storm Data," published by the U.S. Department of Commerce;

(3) the potential for high air pollution; (4) extreme winds and their distribution using Reg Guide 1.23 and "Meteorology and Atomic Energy - 1968" (Slade, 1968); and, (5) gust factors using Reg Guide 1.23.

16.3.5 GEOLOGY AND SEISMOLOGY

The purpose of the review of the licensee's description of the site geology and seismology is to determine if the licensee has provided sufficient information to allow the NRC staff to evaluate the licensee's estimations of doses to on- and off-site individuals during and at the completion of decommissioning operations.

ACCEPTANCE CRITERIA

Regulatory Requirements

10 CFR 30.36(g)(4)(i), 40.42(g)(4)(i), 70.38(g)(4)(i) and 72.54(g)(1)

Information to be Submitted

The information supplied by the licensee should be sufficient to allow the staff to determine how site geological and seismological characteristics will affect the estimation of doses to on- and off-site individuals during and at the completion of decommissioning operations and the potential effects of geological processes (e.g. earthquakes, erosion, and landslides) on restricted-release sites. The staff's review should verify that the geology and seismology section of the decommissioning plan contains the following information:

Geology

- A detailed description of the geologic characteristics of the site and the region around the site;
- A discussion of the tectonic history of the region, regional geomorphology, physiography, stratigraphy, and geochronology. All tectonic structures should be identified, in particular folds and faults in the region around the site, and their geologic and structural history should be discussed. The relationship between seismicity and tectonic structures and the earthquake-generating potential of any active structures should be discussed;
- A regional tectonic map showing the site location and its proximity to tectonic structures should be provided. Appropriate references or supporting documents should be provided with regional physiographic and topographic maps, geologic and structure maps, fault maps, stratigraphic sections, boring logs, and aerial photographs;
- A description of the structural geology of the region and its relationship to the site geologic structure should be discussed. Any faults, folds, open jointing, fractures, and shear zones in the region must be identified, and their significance to the facility should be discussed;

- A description of any crustal tilting, subsidence, karst terrain, landsliding, and erosion;
- A description of the surface and subsurface geologic characteristics of the site and its vicinity. The description should include local stratigraphic units and their accepted names, ages, genetic relationships, and lithologies. To facilitate the presentation, these descriptions should be accompanied by appropriately scaled geologic maps. Descriptions of mineralogy, particle size, organic materials, degree of cementation, zones of alteration, and depositional environment of unconsolidated strata should be included;
- A description of the geomorphology of the site, including USGS topographic maps that emphasize local geomorphic features pertinent to the site. A description of the geomorphic processes affecting the present-day topography of the disposal site and vicinity should be included. Information should include descriptions of processes such as mass wasting, erosion, slumping, landsliding, and weathering where appropriate. The discussion of relevant geomorphic processes should include their rates, frequencies of occurrence, and controlling mechanisms or factors;
- A description of the location, attitude, and geometry of all known or inferred faults in the site and vicinity. Fault displacements should be identified and potential recurrence intervals addressed;
- A discussion of the nature and rates of deformation such as folding within the site and their relation to the local stress regime. Any joint sets within the site, including their densities and orientations, should be described, and their relative ages discussed. Remineralization and mineralization history of the various joint sets should also be discussed. Solution cavities and crevices in the bedrock should be described and discussed, if applicable; and
- A description of any man-made geologic features, such as mines or quarries.

Seismology

- A description of the seismicity, tectonic characteristics of the site and region, correlation of earthquake activity with geologic structures and tectonic provinces, maximum earthquake potential, seismic wave transmission characteristics of the site, design earthquake, settlement and liquefaction, and geophysical methods for site characterization; and
- A complete list of all historical earthquakes that have a magnitude of 3 or more or a modified Mercalli intensity of IV or more within 320 kilometers (200 miles) of the site. The listing should include all available information about the earthquakes such as epicenter coordinates, depth of focus, origin time, intensity, and magnitude, augmented by a map showing the locations of these earthquakes. The references from which the information was obtained should be indicated. In addition, any earthquake that induced geologic hazard (e.g., landsliding or liquefaction) should be identified, and the acceleration that caused the hazard should be provided.

EVALUATION FINDINGS

The staff will review for completeness the information on geologic site characterization in the decommissioning plan. If the information reflects the results of a thorough literature search and an adequate reconnaissance and physical examination of the regional and site conditions by the licensee, the decommissioning plan will be considered acceptable. Consultations with commercial companies and Federal, State, and local Government Agencies that may have had occasion to characterize the site will help ensure the adequacy of the characterization in the decommissioning plan. The review can be completed quickly if the decommissioning plan contains sufficient information to allow the staff to make an independent assessment of the licensee's assumptions, analyses, and conclusions.

16.3.6 SURFACE WATER HYDROLOGY

ACCEPTANCE CRITERIA

The purpose of the review of the licensee's description of the surface water hydrology at the site is to determine if the licensee has provided sufficient information to allow the NRC staff to evaluate the licensee's estimations of doses to on- and off-site individuals during and upon completion of decommissioning operations.

Regulatory Requirements

10 CFR 30.36(g)(4)(i), 40.42(g)(4)(i), 70.38(g)(4)(i) and 72.54(g)(1)

Information to be Submitted

The information supplied by the licensee should be sufficient to enable the staff to determine whether surface water characteristics could impact the doses to on or off-site individuals during or at the completion of decommissioning. For restricted-release sites, staff would also analyze the potential dose impact of atypical surface waters conditions, such as floods. The staff's review should verify that the following information is included in the surface water hydrology section of the decommissioning plan:

- A description of site drainage and surrounding watershed fluvial features, including important water users;
- Water resource data, including maps, hydrographs, and stream records from other Agencies (e.g., USGS and USACE);
- Topographic maps of the site that show natural drainages and man-made features;

- A description of the surface water bodies at the site and surrounding areas, including the location, size, shape, and other hydrologic characteristics of all streams, lakes, or coastal areas;
- A description of existing and proposed water control structures and diversions (both upstream and downstream) that may influence the site;
- Flow-duration data that indicate minimum, maximum, and average historical observations for surface water bodies in the site areas;
- Aerial photography and maps of the site and adjacent drainage areas identifying features such as drainage areas, surface gradients, and areas of flooding;
- An inventory of all existing and planned surface water users, whose intakes could be adversely affected by migration of radionuclides from the site. The inventory should include the owner, location, type, and amount of use; source of supply; type of intake; and surface water quality data;
- Topographic and/or aerial photographs that delineate the 100-year floodplain at the site; and
- A description of any man-made changes to the surface water hydrologic system that may influence the potential for flooding at the site (such changes may include construction of reservoirs, urban development, strip mining, lumbering, etc.). The description of these changes should include the proximity of the affected area to the site, the surface water bodies affected, the size of the area affected, and the potential effects at the site.

EVALUATION FINDINGS

The staff should verify that the information summarized under "Information to be Submitted," above, is included in the licensee's description of the surface water features at the site. Acceptance of the information in the decommissioning plan will be based in part on a qualitative evaluation of the completeness and adequacy of the information and of maps. Descriptions and evaluations of structures and facilities are adequate if they are sufficiently complete to allow independent evaluations of the effects of flooding and intense rainfall. Site topographic maps are acceptable if they are of good quality, legible, and adequate in coverage to substantiate applicable data and analyses. The descriptions of the hydrologic characteristics of surface water features and water use are acceptable if they are detailed and generally correspond to those of the USGS, NOAA, Soil Conservation Service, USACE, or appropriate State and river basin Agencies. Descriptions of existing or proposed reservoirs and dams that could influence conditions at the site should be based on reports of the USGS, U.S. Bureau of Reclamation, USACE, and others; these reports normally include tabulations of drainage areas, types of structures, appurtenances, ownership, seismic and spillway design criteria, elevation-storage relationships, and short- and long-term storage allocations.

16.3.7 GROUNDWATER HYDROLOGY

The purpose of the review of the license's description of the groundwater hydrology section of the decommissioning plan is to determine if the licensee has provided sufficient information to allow the NRC staff to evaluate the licensee's estimations of doses to on- and off-site individuals during and at the completion of decommissioning operations.

ACCEPTANCE CRITERIA

Regulatory Requirements

10 CFR 30.36(g)(4)(i), 40.42(g)(4)(i), 70.38(g)(4)(i) and 72.54(g)(1)

Information to be Submitted

The information supplied by the licensee should be sufficient to allow the staff to determine how the groundwater characteristics of the site affect the doses to on or off-site individuals during or at the completion of decommissioning. The staff's review should verify that the following information is included in the groundwater hydrology section of the decommissioning plan:

- A description of the saturated zone including all potentially affected aquifers, the lateral extent, thickness, water-transmitting properties, recharge and discharge zones, groundwater flow directions and velocities, and other information that can be used to create an adequate conceptual model of the saturated zone;
- Descriptions for monitor wells, including location, elevation, screened intervals, depths, construction and completion details, and hydrogeologic units monitored. The description should include domestic, industrial and/or municipal wells or other monitoring devices, if applicable, and any construction and completion details for these devices, when available. Descriptions of all aquifer tests should also be provided, including test data and a discussion of the assumptions, analysis, and test procedures used;
- Physical parameters such as storage coefficients, transmissivities, hydraulic conductivities, porosities, and intrinsic permeabilities should be included;
- A description, to the extent practicable, of groundwater flow directions and velocities (horizontal and vertical) for each potentially affected aquifer. When applicable, the groundwater hydrology should be described by making use of hydrogeologic columns, cross-sections, and water table and/or potentiometric maps;
- A description of the unsaturated zone including descriptions of the lateral extent and thickness of permeable and impermeable zones, potential conduits of anomalously high flux, and direction and velocity of unsaturated flow;
- Information on all monitor stations, including location and depth;

- A description of physical parameters including the spatial and stratigraphic distribution of the total and effective porosity; water content variations with time; saturated hydraulic conductivity; characteristic relationships between water content, pressure head, and hydraulic conductivity; and hysteretic behavior during wetting and drying cycles, especially during extreme conditions;
- A description of the numerical analysis techniques used to characterize the unsaturated and saturated zones including, the model type, justification, documentation, verification, calibration and other associated information. In addition, the description should include the input data, data generation or reduction techniques, and any modifications to these data; and
- The distribution coefficients of the radionuclides of interest at the site.

EVALUATION FINDINGS

The staff should verify that the information summarized under "Information to be Submitted," above, is included in the licensee's description of the groundwater hydrology at the site. The staff will review the information on the saturated zone by evaluating the testing and monitoring program and sample collection procedure. The staff will evaluate the rationale for choosing particular sampling locations and verify that they are commensurate with the complexity of the saturated zone. The staff will confirm that acceptable procedures were used by the licensee to collect, preserve, and analyze samples. Staff will determine that adequate quality control was used for the collection, preservation, and laboratory analyses of samples. The staff will evaluate the adequacy of non-licensee-constructed monitoring devices used in the characterization (including the characterization of seeps, springs, and private, municipal, or industrial wells in the vicinity of the proposed site). The staff will evaluate aquifer tests performed by the licensee to ensure that applicable test methods incorporate proper assumptions, analyses, and test procedures. The staff will assess the accuracy of the transmissivity, storativity, and hydraulic conductivity results derived from testing. The staff will determine if groundwater will discharge to the surface within the site boundry and if fluctuations in the water table will result in interactions of groundwater with the residual radioactive material. Staff will confirm the description of major hydrologic parameters, aerial extent of aquifers, recharge-discharge zones, flow rates and directions, and travel times, including seasonal fluctuations and long-term trends.

The staff will review the licensee's information on the unsaturated zone by evaluating the monitoring program and sample collection procedure. The staff will evaluate the rationale for choosing particular sampling locations and verify that they are commensurate with the complexity of the unsaturated zone. The staff will confirm that the description of the unsaturated zone incorporates the necessary field and laboratory data, including seasonal fluctuations and long-term trends. The staff will review the licensee's analysis of the likelihood of the development of perched aquifers and perform independent analyses, using accepted methods, to determine the adequacy of the description.

The evaluations described in the following paragraphs may be included in the groundwater hydrology portion or dose modeling sections of the decommissioning plan.

The staff will evaluate the licensee's conceptual model that describes, to the extent practicable, all hydrogeologic processes and features, including the potential for deep percolation, recharge/discharge zones, areas of anomalous physical parameters affecting regional processes, extent of aquifers and confining layers, interactions between aquifers, and movement of groundwater in the saturated and unsaturated zone. The staff will review this model to determine its defensibility, conservatism, and adequate incorporation of data into a unified conceptual model.

The staff will evaluate the numerical analyses of groundwater data collected by the licensee for the site and vicinity. This will normally involve analytical or numerical modeling. The staff will verify that the model type chosen for analysis is properly documented, verified, and calibrated and adequately simulates the physical system of the site and vicinity. The staff will review the modeling strategy used by the licensee to assure that it is logical and defensible. The staff will review the adequacy of the model input data generation and reduction techniques. Modifications of input data required for calibration will be reviewed to ensure that the new values are realistic and defensible.

Following its review of this information, the staff will determine whether the licensee's conclusions are adequate. If the staff conducts an independent analysis, it will compare the results with those derived by the licensee to determine if the licensee's results are adequate.

16.3.8 NATURAL RESOURCES

The purpose of the review of the license's description of natural resources at the site is to aid the staff in evaluating the impacts that the decommissioning alternative chosen by the licensee may have on these resources and to evaluate whether the exploitation of these resources could impact the licensee's dose estimates for the site.

ACCEPTANCE CRITERIA

Regulatory Requirements

10 CFR 30.36(g)(4)(i), 40.42(g)(4)(i), 70.38(g)(4)(i) and 72.54(g)(1)

Information to be Submitted

The information supplied by the licensee should be sufficient to allow the staff to determine what natural resources are present at and in the vicinity of the site. The staff's review should verify that the following information is included in the natural resources section of the decommissioning plan:

- A description of the natural resources occurring at or near the site, including metallic and nonmetallic minerals and ores; fuels, such as peat, lignite, and coal; hydrocarbons, including gas, oil, tar sands, and asphalt; geothermal resources; industrial mineral deposits, such as sand and gravel, clays, aggregate sources, shales, and building stone; timber; agricultural lands; and waters in the form of brines;
- A description of potable, agricultural, or industrial ground or surface waters including information on resource type, occurrence, location, extent, net worth, recoverability, and current and projected use;
- A description of economic, marginally economic, or subeconomic known or identified natural resources as defined in U.S. Geological Survey Circular 831; and
- Mineral, fuel, and hydrocarbon resources near and surrounding the site which, if exploited, would affect the licensee's dose estimates.

EVALUATION FINDINGS

The staff should verify that the information summarized under "Information to be Submitted," above, is included in the licensee's description of the natural resources at the site.

The staff will determine if the licensee has identified known resources as described in U.S. Geological Survey Circular 831. The staff will verify that the decommissioning plan describes economic, marginally economic, and subeconomic known resources as defined in U.S. Geological Survey Circular 831. On the basis of these data, the staff will evaluate the licensees's estimation of potential future exploitation, considering market values and current and projected demand for the resource in question. On the basis of the resources identified, the staff will examine the potential for site disruption resulting from exploration and exploitation techniques including, but not limited to, augering, drilling, shaft mining, strip mining, bulldozing and other excavation, quarrying, bore-hole injection and pumping, uprooting of vegetation, blasting, stream diversion, and dam construction. These techniques are considered for the possibility of direct site intrusion as well as indirect effects such as alteration of groundwater tables or increase in erosion.

16.4 DECOMMISSIONING PLAN RADIOLOGICAL STATUS OF FACILITY

The licensee will provide a description of the current radiological status of the facility. This information will allow the NRC staff to fully understand the types and levels of radioactive material contamination and the extent of radioactive material contamination at the facility. This information will be used by the staff during its review of the licensee's decommissioning activities, to evaluate the cost estimates for decommissioning, and decommissioning health and safety plans. This information should include summaries of the types and extent of radionuclide contamination in all media at the facility including buildings, systems and equipment, surface and subsurface soil, surface water, and groundwater.

Information presented in this section should be developed based on the methodologies and procedures described in Chapter 15.4 (Decommissioning Surveys) and in volume 2 of this NUREG. Information describing how the licensee developed the information presented in this section should be presented in the "Facility Radiation Surveys" section of the decommissioning plan. Licensees that report the results of the characterization survey in the "Radiological Status of Facility" portion of the decommissioning plan do not need to report it in the "Facility Radiation Surveys" portion of the decommissioning plan. Similarly, licensees may combine the information required in this section of this NUREG with that described in the "Facility Radiation Surveys" section of volume 2 of this NUREG, as long as the information discussed in both sections is included in the decommissioning plan.

16.4.1 CONTAMINATED STRUCTURES

The purpose of the review of the description of the contaminated structures is to evaluate whether the licensee has fully described the types and activity of radioactive material contamination in the structures, as well as the extent of this contamination. This information should be sufficient to allow the NRC staff to evaluate the potential safety issues associated with remediating the structures, whether the remediation activities and radiation control measures proposed by the licensee (described in Sections 17.1 and 17.3 of this NUREG) are appropriate for the type of radioactive material present in the structure, whether the licensee's waste management practices are appropriate, and whether the licensee's cost estimates are plausible, given the amount of contaminated material that will need to be removed or remediated.

In some instances, licensees may choose to dismantle contaminated structures and dispose of the building debris as radioactive waste in lieu of decontaminating the building. Similarly, licensees may choose to decontaminate portions of buildings to levels appropriate for unrestricted use and dismantle portions of the building to gain access to areas where contamination has migrated, such as floor/wall joints. In these instances, all of the information described below may not need to be included in the decommissioning plan. NRC staff will discuss these activities with licensees to ensure that adequate information is provided in the decommissioning plan to allow the staff to perform the required evaluations, without requiring the licensee to expend substantial resources characterizing the structures.

INFORMATION TO BE SUBMITTED

The information supplied by the licensee should be sufficient to allow the staff to fully understand the types and activity of radioactive material contamination in the structure, as well as the extent of this contamination. The staff's review should verify that the following information is included in the contaminated structures section of the facility decommissioning plan:

- A list or description of all structures at the facility where licensed activities occurred that contain residual radioactive material in excess of site background levels;
- A summary of the structures and locations at the facility that the licensee has concluded have not been impacted by licensed operations and the rationale for the conclusion;
- A list or description of each room or work area within each of these structures;
- A summary of the background levels used during scoping or characterization surveys;
- A summary of the locations of contamination (e.g., walls, floors, wall/floor joints, structural steel surfaces, and ceilings) in each room or work area;
- A summary of the radionuclides present at each location, the maximum and average radionulide activities in disintegrations per minute per 100 square centimeters (dpm/100cm^2), the chemical form of the radionuclide, and, if multiple radionuclides are present, the radionuclide ratios;
- The mode of contamination for each surface (i.e., whether the radioactive material is present only on the surface of the material or if it has penetrated the material);
- The maximum and average radiation levels in millirem per hour (mrem/hr) or microrem per hour (μrem/hr), as appropriate, in each room or work area; and
- A scale drawing or map of the rooms or work areas showing the locations of radionuclide material contamination and radiation levels. All maps should include compass direction indicators.

NRC EVALUATION FINDINGS

The staff should verify that the information summarized under "Information to be Submitted," above, is included in the licensee's description of the contaminated structures. The staff's review should verify that the licensee has fully described the types and activity of radioactive material contamination in facility structures, as well as the extent of this contamination. These descriptions should be sufficient to allow the NRC staff to evaluate the potential safety issues associated with remediating the structures, whether the remediation activities and radiation control measures proposed by the licensee are appropriate for the type of radioactive material present in the structures, whether the licensee's waste management practices are appropriate, and whether the licensee's cost estimates are plausible, given the amount of contaminated material that will need to be removed or remediated.

16.4.2 CONTAMINATED SYSTEMS AND EQUIPMENT

The purpose of the review of the description of the contaminated systems and equipment at the facility is to evaluate whether the licensee has fully described the types and activity of radioactive material contamination in facility systems or on equipment, as well as the extent of this contamination. This information should be sufficient to allow the NRC staff to evaluate the

potential safety issues associated with remediating the systems or equipment, whether the remediation activities and radiation control measures proposed by the licensee (described in Sections 17.1 and 17.3 of this NUREG) are appropriate for the type of radioactive material present in the systems or equipment, whether the licensee's waste management practices are appropriate, and whether the licensee's cost estimates are plausible, given the amount of contaminated material that will need to be removed or remediated.

Note that, in some instances, licensees may choose to remove and dispose (either as radioactive waste or as usable equipment in another radiation area) of contaminated systems and/or equipment, in lieu of decontaminating the system or equipment. In these instances, all of the information described below may not necessarily need to be included in the decommissioning plan. NRC staff should discuss these activities with licensees to ensure that adequate information is provided in the decommissioning plan to allow the staff to perform the evaluations described above, without requiring the licensee to expend substantial resources characterizing the equipment or system.

INFORMATION TO BE SUBMITTED

The information supplied by the licensee should be sufficient to allow the staff to fully understand the types and activity of radioactive material contamination present in systems or on equipment, as well as the extent of this contamination. The staff's review should verify that the following information is included in the contaminated systems and equipment section of the facility decommissioning plan:

- A list or description and the location of all systems or equipment at the facility that contain residual radioactive material in excess of site background levels;
- A summary of the radionuclides present in each system or on the equipment at each location, the maximum and average radionulide activities in dpm/100cm^2, the chemical form of the radionuclide, and, if multiple radionuclides are present, the radionuclide ratios;
- The maximum and average radiation levels in mrem/hr, or μrem/hr, as appropriate, at the surface of each piece of equipment;
- A summary of the background levels used during scoping or characterization surveys; and
- A scale drawing or map of the rooms or work areas showing the locations of the contaminated systems or equipment. All maps should include compass direction indicators.

16.4.3 SURFACE SOIL CONTAMINATION

The purpose of the review of the description of surface soil (i.e., soil within the top 15-30 centimeters (cm) of the soil column) contamination is to determine if the licensee has fully described the types and activity of radioactive material contamination in the surface soil, as well as the extent of this contamination. This information should be sufficient to allow the NRC staff

to evaluate the potential safety issues associated with remediating the surface soil, whether the remediation activities and radiation control measures proposed by the licensee (described in Sections 17.1 and 17.3 of this NUREG) are appropriate for the type of radioactive material present in the surface soil, whether the licensee's waste management practices are appropriate, and whether the licensee's cost estimates are plausible, given the amount of contaminated soil that will need to be removed or remediated.

INFORMATION TO BE SUBMITTED

The information supplied by the licensee should be sufficient to allow the staff to fully understand the types and activity of radioactive material in surface soil, as well as the extent of this contamination. The staff's review should verify that the following information is included in the description of contaminated surface soil in the facility decommissioning plan:

- A list or description of all locations at the facility where surface soil contains residual radioactive material in excess of site background levels;
- A summary of the background levels used during scoping or characterization surveys;
- A summary of the radionuclides present at each location, the maximum and average radionuclide activities in picoCuries per gram (pCi/gm), the chemical form of the radionuclide, and, if multiple radionuclides are present, the radionuclide ratios;
- The maximum and average radiation levels in mrem/hr at each location; and
- A scale drawing or map of the site showing the locations of radionuclide material contamination in surface soil. All maps should include compass direction indicators.

16.4.4 SUBSURFACE SOIL CONTAMINATION

The purpose of the review of the description of subsurface soil (i.e., soil below the top 15-30 cm of soil in the soil column) contamination is to determine if the licensee has fully described the types and activity of radioactive material contamination in the subsurface soil, as well as the extent of this contamination. This information should be sufficient to allow the NRC staff to evaluate the potential safety issues associated with remediating the subsurface soil, whether the remediation activities and radiation control measures proposed by the licensee (described in Sections 17.1 and 17.3 of this NUREG) are appropriate for the type of radioactive material present in the subsurface soil, whether the licensee's waste management practices are appropriate and whether the licensee's cost estimates are plausible, given the amount of contaminated soil that will need to be removed or remediated.

INFORMATION TO BE SUBMITTED

Information sufficient to allow the NRC staff to fully understand the types and activity of radioactive material in subsurface soil, as well as the extent of this contamination. The staff's review will verify that the following information is included in the description of contaminated subsurface soil in the facility decommissioning plan:

- A list or description of all locations at the facility where subsurface soil contains residual radioactive material in excess of site background levels;
- A summary of the background levels used during scoping or characterization surveys;
- A summary of the radionuclides present at each location, the maximum and average radionulide activities in pCi/gm, the chemical form of the radionuclide, and, if multiple radionuclides are present, the radionuclide ratios;
- The depth of the subsurface soil contamination at each location; and
- A scale drawing or map of the site showing the locations of subsurface soil contamination. All maps should include compass direction indicators.

NRC EVALUATION FINDINGS

The staff should verify that the information summarized under "Information to be Submitted," above, is included in the licensee's description of the subsurface soil contamination at the facility. The staff's review should verify that the licensee has fully described the types and activity of radioactive material contamination in the subsurface soil at the facility, as well as the extent of this contamination. These descriptions should be sufficient to allow the NRC staff to evaluate the potential safety issues associated with remediating the subsurface soil, whether the remediation activities and radiation control measures proposed by the licensee are appropriate for the type of radioactive material present in the subsurface soil, whether the licensee's waste management practices are appropriate, and whether the licensee's cost estimates are plausible, given the amount of contaminated material that will need to be removed or remediated.

16.4.5 SURFACE WATER

The purpose of the review of the description of contaminated surface water is to evaluate whether the licensee has fully described the types and activity of radioactive material present in surface water bodies at the facility, as well as the extent of this contamination. This information should be sufficient to allow the NRC staff to evaluate potential safety issues associated with remediating the surface water, whether the remediation activities and radiation control measures proposed by the licensee (described in Sections 17.1 and 17.3 of this NUREG) are appropriate for the type of radioactive material present in the surface water, whether the licensee's waste management practices are appropriate, and whether the licensee's cost estimates are plausible, given the amount of contaminated water that will need to be removed or remediated.

INFORMATION TO BE SUBMITTED

The information supplied by the licensee should be sufficient to allow the staff to fully understand the types and activity of radioactive material contamination in surface water at the facility, as well as the extent of this contamination. The staff's review should verify that the following information is included in the description of surface water contamination in the decommissioning plan:

- A list or description and map of all surface water bodies at the facility that contain residual radioactive material in excess of site background levels;
- A summary of the background levels used during scoping or characterization surveys; and
- A summary of the radionuclides present in each surface water body and the maximum and average radionuclide activities in picoCuries per liter (pCi/l).

NRC EVALUATION FINDINGS

The staff should verify that the information summarized under "Information to be Submitted," above, is included in the licensee's description of the surface water contamination at the site. The staff's review should verify that the licensee has fully described the types and activity of radioactive material contamination in the surface water at the site, as well as the extent of this contamination. These descriptions should be sufficient to allow the NRC staff to evaluate potential safety issues associated with remediating the surface water, whether the remediation activities and radiation control measures proposed by the licensee are appropriate for the type of radioactive material present in the water, whether the licensee's waste management practices are appropriate and whether the licensee's cost estimates are plausible, given the amount of contaminated material that will need to be removed or remediated.

16.4.6 GROUNDWATER

The purpose of the review of the description of contaminated groundwater is to evaluate whether the licensee has fully described the types and activity of radioactive material present in groundwater at the facility, as well as the extent of this contamination. This information should be sufficient to allow the NRC staff to evaluate potential safety issues associated with remediating the groundwater, whether the remediation activities and radiation control measures proposed by the licensee (described in Sections 17.1 and 17.3 of this NUREG) are appropriate for the type of radioactive material present in the groundwater, whether the licensee's waste management practices are appropriate, and whether the licensee's cost estimates are plausible, given the amount of contaminated water that will need to be removed or remediated.

INFORMATION TO BE SUBMITTED

The information supplied by the licensee should be sufficient to allow the staff to fully understand the types and activity of radioactive material contamination in groundwater at the facility, as well as the extent of this contamination. The staff's review should verify that the following information is included in the description of groundwater contamination in the decommissioning plan:

- A summary of the aquifer(s) at the facility that contain residual radioactive material in excess of site background levels;
- A summary of the background levels used during scoping or characterization surveys; and
- A summary of the radionuclides present in each aquifer and the maximum and average radionulide activities in pCi/l.

NRC EVALUATION FINDINGS

The staff should verify that the information summarized under "Information to be Submitted," above, is included in the licensee's description of the groundwater contamination at the site. The staff's review should verify that the licensee has fully described the types and activity of radioactive material contamination in the groundwater at the site, as well as the extent of this contamination. These descriptions should be sufficient to allow the NRC staff to evaluate the potential safety issues associated with remediating the groundwater, whether the remediation activities and radiation control measures proposed by the licensee are appropriate for the type of radioactive material present in the groundwater, whether the licensee's waste management practices are appropriate, and whether the licensee's cost estimates are plausible, given the amount of contaminated material that will need to be removed or remediated.