LONG-TERM STEWARDSHIP STUDY

Volume I – Report

Prepared to comply with the terms of a settlement agreement:
Natural Resources Defense Council, et al. v. Richardson, et al., Civ. No. 97-936 (SS) (D.D.C. Dec. 12, 1998).

Final Study

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U.S. Department of Energy
Office of Environmental Management
Office of Long Term Stewardship

Foreword

The Department of Energy (DOE) has prepared this *Long-term Stewardship Study* ("*Study*" or "*Final Study*") to comply with the terms of a settlement agreement between DOE, the Natural Resources Defense Council, and 38 other plaintiffs [*Natural Resources Defense Council, et al. v. Richardson, et al.,* Civ. No. 97-936 (SS) (D.D.C. Dec. 12, 1998)]. The *Study* describes and analyzes several issues and a variety of information associated with long-term stewardship. The *Study* defines long-term stewardship as the physical controls, institutions, information, and other mechanisms needed to ensure protection of people and the environment at sites where DOE has completed or plans to complete "cleanup" (e.g., landfill closures, remedial actions, removal actions, and facility stabilization.) Depending on specific circumstances, long-term stewardship could include any combination of land-use controls, monitoring, maintenance and information management.

The *Study* discusses current long-term stewardship issues and challenges identified by the public during a public scoping and comment process. In accordance with the terms of the settlement agreement, DOE followed the President's Council on Environmental Quality (CEQ) procedures for public scoping, 40 CFR §1501.7(a)(1)-(2), and, in general, the procedures set forth in DOE's NEPA regulations for public review of environmental impact statements, 10 C.F.R. §1021.313, even though the *Study* is not a National Environmental Policy Act (NEPA) document or its functional equivalent. Appendix B of the *Study* describes how DOE identified the *Study* scope and met NEPA scoping requirements. The Department is using this input to help shape and guide long-term stewardship decision-making. However, the *Study* is not a policy document and does not indicate the specific long-term stewardship actions that the Department will take.

DOE identified the issues addressed in the *Study* by conducting a public scoping process, soliciting public comments on the *Draft Study* released to the public in October 2000, and considering information from a variety of organizations (both DOE and non-DOE) that have analyzed the subject of long-term stewardship. The Department received comments on the *Draft Study* from 50 sources, including state agencies, citizen groups, DOE advisory groups, private citizens, Tribal nations, and federal agencies. The *Final Study* reflects textual changes made in response to those comments or clarifications that DOE felt were appropriate. The comment-related issues and clarifications are highlighted in comment text boxes in chapters 2-10 of Volume One. Volume Two provides DOE's responses to comments on the *Draft Study*. Together these documents highlight public input on the Department's planning, funding, and stakeholder involvement processes to identify and address long-term stewardship needs.

Where possible, the *Study* identifies alternatives for addressing long-term stewardship. The potential environmental impacts associated with these alternatives are site specific and will be addressed as part of the long-term stewardship and environmental management systems planning at individual sites.

A better understanding of the challenges faced by DOE will allow individuals and organizations inside and outside the Department to make more informed decisions to shape future long-term stewardship

activities, both nationally and at individual sites. The *Study* and public comments address eight key challenges:

- Incorporating long-term stewardship considerations into site-specific cleanup decisions to improve DOE's ability to plan for and implement long-term stewardship.

- Ensuring the continued effectiveness of long-term stewardship for long periods of time and if property ownership changes to other federal or non-federal entities.

- Developing processes for meaningful public involvement in long-term stewardship decisions and plans.

- Building partnerships with state, local, and Tribal governments to plan for long-term stewardship activities, land use, enforcement of hazard controls, and information management requirements.

- Ensuring long-term public access to information and outreach efforts about residual risks to continue protection of human health and the environment.

- Providing reliable and sufficient funding for needed long-term stewardship activities into the future.

- Developing mechanisms for the sustainability of long-term stewardship, focusing on vigilance of duty, adaptability for societal changes, and commitment to advances in science and technologies.

- Considering ways to minimize the need for eventual long-term stewardship in the planning and operation of new missions and facilities.

Because the *Study* is not a decision document, it does not attempt to describe how DOE will address stewardship issues in the future. Many of the decisions framing DOE's long-term stewardship will be site specific and depend on a variety of factors (e.g., future site missions, degree of hazard and potential consequence of lapses in stewardship, any unique state and local requirements that may apply, and the ability of federal and state agencies, local governments and communities, and Tribal nations to maintain future land use controls).

The Department has undertaken a number of interrelated initiatives to improve planning for and implementation of long-term stewardship. With regard to overall program direction, DOE's Office of Long Term Stewardship has formed the Long-term Stewardship Executive Steering Committee and the Long-term Stewardship Working Group to develop a strategic plan for long-term stewardship. More specifically, DOE has taken a number of steps to institutionalize sound decision-making within the Department with regard to its long-term stewardship responsibilities. These steps include:

- Assigning responsibility for long-term stewardship to program offices with landlord responsibilities at each site.

- Preparing guidance for sites to develop long-term stewardship plans, site-specific cost estimates, budget requests, and performance metrics for long-term stewardship activities.

- Revising DOE's Life Cycle Asset Management (LCAM) process and the related DOE LCAM Order to account for long-term stewardship.

- Providing training to DOE staff and contractors on long-term stewardship.

- Developing directives and/or guidance for compliance with stewardship requirements.

- Developing guidance to address long-term stewardship information management and coordinating land use planning between DOE and surrounding communities.

- Managing the Long-term Stewardship web-based information center available at: *http://lts.apps.em.doe.gov*.

The Department recognizes that long-term stewardship is important for ensuring continued protection of human health and the environment, and is considering additional steps to further develop policies, guidance, and procedures for planning and implementing long-term stewardship. This *Study* identifies a number of important issues and challenges that need to be addressed. Over the next several months, the Department will be conducting an assessment of the Environmental Management program. The *Study* provides a timely and important reference for that review because long-term stewardship issues are integral to our cleanup decisions and land use planning.

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List of Exhibits

Chapter 1: Introduction

During World War II and the Cold War, the federal government developed the "nuclear weapons complex," a vast network of industrial facilities for the research, production, and testing of nuclear weapons and nuclear devices. The production and testing of nuclear weapons and energy research activities left a legacy of radioactive and chemical waste, contamination, and hazardous facilities and materials. During the past decade, the U.S. Department of Energy (DOE) Office of Environmental Management (EM) has made significant progress in addressing this environmental legacy and has reduced the risks and costs associated with maintaining safe conditions across the DOE complex. Based on existing plans and agreements with regulators, with input from affected parties,[1] EM program cleanups will result in radioactive waste and other residual hazards at most sites.[2] The challenge facing DOE is how to ensure continued protection of human health and the environment after the cleanup projects are complete. Exhibit 1-1 provides an overview of recent documents that discuss DOE's long-term stewardship mission.

What is Long-term Stewardship?

There are many different perspectives on the definition and scope of long-term stewardship. The *Study* uses the following definition from the 1998 Settlement Agreement:

> "the physical controls, institutions, information and other mechanisms needed to ensure protection of people and the environment at sites where DOE has completed or plans to complete 'cleanup' (e.g., landfill closures, remedial actions, removal actions, and facility stabilization). This concept of long-term stewardship includes, *inter alia*, land-use controls, monitoring, maintenance, and information management."

The *Study* also considers issues related to several sites where cleanup was completed by parties other than DOE, but where DOE has been mandated to conduct long-term stewardship.

DOE, including the National Nuclear Security Administration (NNSA), has prepared this *Final Long-term Stewardship Study* to comply with the terms of a settlement agreement between DOE, the Natural Resources Defense Council, and 38 other plaintiffs.[3] The specific language pertaining to the *Study* is summarized in Exhibit 1-2 and presented in its entirety in Appendix A.

In accordance with the settlement agreement, DOE conducted a public scoping process to obtain input on what issues the Department should address, published a *Draft Study* in October 2000, conducted a public comment process for the *Draft Study*, and considered public comments in preparing this *Final Study* (see Exhibit 1-2). This *Final Study* considers information provided by other organizations that have considered long-term stewardship, including stakeholder groups at DOE sites, the Environmental Management Advisory Board, the State and Tribal Government Working Group, the National

[1] The term "affected parties" refers to individuals and communities within the broad regional areas potentially impacted by DOE sites and includes Tribal nations, state governments, local governments, and private citizens.

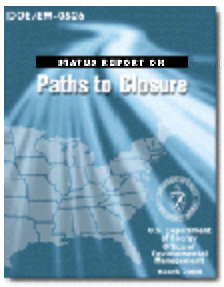
[2] *Status Report on Paths to Closure*. U.S. Department of Energy, Office of Environmental Management, March 2000 (DOE/EM-0526); *A Report to Congress on Long-term Stewardship*, U.S. Department of Energy, Office of Environmental Management, January 2001 (DOE/EM-0563).

[3] *Natural Resources Defense Council, et al. v. Richardson, et al.,* Civ. No. 97-936 (SS) (D.D.C. Dec. 12, 1998).

Research Council, the Energy Communities Alliance, the Environmental Law Institute, and Resources for the Future. Appendix B provides a description of the scoping process, a summary of the scoping comments received, and a summary of the

Exhibit 1-1. Recent Documents Related to the Concept of Long-term Stewardship at DOE Sites

The 1995 and 1996 Baseline Environmental Management Reports provided the first comprehensive scope and cost estimates for the cleanup of the nuclear weapons complex. The reports clearly identified that most of the contaminated areas at DOE sites would not be cleaned up to "green fields" or unrestricted use and that almost all DOE sites would require long-term surveillance and monitoring far into the future.

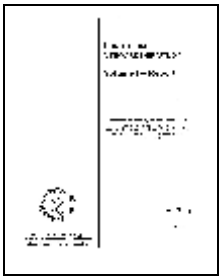


The Paths to Closure Reports reorganized the scope associated with the schedule and cost in the Baseline reports into formal projects. The 1998 report articulated the vision of reducing the overall program cost by accelerating cleanup, completing projects, and closing sites, with a goal of achieving as much as possible by 2006. The 2000 Status Report updates life-cycle cost and schedule estimates. The Department addressed the need for long-term stewardship in these national summaries, but in response to significant public comment, a more complete consideration was deferred to a companion document.

From Cleanup to Stewardship was published as a companion document to the 1998 Paths to Closure report and began to examine national policy issues, challenges, and barriers associated with the transition from cleanup to long-term stewardship.

From Cleanup to Stewardship also provided a summary of the nature and extent of DOE's long-term stewardship responsibilities for soils, facilities, groundwater, surface water, and engineered units.

The Long-term Stewardship Study (this report) describes and analyzes the issues associated with long-term stewardship in greater detail. Because it is not a NEPA or decision document, the *Study* does not attempt to describe how DOE intends to address these issues except where decisions already have been made. Where possible, it identifies options for addressing issues in order to promote information exchange and to inform the decision-making processes at the national level and individual sites. The *Study* does not address issues related to specific sites or national security issues such as stewardship of nuclear weapons and special nuclear materials.



The Report to Congress Long-term Stewardship Report identified sites or portions of sites where environmental restoration, waste disposal, and facility stabilization will be completed by 2006 but land use would be restricted. The *Report to Congress* described the necessary management and long-term stewardship responsibilities for these areas, including cost, scope, and schedule, at a much finer level of detail than in previous reports. The *Report to Congress* was

Copies of these documents can be obtained from the Center for Environmental Management Information (1-800-736-3282) or from the Internet at *http://lts.apps.em.doe.gov*

Exhibit 1-2. Legal Basis for the *Long-term Stewardship Study*

The Department is preparing this study pursuant to the terms of the Settlement Agreement between DOE, the Natural Resources Defense Council, and 38 other plaintiffs (see Appendix A). According to the Settlement Agreement:

> *"While DOE's study on long-term stewardship will not be a NEPA document or its functional equivalent, DOE will, nevertheless, follow the procedures set forth in the regulations of the President's Council on Environmental Quality (CEQ) for public scoping, 40 C.F.R. § 1501.7(a)(1)-(2)...."*

DOE followed the President's Council on Environmental Quality procedures for public scoping, 40 CFR Part 1501.7(a)(1)-(2), in preparing the *Draft Long-term Stewardship Study* that was issued on October 31, 2000. The scoping process provided DOE with input about the topics and issues that the commenters believed should be included in the study. DOE considered all relevant comments and suggestions in developing the scope of the study (see Appendix B).

As specified in the Settlement Agreement, the public review process for the *Draft Study* followed:

> *"the procedures set forth in DOE's NEPA regulations for public review of environmental impact statements, 10 C.F.R. § 1021.313, except that (a)...DOE (not EPA) will publish a Notice of Availability in the Federal Register, as set forth in 10 C.F.R. § 1021.313(a); and (b) DOE will not include any Statement of Findings as set forth in 10 C.F.R. § 1021.313(c)."*

This public review process included a 45-day public comment period (October 31-December 15, 2000), a public hearing in Washington, DC (November 30, 2000), and a public workshop in San Francisco, CA (December 14, 2000). The public review process was intended to allow comprehensive public comment on the *Draft Study*. DOE published a Notice of Availability in the Federal Register (65 FR 64934, October 31, 2000) announcing the availability of the *Draft Study* and describing the public review process for the *Draft Study*, including the public hearing. DOE used input from the public to complete this *Final Study*. Appendix C presents a summary of public comments. Volume II of this *Final Study* presents the comment letters along with DOE's responses to these public comments.

The full text of the Settlement Agreement, and copies of this *Study*, including Volume II, *Comment-Response*, can be found at ***http://lts.apps.em.doe.gov***

issues identified during the scoping process. Volume II to this *Final Study* provides a description of the public comment process and includes a copy of each public comment received on the *Draft Study* and the Department's response to these comments.

1.1 Purpose

The purpose of this *Study* is to identify programmatic and cross-cutting issues and information that DOE should consider while implementing its long-term stewardship activities. The Department's long-term stewardship needs are derived from DOE activities and programs resulting from many environmental, national security, and energy-based laws. Although not exclusively related to site cleanup, many long-term stewardship needs result from the fact that cleanup and waste management operations will not restore lands and structures to conditions that will permit unrestricted use. Rather, the property will be accessible for limited re-use where restrictions or conditions must be maintained to ensure public safety. In recognizing that the decisions regarding ultimate cleanup goals are best made

on a site-specific basis, and hence many long-term stewardship needs cannot be defined programmatically, this *Study* summarizes the issues that should be considered as these decisions develop. The *Study* also discusses various related activities being pursued by DOE.

1.2 Organization of the *Study*

- Chapter 2 describes the complexity of long-term stewardship and notes where critical issues are discussed in the *Study*.

- Chapter 3 describes the relationship between cleanup decisions and long-term stewardship obligations.

- Chapter 4 describes DOE's long-term stewardship activities and how long-term stewardship is being planned and implemented at DOE sites.

- Chapters 5 through 9 provide more detailed discussions of several key issues that have been identified by DOE and during the public scoping process:

  – Managing residual site hazards (Chapter 5);
  – Managing land and real property (Chapter 6);
  – Information management (Chapter 7);
  – Funding and financial management (Chapter 8); and
  – Environmental and socioeconomic issues, including public involvement (Chapter 9).

- Chapter 10 identifies and discusses some of the important challenges associated with maintaining the sustainability of long-term stewardship over multiple generations.

Chapter 2: Long-term Stewardship is Complex

The decisions framing DOE's long-term stewardship activities will be primarily site-specific and depend on a variety of factors such as potential or future site missions; unique state and local requirements and Tribal agreements; and the willingness and ability of affected parties to maintain future land use controls. However, many of these local issues can be discussed collectively in general terms. A better understanding of the challenges faced by DOE will allow individuals and organizations within and outside of the Department to make more informed decisions that will shape future long-term stewardship activities, both nationally and at individual sites.

APPLICABLE SCOPING COMMENTS AND ISSUES

Each subsequent chapter will include a box that highlights the public comments received by DOE during the scoping process for the *Draft Study* that apply to the issues being discussed in the chapter. The box also will identify which of the 27 issues identified during the scoping process are addressed in that chapter. Exhibit 2 in Appendix B summarizes all of the scoping comments and identifies where they are addressed in the *Study*. Exhibit 3 in Appendix B lists the 27 issues and identifies where they are addressed in the *Study*.

DOE is currently conducting long-term stewardship at many sites across the country, either as the sole activity at the site (e.g., monitoring a uranium mill tailings disposal cell), or for some portion of a site where remediation is complete (e.g., performing quarterly groundwater monitoring for a pump and treat system). At other sites, the decision-making processes that will ultimately determine long-term stewardship obligations are just now underway. The questions that remain, however, are numerous and complex. What type of framework will guide long-term stewardship activities? DOE currently is responsible for managing long-term stewardship at many sites – will this responsibility remain with DOE in the future? What approaches to long-term stewardship provide a reasonable expectation of success commensurate with the needs to protect human health and the environment? Can a graded approach be implemented that commits the resources to long-term stewardship consistent with public and environmental risk? What will happen if long-term stewardship fails? What are the implications for long-term stewardship of cleanup decisions that are made today? To address these and other questions, it is important that DOE and all affected parties fully understand the challenges ahead.

This chapter provides an overview of several issues that were identified during the research and public scoping for the *Study*. These issues will shape DOE's long-term stewardship activities and also highlight the complex nature of those activities. The chapter also identifies where these issues are discussed in the *Study*.

APPLICABLE PUBLIC COMMENTS

Chapters 2-10 include boxes that highlight comments received by DOE during the public comment process for the *Draft Study* that apply to a specific issue being discussed in the chapter. Commenters are identified by a number that identifies the specific commenter that raised the issue; Exhibit C-2 in Appendix C includes a numbered list of commenters. Volume II of this *Final Study*, *Comment Response*, contains the public comments on the *Draft Study* along with the Department's responses to these comments.

The Scope of Long-term Stewardship at DOE Sites

Long-term stewardship will be needed at more than 100 sites throughout the United States. There are several limitations and challenges that preclude remediating many DOE sites to levels that would permit residential use, including:

- Technical limitations – no complete remediation strategy exists because of technological limitations to effectively destroy and/or reduce the volume of contaminants.
- Economic limitations – the costs to employ existing remediation technologies are prohibitive.
- Worker health and safety challenges – use of existing remediation technologies for waste handling and removal poses high risks to remediation workers.
- Collateral ecological damage caused by remediation – use of existing remediation technologies would result in greater ecological damage than would occur by leaving the contamination undisturbed.

A variety of residual hazards will remain after DOE sites have been cleaned to agreed-upon levels, including:

- Engineered units – landfills and other land-based waste disposal units with engineered controls.
- Soil and buried waste – contaminants left in place in soils, and old burial grounds.
- Facilities – entombed reactors, processing "canyons," and other buildings with residual contamination.
- Water – residual contamination in groundwater or surface water sediments.

Although radionuclides are most frequently encountered, the need for long-term stewardship results from both the radioactive and chemical contaminants that will remain onsite and continue to pose some degree of risk for periods of time ranging from decades to the indefinite future. As a radionuclide decays over time, it changes into a different radionuclide, or "decay product," by the spontaneous emission of an alpha particle, beta particle, or gamma rays, or by electron capture. Radionuclides decay at a fixed rate, a "half life," which is the amount of time required for a given amount of radioactive material to decay to half the amount. Half lives vary from a fraction of a second to billions of years and are unaffected by factors such as temperature or pressure. Other contaminants of concern that will remain onsite include organic chemicals (e.g., polychlorinated biphenyls, chlorinated solvents, polynuclear aromatic hydrocarbons) and inorganic chemicals (e.g., mercury, arsenic, lead, cadmium, asbestos). Chemical contaminants do not have well-defined rates of decay and may persist for a short time (as with some chlorinated organic solvents exposed to sunlight) or in perpetuity (as with inorganic chemicals such as lead and asbestos).

Long-term stewardship involves a wide range of activities. The specific activities at a given site will depend on the nature of the site conditions and/or the residual hazards. Site-level activities may include operating, maintaining, and monitoring landfill caps, groundwater pump-and-treat systems, and other engineered systems used to prevent residual hazards from migrating and reaching human and environmental receptors. Site-level activities also may include ensuring the continued effectiveness of fences, ordinances, building permits, easements, and deed restrictions used to prevent human and environmental receptors from reaching residual hazards. Long-term stewardship also involves a variety of other tasks, which may not occur at a local site level, including: supporting, evaluating, and implementing new technologies; emergency response; compliance oversight; land management; natural and cultural resource management; information management; budget preparation and other administrative support; site re-development; and community liaison and planning.

Sources: *From Cleanup to Stewardship*, U.S. Department of Energy, Office of Environmental Management, October, 1999 (DOE-EM/-0466); *A Report to Congress on Long-term Stewardship*. U.S. Department of Energy, Office of Environmental Management, January, 2001 (DOE/EM-0563).

2.1 Today's Cleanup Decisions Have Important Implications for the Future

Decision-makers should take into account the cost and difficulty of long-term stewardship before selecting a cleanup[4] option. Cleanup decisions affect the "end state," or the physical condition reached when cleanup actions are complete. The end state, in turn, essentially determines how the residual hazards will need to be managed in the long-term, and thus establishes implicit or explicit long-term stewardship obligations. The end states and resulting long-term stewardship activities, in turn, are the basis for identifying needs and opportunities for new science and technology to improve protectiveness and/or lower costs. Because cleanup decisions are still being made at many sites, cleanup alternatives should include long-term stewardship activities to ensure that scope, schedule, and cost issues are adequately addressed.

Public Comments on the Definition of Long-term Stewardship
(see Exhibit 2 in Appendix C)

- The definition should include management of natural and manmade features and how this integrates with adjacent federal or state lands (4, 39)
- The distinction between the completion of remediation and the start of long-term stewardship is unclear – long-term stewardship begins when each remedy is implemented, not when a bureaucratic system changes the project title (8, 29)
- The definition should include past, present, and future resources and activities – not just cleanup (39)
- The definition should provide some quantitative perspective on the deep geologic time periods involved (34, 49)
- The definition should indicate that the standards for long-term stewardship at DOE sites will probably not be the same as the stewardship mandates for closure under CERCLA, RCRA, UMTRCA, etc. (49)
- The *Study* should clearly define "cleanup," "end state," and "closure" in words that the public will understand and trust (24, 30, 44, 48)
- Some of the assumptions upon which long-term stewardship is based may not be true (e.g., DOE does not have existing plans or agreements with all, or even most of the "affected parties" regarding cleanup standards) (49)
- The *Study* should include a summary explanation of how DOE arrived at the conclusion that large amounts of residual contamination will remain (49)
- The definition of long-term stewardship in the *Study* is different from the one provided in the *Report to Congress* (25)

At many sites, a number of options may be available to meet the cleanup goals established for a particular environmental problem. For example, options available for contaminated soil or groundwater may include removal, in-situ treatment, containment, or monitored natural attenuation. Each of these options has implications for long-term stewardship. Removal (i.e., relocation) or treatment to achieve unrestricted use[5] would result in no need for long-term stewardship beyond routine record-keeping at

[4]The term "cleanup" refers to the process of addressing contaminated land, facilities, and materials in accordance with applicable requirements. Cleanup does not imply that all hazards will be removed from the site. This function encompasses a wide range of activities, such as stabilizing contaminated soil; treating groundwater; decommissioning process buildings, nuclear reactors, chemical separations plants, and many other facilities; and exhuming sludge and buried drums of waste. The term "remediation" is often used synonymously with cleanup.

[5]The term "unrestricted use" refers to conditions where people can live on a site and/or use site resources such as surface soils, subsurface soils, or groundwater without restrictions. Cleanup to unrestricted use levels does not imply that all future uses would be acceptable to DOE or affected parties (e.g., if the land is needed as a "buffer

that site. However, when radioactive or other hazardous materials are removed from one site and relocated to another, the need for long-term stewardship is merely transferred, not eliminated. The use of caps, barriers, or pumping to prevent additional migration of contaminants would result in a need to monitor, maintain, and periodically repair or replace the containment systems. Containment and monitored natural attenuation would likely require land use controls to retain protectiveness. For long-term stewardship to be successful, all controls used to contain or isolate residual hazards must remain effective until the residual hazards have diminished to the point that unrestricted use is allowed.

Chapter 3, *The Relationship Between Cleanup, End State, and Long-term Stewardship*, describes the relationship between cleanup decisions and long-term stewardship activities. Chapter 5, *Hazard Management*, discusses issues involved in managing residual hazards following cleanup.

2.2 Long-term Stewardship Activities are Subject to a Variety of Requirements

There are many applicable requirements that affect long-term stewardship activities, and the existing framework for DOE mission activities includes the concept of long-term stewardship. Each of these requirements addresses facets of long-term stewardship, but there currently is no single enforceable requirement that clearly and cohesively directs the planning and implementation of long-term stewardship.

Chapter 4, *DOE's Long-term Stewardship Activities*, describes the current regulatory framework and how DOE currently is implementing long-term stewardship at its sites.

2.3 New Site Missions and Facilities May Affect Long-term Stewardship Needs

New or expanded DOE missions and associated facilities may eventually lead to additional long-term stewardship challenges. Mission operations may generate long-lived wastes or surplus materials that may need long-term stewardship. After operations are completed, facilities may be entombed in place or decontaminated and decommissioned in such a manner that results in residual hazards requiring long-term stewardship. The life-cycle environmental and cost impacts of mission operations, including those that occur during long-term stewardship, may be more easily mitigated if they are taken into account early in the planning process.

Chapter 6 of this report, *Managing Real Property*, presents a full discussion of the current planning activities that exist at DOE sites.

2.4 Land Transfers Challenge Implementation of Long-term Stewardship

At the conclusion of cleanup activities, lands owned or controlled by DOE are likely to follow one of four disposition paths:

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zone"). Residential use or other uses such as mineral extraction may be prohibited by zoning authorities for reasons unrelated to the former contamination (e.g., if the area is now a nature preserve).

- *Retention indefinitely as federal lands managed by DOE or another federal agency*. This is the most likely path. It may be the only possibility for parcels of land needed for ongoing missions or for buffer zones to protect public health and safety and the environment; areas where federal and Tribal governments want to preserve natural resources or cultural resources; or land where risks associated with residual hazards are relatively high.

- *Transfer to the Secretary of the Interior, under the direct management of the Bureau of Indian Affairs, to be held in federal trust for Native American Tribes*. This could be used where affected parties want to use lands for specific uses (e.g., treaty reserved use), and risks associated with residual hazards are consistent with these intended uses.

- *Transfer to non-federal government ownership and release for restricted or specific use*. This could be used where affected parties want to use lands for economic redevelopment or other specific uses, and risks associated with residual hazards are consistent with these anticipated uses.

- *Transfer to non-federal ownership and release for unrestricted use*. This is most likely for lands that are currently uncontaminated or where cleanup has been able to reduce risks to levels appropriate for unrestricted use.

The transfer of property that needs long-term stewardship to other entities presents challenges to long-term stewardship implementation. DOE needs to determine whether to retain active control of long-term stewardship activities, how to impose management or use restrictions on the property, how to oversee any restrictions or limits that are imposed, and how such activities will be funded. It may be difficult for DOE, other agencies, or regulators to enforce restrictions on land owned by someone else, particularly if ownership continues to change hands.

Chapter 6, *Managing Real Property*, presents a discussion of managing real property, the implications of property transfers on long-term stewardship needs, and the difficulties that property transfers may pose for long-term stewardship.

2.5 The Public Needs Open Access to Information about Residual Hazards at DOE Sites

Successful implementation of long-term stewardship will be aided by open public access to the specific information about the residual hazards at DOE sites, including how they were generated, what DOE has done to reduce or mitigate the risks they pose, what ongoing measures are needed, and, to the extent possible, how long such measures are needed. Continued protection of human health and the environment will depend on public awareness and information availability. For example, it may be difficult for people to accept restrictions on land and resource use unless they fully understand why such restrictions are necessary (and conversely what activities can be safely conducted on the land). This is a challenge in the near term, and because long-term stewardship obligations will be passed on from generation to generation, it becomes one of the most critical challenges to sustainability.

Chapter 7, *Information Management*, describes the types of information practices that will be necessary to support long-term stewardship and identifies how DOE has begun to develop such practices.

2.6 Reliable Funding is a Significant Concern to Stakeholders

One of the biggest stakeholder concerns is the source and nature of sustained funding for long-term stewardship. Long-term stewardship activities at DOE sites are currently funded largely through annual Congressional appropriations. Alternatives such as investment funds, mitigation funds, trust funds, commercial fees, and public-private partnerships may provide more stable sources of funding. A variety of issues are associated with each funding alternative, including in some cases the lack of clear legislative authority to implement the alternative.

Chapter 8, *Funding and Financial Management*, provides further detail on the challenges to estimating the costs for implementing stewardship and the types of funding mechanisms that could be used for long-term stewardship.

2.7 Continued Partnerships with State, Local, and Tribal Governments is Essential

Depending on specific site circumstances, successful implementation of long-term stewardship may need significant participation from states, local communities, and Tribal nations. Tribal nations have a unique legal and political relationship with the United States government. Entities other than DOE are likely to have some responsibility for certain long-term stewardship activities. For example, local and Tribal governments have traditionally conducted and enforced land use planning, certain land use restrictions (e.g., zoning) and certain types of record-keeping (e.g., deed registration). Local communities and Tribal governments also may need to be active participants in creating and maintaining institutions to transfer long-term stewardship information and responsibility from generation to generation.

Affected parties may have secondary long-term stewardship goals for a site. In some instances, secondary goals may conflict with one another. A secondary goal of maintaining a site as open space for cultural resource protection or aesthetic reasons might be in conflict with a secondary goal to develop the site to enhance the local economy. It is essential that existing partnerships between DOE and affected parties continue to be maintained during long-term stewardship.

Chapter 9, *Natural Resources, Cultural Resources, Socioeconomic Issues, and Environmental Justice*, identifies many of the concerns and competing priorities that may need to be balanced during long-term stewardship. The strong need for continued partnerships is also noted in several other chapters.

2.8 Long-term Stewardship Responsibilities Will Pass from Generation to Generation

How long will long-term stewardship be needed? There is no precise answer to this question, but many of the residual hazards at DOE sites are likely to persist for many generations:

- Chromium, lead, and other elemental metals do not degrade in the environment and may pose threats through bioaccumulation in the food chain.

- Many organic chemicals, such as trichloroethylene, are relatively stable in the environment and may persist for hundreds of years. Other organic chemicals (e.g., benzene) may degrade in the environment over periods of decades. Organic chemicals may be difficult to remove from contaminated media and thus may pose threats for continued migration.

- Entombed facilities, building foundations, and buried infrastructure left in place may present physical hazards that will persist far into the future.

- Many of the radionuclides present at DOE sites have half-lives[6] measuring hundreds, thousands, and even millions of years. While half-life *per se* does not necessarily indicate either the hazards posed by the material or the length of time that long-term stewardship will be needed, it is clear that many of the long-lived residual hazards at DOE sites have the potential to persist far into the future.

Some of the residual hazards at DOE sites will almost certainly outlive any cleanup strategies that can be implemented using today's technologies (e.g., disposal in landfills). Therefore, unless advances in science and technology allow us to eliminate or otherwise reduce the hazards associated with these long-lived substances, long-term stewardship responsibilities will pass from generation to generation. However, as experience has shown, there are challenges inherent in such intergenerational transfer.

The threats posed by residual hazards, the ability to reduce or eliminate these threats, and the economic value placed on residual materials and contaminated areas are likely to change over time. However, the need to conduct long-term stewardship to protect human health and the environment will remain. Therefore, the approaches and strategies developed for long-term stewardship must also evolve over time. Residual hazards and strategies for managing these hazards should be re-evaluated periodically to take into account new science and technology. Periodic reviews also will allow stewards to evaluate current and future technologies for which long-term effectiveness has not been demonstrated.

Chapter 10, *Sustainability of Long-term Stewardship*, discusses these inter-generational issues in detail, including the importance of integrating science and technology effectively into long-term stewardship activities. Chapter 4, *DOE's Long-term Stewardship Activities*, also discusses science and technology development efforts within the Department.

[6]The half-life of a radionuclide is a physical characteristic specific to that radionuclide. A half-life is the time required for a given amount of radioactive material to decay to half that amount. Half-lives of radionuclides vary from a fraction of a second to billions of years.

Long-term Stewardship and Public Health

The primary purpose of long-term stewardship is the continued protection of human health and the environment. Continued protection of public health will need continued research on the health effects of residual contaminants, public availability of up-to-date health information about residual contaminants, and public availability of up-to-date monitoring information on residual contaminants. At some sites, it may be appropriate to conduct health monitoring in the surrounding communities.

Chapter 3: The Relationship Between Cleanup, End State, and Long-term Stewardship

Many of the specific long-term stewardship needs at a site will follow directly from the types of cleanup actions being performed today. Decisions such as what to do with contaminated soils or facilities, and the subsequent cleanup actions taken to implement these decisions, will result in a specific *end state* for each site.[7] The cleanup strategy implemented at a site and the resulting end state achieved are closely related to the potential future use of land and water resources and long-term stewardship needs. In some cases, intended future uses will determine the end state conditions to be achieved during cleanup. In other cases, technical, economic, and worker safety considerations may limit the end state conditions that can be achieved, and thus may limit future uses. Specific long-term stewardship needs will depend directly on the cleanup strategy implemented, end state achieved, and desired future uses.

This chapter describes DOE's efforts to integrate consideration of long-term stewardship issues into cleanup decisions, discusses several challenges facing the Department, and identifies several criteria for evaluating the long-term stewardship implications of cleanup decisions and end states.

APPLICABLE SCOPING COMMENTS
(see Exhibit 2 in Appendix B)

- DOE should not use long-term stewardship as a substitute for cleanup; leaving contamination in place should not be a priority cleanup strategy (13, 14)
- Long-term stewardship should be instituted only after cleanup to remove the maximum amount of contamination has been undertaken (13)
- DOE's long-term stewardship obligations will be greater at a given site if on-site waste treatment and disposal facilities are used instead of off-site facilities (15)
- DOE should develop methods for accurately reflecting long-term stewardship commitments in decision documents or should identify any uncertainties related to these commitments (STGWG)
- Each remedial alternative considered should be evaluated with respect to the types of institutional controls required and how they will be implemented (1, STGWG)
- DOE should use life-cycle accounting to assess the complete costs, present and future, associated with cleanup decisions (1, 4)
- DOE needs to identify portions of sites that can be cleaned up to unrestricted use and portions that can never be cleaned up completely with available technologies (18)

APPLICABLE ISSUE
(see Exhibit 3 in Appendix B)

1. *Relationship of "Cleanup" Decision Process to Long-term Stewardship Needs*

3.1 Cleanup and Long-term Stewardship

During cleanup, it is important to consider long-term stewardship issues and obligations explicitly when examining remedial alternatives and implementing a final remedy.[8] Affected parties need to understand how the cleanup actions selected during remedy selection will be implemented over time. To the extent they are willing to have a role in implementing certain aspects of long-term stewardship (e.g., managing

[7] The "end state" of a site or portion of a site is the physical condition reached when cleanup actions are complete. Key components for long-term stewardship include the nature and extent of residual contamination; the location and condition of stored or disposed materials; the location, type and condition of all engineered control and monitoring systems, and the threats posed to affected parties.

[8] *Planning and Implementing RCRA/CERCLA Closure and Post-Closure Care When Wastes Remain Onsite*. U.S. Department of Energy, Office of Environmental Policy and Assistance, RCRA/CERCLA Information Brief. DOE/EH-413-9910, October 1999.

and disseminating monitoring data, maintaining and enforcing groundwater use restrictions), affected parties also need to understand the future resource obligations they may incur as a result of this role. Affected parties also should determine the value of long-term stewardship activities in terms of how they may effectively prevent a larger-scale problem from impacting their communities in the future.

The Atomic Energy Act (AEA) directs DOE to manage radioactive materials in a manner consistent with the protection of public health and safety. The AEA authorizes DOE to establish standards to protect human health and the environment from activities under DOE jurisdiction.[9] The Resource Conservation and Recovery Act (RCRA) requires DOE and all other federal agencies to comply with all federal, state, and local laws and regulations concerning solid and hazardous waste (including mixed waste). In addition to its own requirements, DOE relies upon regulations and procedures developed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), RCRA, the Uranium Mill Tailings Radiation Control Act (UMTRCA), similar state regulations, site-specific agreements, and, in some cases, Nuclear Regulatory Commission (NRC) regulations to carry out cleanup actions.[10] The cleanup authorities pursuant to AEA, CERCLA, RCRA, and UMTRCA set the initial parameters for engineered and institutional controls and long-term care of sites as the necessary follow-on tasks to cleanup actions that cannot achieve unrestricted use.

Cleanup vs. Long-term Stewardship

- Long-term stewardship is not a substitute for cleanup
- Cleanup levels should be determined within the proper context of:
  - Technical feasibility
  - Worker health and safety
  - Collateral ecological damage
  - Cost
- A key driver for long-term stewardship is the extent to which cleanup achieves unrestricted use

The processes for determining cleanup decisions involve (1) evaluating the site conditions (e.g., contaminants of concern and concentration levels, real or potential risk, future use); and (2) developing remediation goals consistent with a set of threshold (or performance) criteria and balancing criteria, identified in DOE Orders, the CERCLA National Contingency Plan, and RCRA guidance documents. These criteria include evaluating long-term effectiveness and permanence of the alternative, anticipated future use, and the degree of certainty that the alternative will prove successful (Exhibit 3-1).[11] Requirements of cleanup decisions under RCRA typically extend up to 30 years beyond completion of cleanup, with provisions to extend monitoring and maintenance activities beyond that period if necessary.

[9]For example, DOE has developed Orders such as Order 5400.1, *General Environmental Protection Program*; Order 5400.5, *Radiation Protection of the Public and the Environment*; and Order 435.1, *Radioactive Waste Management*, in order to establish and maintain conditions that are protective of human health and the environment. DOE Orders are internal policies that are not enforceable by external parties.

[10]Activities under the jurisdiction of DOE generally are exempt from licensing requirements of the Nuclear Regulatory Commission (NRC), with limited exceptions. For example, DOE conducts long-term stewardship at inactive uranium milling sites under site licenses issued by the NRC in accordance with requirements in 10 CFR Parts 40.27 and 40.28.

[11]*Development of Remediation Goals under CERCLA*, U.S. Department of Energy, Office of Environmental Policy and Assistance, CERCLA Information Brief. DOE/EH-413/9711, August 1997; *RCRA Closure and Post-Closure Plans*, U.S. Department of Energy, Office of Environmental Guidance, RCRA Information Brief. DOE/EH-231-009/1291, December 1991.

Exhibit 3-1. CERCLA Criteria for Evaluating and Selecting Remedies*

Overall protection of human health and the environment. The ability of each alternative to provide protection is assessed. The assessment draws on the baseline risk assessment and the evaluations of other criteria, especially the long- and short-term effectiveness evaluations.

Compliance with Applicable and Relevant and Appropriate Requirements (ARARs). Each alternative must comply with chemical-specific, action-specific and location-specific ARARs. If an alternative cannot achieve compliance, justification for a waiver of the ARAR must be developed.

Long-term effectiveness and permanence. This evaluation assesses the residual risk posed by the site following the remedial action. This assessment also considers the reliability and adequacy of the remedial action in providing a long-term solution to the contamination at the site.

Reduction of toxicity, mobility, and volume of contamination. This involves assessment of the treatment process, the materials being treated, the effectiveness of the treatment, and the quantity of contaminated material remaining following the remedial action.

Short-term effectiveness. This addresses the risks posed by each remedial alternative during construction and implementation, up to the time the remedial action objectives are achieved. Each alternative is evaluated to determine the degree of protection afforded the surrounding community during the remedial action, the degree of the risk posed to workers during implementation, the adverse environmental impacts arising from construction and implementation, and the time required to achieve the remedial action objectives.

Implementability. This assesses both the technical and administrative feasibility of implementing each remedial alternative. Included in this assessment are: (1) consideration of the availability of the necessary resources to construct and implement the remedy; (2) an assessment of the reliability of the technology; and (3) the ease of undertaking other remedial actions at the site once the alternative is implemented. Another aspect of this assessment is the determination of the needs for interaction with other federal, state or local agencies. For example, this assessment may include determining any necessary permits for offsite activities.

Cost-effectiveness. This evaluation includes direct and indirect capital costs, as well as the operating and maintenance costs, associated with the remedial action. This process should also consider the costs of any long-term liability associated with implementing the remedy.

State and community acceptance. After the state and stakeholders have had an opportunity to review the proposed remedial and corrective action alternatives and supporting documentation, their comments can lead to modification of DOE's preferred alternative [note that CERCLA regulations list state and community acceptance as two separate criteria].

*RCRA requirements for remedy selection are similar.

Cleanup standards and long-term stewardship requirements for UMTRCA sites are established directly by UMTRCA, NRC regulations, and EPA regulations. A long-term surveillance and maintenance plan is required for each UMTRCA site, including the monitoring and maintenance of engineered controls and provisions for emergency measures needed to protect public health and safety. Under the AEA, once site cleanups are completed,[12] the NRC will license the long-term maintenance and monitoring of UMTRCA sites in perpetuity. According to NRC regulations,[13] there is no termination of the general license issued by the NRC for custody and long-term care of residual radioactive material disposal sites.

[12]DOE is responsible for the cleanup of Title I sites; the licensee is responsible for the cleanup of Title II sites.

[13]10 CFR Part 40.27(b) [Title I] and 10 CFR Part 40.28(b) [Title II].

The remedy selection and implementation process essentially determines how any residual hazards at a site will be managed for the long-term and thus establishes implicit or explicit long-term stewardship needs. For example, a remedy that incorporates an assumption about anticipated future land use establishes the long-term stewardship need to ensure that actual land uses remain consistent with this assumption. Similarly, a remedy that involves construction of a cap over a landfill establishes the long-term stewardship need to perform surveillance and maintenance of the cap and perform monitoring around and below the landfill. Similar long-term stewardship needs apply to private-sector and municipal landfills.

With respect to remedial actions conducted at DOE sites, if complete treatment or removal of the source(s) and resulting contaminated media is technically and economically feasible, the affected area should be suitable for unrestricted use (unless the area is needed for security or safety reasons). In these cases, where residual hazards have been eliminated, information management (e.g., routine record-keeping) will be the only long-term stewardship activity needed.

Closure of Beatty Low-level Radioactive Waste Disposal Site

On December 30, 1997, the State of Nevada assumed long-term stewardship responsibility for a commercial low-level waste disposal site in Beatty, NV. The disposal site was established in 1962 as a commercial site that was located on state property. The site closed in 1992, and the owner conducted closure and post-closure activities pursuant to the requirements in 10 CFR Part 61. The site was always state property, and the terms of the original site license called for the State of Nevada to accept permanent custody of the disposal site after closure. Because the license was agreed upon prior to the promulgation of 10 CFR Part 61, only some of the requirements of the regulation are applicable (for example, financial assurance was not applicable). The Beatty site was the first low-level radioactive commercial waste disposal site to complete all closure activities.

Sources: *Beatty facility closure complete, state takes over*. Nuclear News, February 1998, p. 67; Telephone conversation with the State of Nevada Health Division, June 26, 2000.

DOE typically conducts cleanups to achieve levels of residual hazards that are consistent with site land use plans. At sites where it is not technically or economically feasible to remediate to levels consistent with unrestricted use, the AEA, CERCLA, RCRA, UMTRCA, and other statutes require the use of long-term controls and/or operations as part of the remedy. A remedy consistent with an industrial land use plan would thus need appropriate institutional controls to protect worker health and safety. AEA, CERCLA, RCRA, and UMTRCA also require the monitoring of remedies to ensure their efficacy. The implementation of monitoring and institutional controls becomes a major part of long-term stewardship (see Chapter 5).

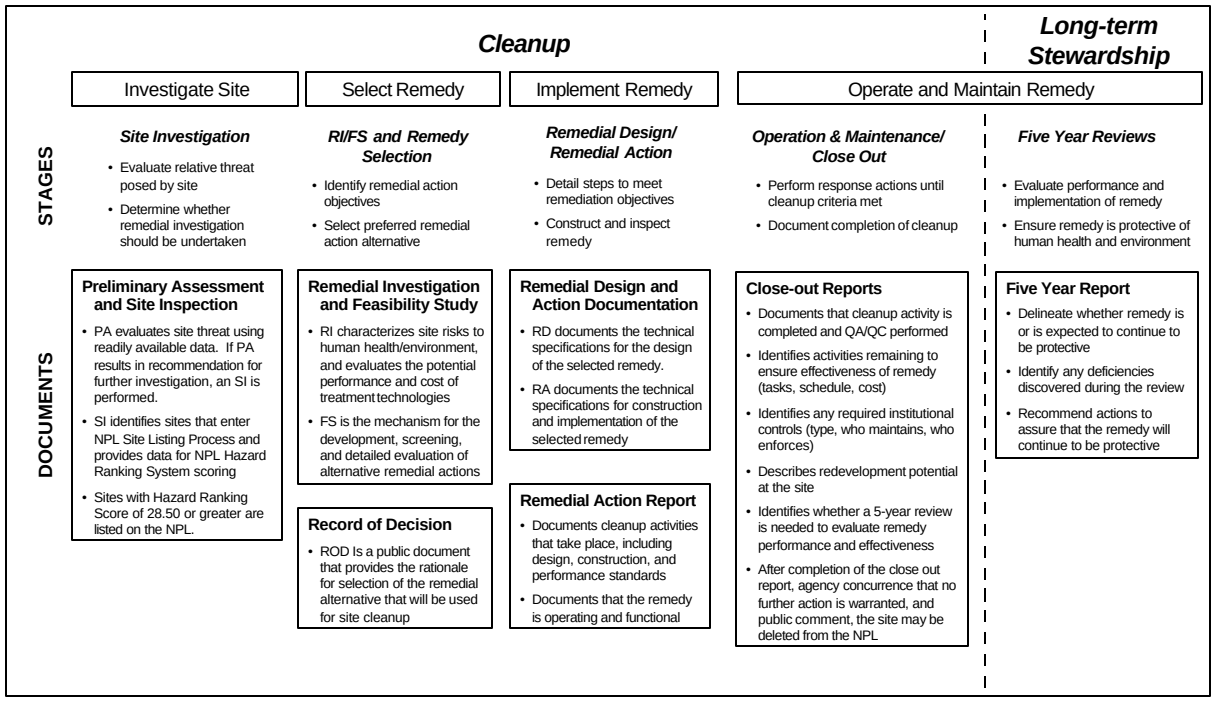
The processes for evaluating remedial alternatives and selecting, designing, and implementing remedies should consider the full life-cycle of each alternative, including any needed long-term stewardship activities associated with the remedial alternatives. DOE has developed initial guidance for evaluating long-term stewardship activities during these processes,[14] and NRC has developed specific regulations for long-term stewardship of UMTRCA sites (10 CFR Part 40 Appendix A). However, certain

[14] *Using Remedy Monitoring Plans to Ensure Remedy Effectiveness and Appropriate Modifications.* U.S. Department of Energy, Office of Environmental Policy and Assistance, RCRA/CERCLA Information Brief. DOE/EH-413/9809, July 1998. *Assessment of Short-term and Long-term Risks for Remedy Selection*. U.S. Department of Energy, Office of Environmental Policy and Assistance, CERCLA Information Brief. DOE/EH-413/9708, August 1997. These documents are available at *http://tis.eh.doe.gov/portal/ksmlinkReg.htm.*

challenges remain, particularly for RCRA and CERCLA cleanup actions. In particular, it is not clear what documents are most appropriate for recording the long-term stewardship activities and obligations associated with each decision, and what criteria are appropriate for evaluating the long-term stewardship implications of remedial decisions. These challenges are discussed below.

3.2 Documenting Long-term Stewardship Needs During the Selection and Implementation of Cleanup Actions

Some observers have expressed concerns that decision documents (e.g., Records of Decision under CERCLA) do not explicitly identify all of the long-term stewardship activities associated with the selected remedy. Records of Decision (RODs) are developed relatively early in the overall cleanup process (Exhibit 3-2), at a time when many details of the final remedy are not always known. Preliminary and Final Close-out Reports and other documents developed later in the cleanup process provide more specific information about the constructed remedy and needs for operation, maintenance,



and monitoring of the remedy.

Exhibit 3-2. Highlights of the CERCLA Remedial Action Process*

*The cleanup process under RCRA is similar but uses different terminology.

Although documents such as Close-out Reports identify the types of institutional controls needed for a specific cleanup action, institutional controls needed for a number of individual cleanup actions are addressed through area- or site-wide land use plans (see Chapter 5). Most Regional Offices of the U.S. Environmental Protection Agency (EPA) have developed institutional controls policies that direct federal sites to develop and maintain Land Use Control Assurance Plans or their equivalent. For

remedies that depend upon land use controls for protectiveness, EPA Region 4 Federal Facilities Branch has issued a policy memorandum on land use controls at

Public Comments for Considering Long-term Stewardship During the Remedy Selection Process (see Exhibit 2 in Appendix C)

- There should be a high likelihood that cleanups will remain effective as long as the residual hazards remain dangerous (1)
- The use of proven engineered barriers should be preferred over the use of institutional controls (1)
- Reliance on anticipated land use to establish cleanup levels leaves the remedy vulnerable to future land use changes (1)
- Clean up to unrestricted use levels, which would avoid the need for long-term stewardship, whenever possible (1, 4, 6, 11, 13, 15, 17, 19, 20, 24, 28, 29, 30, 32, 34, 35, 44, 45)
- Consider how to plan establish, maintain, and fund long-term stewardship (6, 11, 16, 20, 32, 34, 35, 45)
- Evaluate who benefits from and who pays for different remedial alternatives (29)
- Cost-effectiveness should not be as important as reliability (30)
- Evaluate the costs of long-term storage and different levels of cleanup (37)
- Try to minimize the overall physical "footprint" of each site (37)
- Manage and dispose of waste in a manner that preserves future long-term management options (e.g., segregate waste and use location controls within each disposal cell) (37)
- Consider how to reconcile past decisions that did not adequately account for public input and the cost, difficulty, and uncertainty of long-term stewardship (41)
- Clearly integrate the concept of permanence (1, 47)
- The current approach DOE has taken to limit cleanup and reduce engineered protection of buried wastes does not ensure adequate compliance and protection for future generations (49)
- The *Draft Study* assumes cleanup has been defined or characterized in a manner acceptable to all stakeholders; but end states have not been fully examined or decided upon to the satisfaction of those who will eventually be responsible for long-term stewardship (e.g., Tribes, states, local governments) (49)
- Mitigation and restoration plans should be incorporated into waste site remediation efforts (27)
- It is unclear who will decide what is an acceptable level of cleanup at DOE sites and what level would be the national standard (44)
- Seismic concerns must be evaluated (45)
- Avoid transferring hazardous substances; this necessitates the complication of transportation and site reclamation (6, 11, 32, 34, 45)
- "Unrestricted Use" must be clearly and consistently defined (46)
- A well defined remediation objective in the ROD will clarify long-term stewardship needs (29)
- Uniform long-term stewardship criteria for remediation should be identified with stakeholder participation (1, 19)
- The inclusion of long-term stewardship controls in the remedy selection process is an important factor in the acceptance of institutional controls (50)
- The overwhelming driver for leaving contamination at most DOE sites is cost rather than technical feasibility or community values (29)
- Without some certainty about long-term stewardship, there may be a decline in support (47)
- Long-term stewardship evolved from environmental cleanup (47)
- It is optimistic to think that the remedy selection process essentially determines how any residual hazards at a site will be managed for the long-term and therefore establishes implicit or explicit long-term stewardship requirements (4)
- DOE should make every effort to delineate alternative possible future courses of action as clearly as possible in the *Study* and provide objective analyses of the various pros and cons of each alternative (7)
- The highest level goal for long-term stewardship is the remedy objective established in the remedy selection process (29)
- DOE should develop Contingency Plans at the time cleanup decisions are made (20)

Federal Facilities.[15] Region 4 policy is to require, as a precondition to concurrence on any remedial action that relies on land use controls for the protectiveness of the remedy, that the lead federal agency seeking EPA concurrence commit itself to implementing a detailed written Land Use Control Assurance Plan (LUCAP) designed to assure the effectiveness and reliability of the land use controls for as long as they are needed to maintain the protectiveness of the remedy. A LUCAP may be documented in a Memorandum of Agreement, Federal Facility Agreement, or Record of Decision.

According to DOE guidance,[16] documentation for the proposed and final remedy should describe the criteria used to evaluate each remedial alternative with respect to long-term stewardship and how long-term stewardship was considered in the decision making process. For example:

> *The potentially feasible institutional controls will be bounded by:*
>
> - *Short and long term land-use expectations (e.g., current industrial, future residential, future recreational green space);*
> - *Availability of enforcement mechanisms (e.g., property owner controls, third parties, local government, state government); and*
> - *Community acceptance of the response action.*[17]

The documentation also should describe how each remedial alternative and its associated long-term stewardship activities are related to the anticipated future land use, and particularly should describe systems and procedures that will be implemented to maintain that anticipated land use. The Department is currently evaluating whether it may be appropriate to consider supplemental documentation for older decisions that do not fully describe long-term stewardship issues.

CERCLA RODs and other decision documents should clearly identify the problems being remedied, the remedial objectives, and the long-term stewardship implications to the extent feasible. CERCLA RODs are enforceable federal requirements developed with well-defined public involvement processes; and they are highly visible public documents. Including long-term stewardship needs in CERCLA RODs would ensure that these needs are considered early in the remedy selection process. Well-defined objectives will allow definition of long-term needs, even if the specifics of implementation are not resolved until later in the cleanup process.

CERCLA RODs are not the only appropriate documents for recording long-term stewardship needs. Many cleanups are conducted pursuant to other, non-CERCLA authorities (e.g., AEA, state laws) which may differ in the need to consider remedial alternatives. Moreover, many removal actions under

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[15] *Assuring Land Use Controls at Federal Facilities*. U.S. Environmental Protection Agency, Region 4, Federal Facilities Branch, Memorandum 4WD-FFB, April 1998.

[16] *Institutional Controls in RCRA and CERCLA Response Actions.* U.S. Department of Energy, Office of Environmental Policy and Guidance, RCRA/CERCLA Division, August 2000 (DOE/EH-413-0004); *Planning and Implementing RCRA/CERCLA Closure and Post-Closure Care when Wastes Will Remain On Site*. U.S. Department of Energy, Office of Environmental Policy and Assistance, October 1999 (DOE/EH-413-9910); *The Long-term Control of Property: Overview of Requirements and Orders DOE 5400.1 & DOE 5400.5*, U.S. Department of Energy, Office of Environmental Policy and Assistance, October 1999 (EH-412-0014/1099).

[17] *Institutional Controls in RCRA and CERCLA Response Actions*, page 29.

CERCLA are not based on RODs, and decision documents often cover only part of an overall long-term stewardship problem (e.g., they cover one operable unit at a large site, or there may be separate ROD for groundwater and soil contamination). In addition, remedies may need to be adjusted based on information that becomes available during design and implementation stage.

Public Comments with Suggestions for Public Involvement During Remedy Implementation and Long-term Stewardship (see Exhibit 2 in Appendix C)

- DOE must speak candidly about the nature of persisting hazards (24)
- DOE should identify the public involvement processes for preliminary and final Close-out Reports, Remedy Monitoring Plans, site long-term stewardship plans, CERCLA Five Year reviews, and other periodic re-evaluations (1, 25, 30, 35)
- The public, both local and regional, affected states, Tribes, local universities and private institutions, local communities and others should be consulted and involved in decision-making at the beginning and throughout long-term stewardship, including periodic re-evaluations, monitoring updates, and funding options and every final decision. DOE should plan for uncertainties in coordination between the agency and other parties (1, 5, 6, 11, 13, 15, 17, 20, 21, 23, 29, 30, 32, 34, 36, 44, 45, 47)
- DOE should make special efforts to involve Tribes, members of minority and low-income populations, residential neighborhoods around the site, communities in the broad geographic region affected by the site, and citizens not on advisory boards (30, 44, 45, 47)
- Open dialogue, access to information, candid discussions, and trust will be very important (24, 30)
- Public involvement should include providing accurate, complete information (historical and ongoing), good communication, and regular meetings and hearings with affected parties (5, 23, 26, 30, 34)
- DOE should provide support to local communities in the form of independent technical expertise, retention of the SSABs during long-term stewardship, funding of a system of community boards, funding for active and ongoing public education, funding for community-led studies, and training members of the public to find and interpret monitoring data (3, 17, 20, 22, 23, 24, 30, 31)
- There should be better long-term stewardship coverage in proposed plans and RODs; a post-ROD document, to which the public has no required input, is no place to define high-level goals for long-term stewardship (3, 22)
- All cleanups that fall under the long-term stewardship program should use the CERCLA regulatory framework (6, 11, 32, 34, 45)
- Should discussions at the site or field office level which examine future Long-term stewardship include local universities and private institutions who may have an interest? (36)
- Principle drivers for long-term stewardship should include public and state concern (25)
- The *Study* should identify the many ways DOE benefits from public involvement (1, 28, 44)
- Long-term stewardship should include residential neighborhoods around the facilities (45)
- Soon, community boards connected to a national board should help guide long-term stewardship activities. DOE should fund but not direct these boards (24)
- The history and background of long-term stewardship decisions must be made available to the public and these details should be required to be included in final decision documents. (34)
- Any DOE claim that "national security" is a legitimate excuse for withholding information is a relic of the Cold War and should be discarded immediately (49)
- Exhibit 3-2 should discuss points for public involvement in the CERCLA process (1)
- A joint effort, involving all stakeholders, is needed to ensure the provisions of a stewardship plan (25)
- The primary concern of some Tribal and local representatives is figuring how to make long-term stewardship work. Since DOE is not going to spend trillions of dollars to clean up to background levels, long-term stewardship has to work (47)
- DOE should reinforce its commitment to meaningful public involvement by adding appropriate language in several sections of the *Study* (7)

Documents developed subsequent to CERCLA RODs or their equivalent should be used to provide more specific details about long-term stewardship needs. Such documents may include Close-out Reports, Five Year Reviews, and/or Remedy Monitoring Plans (RMPs). These documents can reflect adjustments to the remedy that occur during design and implementation of the remedy and subsequently during long-term stewardship. However, CERCLA and other existing laws and regulations do not clearly articulate the role of public involvement in the activities and decisions that follow the selection of the remedy (e.g., the CERCLA ROD). At the same time, the Department recognizes that the ultimate success of long-term stewardship will depend, in part, on the meaningful involvement of affected parties. It is therefore important for DOE, states, Tribes, communities, and all other affected parties to develop a workable approach for meaningful public involvement in the decisions that affect and manage long-term stewardship activities.

Remedy Monitoring Plans

DOE guidance recommends the development of a remedy monitoring plan (RMP) to identify the objectives, schedules, information, procedures, technologies, and personnel necessary to monitor and ensure the continued effectiveness of a remedy. The plans would include evaluation of the compliance of the remedy with applicable standards; continued performance of the design, operation, and maintenance of the remedy; and continued maintenance of the land use upon which the remedy selection was based. The RMP also should include provisions for modifying the RMP and/or the remedy itself to respond to changes in land use, advances in technology, changes in remedy performance, or changes in site characteristics. The RMP should be established as part of the decision document for the remedy. To the extent feasible, a preliminary draft RMP should be developed for each remedy being considered in the remedy selection process to identify the long-term stewardship needs for each alternative. In cases where RMPs for individual remedial actions are impractical (e.g., many separate areas of concern within a larger area or site), it may be possible to extend the concept of the RMP to an entire site or major portions of a site.

Source: Using Remedy Monitoring Plans to Ensure Remedy Effectiveness and Appropriate Modifications. U.S. Department of Energy, Office of Environmental Policy and Assistance, RCRA/CERCLA Information Brief, DOE/EH-413-9809, July 1998.

There is no direct regulatory driver for a long-term stewardship RMP. However, DOE Orders, and CERCLA and other environmental laws and regulations, require remedies to be monitored for effectiveness. The enhanced RMP could apply either to a specific cleanup project or to a site/area in general. It would provide a formal basis for developing and evaluating long-term stewardship plans and needs, while at the same time preserving the flexibility to modify approaches as new information becomes available. The RMP also could be used for self-regulated DOE activities (e.g., facility disposition, on-site disposal of low-level waste), although any such plans would need to incorporate the performance assessment (PA) and composite analysis (CA) directed by DOE Order 435.1 for each low-level waste disposal facility (see Section 5.2).

3.3 Criteria for Evaluating Long-term Stewardship Needs During Remedy Selection

Several criteria and recommendations for evaluating long-term stewardship needs during remedy selection have been suggested in guidance developed by DOE, EPA, and the Department of Defense (DoD) and in recommendations forwarded to the Department by stakeholders and throughout the public scoping process. These criteria and recommendations and their citations are highlighted in Exhibits 3-3 and 3-4 and summarized below.

- **Ability to demonstrate the long-term effectiveness of institutional controls**. The evaluation of each remedial alternative should include the identification, description, and assessment of existing systems for implementing, enforcing, and funding institutional controls within the site-specific context of affected parties. An alternative that relies upon affected parties to enforce land use controls but does not identify specific mechanisms by which affected parties can enforce these controls should be given less consideration than an alternative for which oversight and enforcement authorities and mechanisms have been clearly identified.

Public Comments Providing Recommendations on Criteria for Evaluating Long-term Stewardship Needs During Remedy Selection
(see Exhibit 2 in Appendix C)

- The *Study* should include a specific set of tasks that DOE will perform, with stakeholder participation, to establish uniform long-term stewardship criteria that can be used in the remedy selection process (19)
- DOE should provide an opportunity for the public to challenge cleanup choices if there is overwhelming concern in the community for the impacts of cleanup technologies (45)
- DOE should use a layered approach where greater weight is given to inputs from those who live near or may be directly impacted by a site (46)
- Discussions of cleanup and long-term stewardship must include an analysis of how Natural Resource Damage Assessments fit into the scheme (49)

- **Ability to monitor, maintain, and replace engineered controls**. The evaluation of each alternative should include the identification, description, and assessment of the technologies for maintaining, refurbishing, and replacing any needed engineered controls at the end of their functional design life. An alternative for which there is no technologically feasible methodology for replacing the engineered control at the end of its functional design life should be given less consideration than an alternative for which periodic replacement is feasible. Similarly, an alternative for which maintenance procedures are difficult to design and implement, or for which data to monitor remedy effectiveness would be difficult to interpret, should be given less consideration than an alternative for which monitoring and maintenance are relatively straightforward.

- **Ability to identify uncertainties and develop contingency plans**. The evaluation of each alternative should include the identification, description, and assessment of uncertainties related to long-term stewardship needs. An alternative for which there is considerable uncertainty concerning the functional design life of an engineered control, or the ability to detect and mitigate potential failures, should be given less consideration than an alternative for which there is less uncertainty and clear contingency plans for addressing potential failures.

Exhibit 3-3. Criteria Developed by DOE, EPA, and DoD for Evaluating Long-term Stewardship Needs During Remedy Selection and Implementation

Department of Energy

Long-term Effectiveness of Institutional Controls

- Institutional controls (ICs) must be effective for both current and future conditions. Effectiveness criteria should include durability, monitoring of remedy, and ability to modify controls.[1]
- Remedy selection process should assess capacity to identify, implement, and enforce ICs, including existence of the legal authorities.[1]
- DOE should investigate the practicability and cost of ICs as thoroughly as the proposed treatment technology during the remedy selection process.[2]
- DOE should evaluate the long-term risks of remedial alternatives during the feasibility study phase of the remedy selection process to ensure that the "long-term effectiveness and permanence" of each alternative is considered.[3]

Monitoring and Maintenance of Engineered Units

- DOE guidance recognizes that many containment-in-place remedies need monitoring through the use of discrete monitoring points; however, discrete points often only indicate data trends and cannot demonstrate that the remedy is functioning properly.[4]
- DOE should develop remedy monitoring plans to screen each alternative remedy for effectiveness, cost, and implementability. Remedy monitoring plans should be designed to gauge performance of the remedy design, operation, and maintenance and detect engineered or institutional control failures.[4,5]

Uncertainty Management/Contingency Planning

- DOE can use Conceptual Site Models to evaluate uncertainties associated with remedial alternatives.
- Remedy monitoring plans should specify under what conditions contingencies must be implemented.[4]
- DOE can use uncertainty matrices to identify impacts of uncertainties associated with engineered and institutional controls, assess uncertainties that may affect performance, and identify contingencies to mitigate potential impacts.[1,6]
- Effectiveness of ICs can be enhanced if the ICs are managed as rolling rather than static systems. IC monitoring plans should allow for systematic reassessment of the need for effectiveness of ICs.[1]

Remedy Life-cycle Cost Analysis

- Evaluation of ICs needs consideration of life-cycle costs that will be incurred over the length of time the controls need to be effective. Remedy evaluations should consider life-cycle costs of ICs, including maintenance of physical control measures, monitoring, and enforcement.[1]
- Some IC life-cycle costs will be incurred by entities other than the federal government. These costs must also be considered in the life-cycle cost analysis.[1]
- The DOE Offices of Site Closure and Long Term Stewardship will ensure that sites create Long-term Surveillance and Maintenance (LTSM) programs that will estimate continuous and intermittent costs.[7]

Environmental Protection Agency

Long-term Effectiveness of Institutional Controls

- EPA remedy selection criteria used to evaluate the long-term effectiveness of ICs also can be used to evaluate the potential for failure of the controls.[8]
- In evaluating remedies, EPA should determine the existence of the authority, ability, and resolve of the implementing entity to implement controls.[8,9,10]
- EPA should evaluate ICs as rigorously as proposed engineered controls and should evaluate long-term effectiveness and permanence of the ICs.[8,10,11,12]
- A remedy that relies on ICs should be selected only if the ICs will be effective and enforceable against both current and potential future property owners.[8]
- DOE facilities should develop and implement land use control assurance plans that identify procedures to ensure ICs remain effective, prior to agency approval of the remedy.[12]

Uncertainty Management/Contingency Planning

- Institutional Control Plans developed for selected remedies should identify and establish contingencies to be implemented in the event of control failures.[8]

Remedy Life-Cycle Cost Analysis

- Cost estimates developed for remedial alternatives should incorporate remedy capital costs and lifetime operation and maintenance costs.[13]
- The remedy selection process should include a comparison of long-term risks and costs of leaving a residual hazard in place versus permanent remedies that do not need ICs. Long-term costs of leaving residual hazards in place include cost to implement and maintain engineered controls and cost to implement contingencies for control failures.[8]

Exhibit 3-3 (continued)

Department of Defense	
Long-term Effectiveness of Institutional Controls • DoD reserves the right to enforce ICs and include enforcement language in land transfer documents.[14] • DoD should consider the pros and cons of establishing and maintaining ICs in the remedy process.[16] • DoD guidance recommends that, to the extent allowable by state and local laws, ICs should "run with the land" and be enforceable by all prior owners of property and other third parties.[16] **Monitoring and Maintenance of Engineered Units** C DoD advocates establishment of ongoing long-term monitoring optimization programs to maintain the maximum effectiveness for monitoring engineered and institutional controls. Monitoring programs should be reviewed and updated periodically.[15]	• Property transfer agreements will include provisions for continued access to DoD to conduct Five Year Reviews and effectiveness monitoring.[17] **Remedy Life-cycle Cost Analysis** • Feasibility studies for remedial alternatives should analyze the relative cost of implementation and monitoring of ICs.[15] • To ensure effectiveness of ICs, stakeholders may need to coordinate long-term responsibilities for implementation among federal and local entities and determine resources that are needed and/or available to implement controls.[15] C DoD recommends periodic cost analysis review of long-term monitoring systems. DoD's Remedial Actions Cost Engineering and Requirements tool facilitates comparison of long-term monitoring program costs.[18]

Exhibit 3-3 (continued)

1. Institutional Controls in RCRA and CERCLA Response Actions. U.S. Department of Energy, Office of Environmental Policy and Guidance, RCRA/CERCLA Division, DOE/EH-413-0004, August 2000.
2. Effects of Future Land Use Assumptions on Environmental Restoration Decision Making. U.S. Department of Energy, Office of Environmental Policy and Assistance, RCRA/CERCLA Information Brief, DOE/EH-413/9810, July 1998.
3. Assessment of Short-Term and Long-Term Risks for Remedy Selection. U.S. Department of Energy, Office of Environmental Policy and Assistance, CERCLA Information Brief, DOE/EH-413/9708, August 1997.
4. Planning and Implementing RCRA/CERCLA Closure and Post-Closure Care when Wastes Will Remain On Site. U.S. Department of Energy, Office of Environmental Policy and Assistance, DOE/EH-413-9910, October 1999.
5. Using Remedy Monitoring Plans to Ensure Remedy Effectiveness and Appropriate Modifications. U.S. Department of Energy, Office of Environmental Policy and Assistance, RCRA/CERCLA Information Brief, DOE/EH-413-9809, July 1998.
6. Uncertainty Management: Expediting Cleanup through Contingency Planning. U.S. Department of Energy, Office of Environmental Management and Office of Environmental Safety and Health, DOE/EH/(CERCLA)-002, February 1997.
7. Self-Assessment of Business Close-Out Activities. U.S. Department of Energy. Office of Site Closure, March 15, 2000.
8. Use of Institutional Controls in the RCRA Corrective Action Program. U.S. Environmental Protection Agency, Region 5, Waste, Pesticides, and Toxics Division, March 2000.
9. Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination. U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, and Office of Radiation and Indoor Air, OSWER No. 9200-4.18, August 22, 1997.
10. Land Use in the CERCLA Remedy Selection Process. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, EPA OSWER Directive No. 9355.7-04, May 1995.
11. Region X Final Policy on the Use of Institutional Controls at Federal Facilities. U.S. Environmental Protection Agency, Region 10, Office of Environmental Cleanup Memorandum, May 1999.
12. Assuring Land Use Controls at Federal Facilities. U.S. Environmental Protection Agency, Region 4, Federal Facilities Branch, Memorandum 4WD-FFB, April 1998.
13. The Role of Cost in the Superfund Remedy Selection Process. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Publication 9200-3-23FS, EPA 540/F-96/018, September 1996.
14. DoD Responsibility for Additional Environmental Cleanup After Transfer of Real Property. U.S. Department of Defense, located at *www.dtic.mil/envirodoc/brac.flu.html* July 25, 1997.
15. The Environmental Site Closeout Process Guide. U.S. Department of Defense, Air Force Base Conversion Agency, September 1999.
16. A Guide to Establishing Institutional Controls at Closing Military Installations. U.S. Department of Defense, February 1998.
17. DoD Guidance on the Environmental Review Process to Reach a Finding of Suitability to Transfer for Property where Release or Disposal has Occurred. U.S. Department of Defense, located at *http://emmisary.acq.osd.mil/bccr/brim*, June 1, 1994.
18. Long-Term Monitoring Optimization Guide. U.S. Department of Defense, Air Force Center for Environmental Excellence, located at *http://www/afbca.hq.af.mil/closeout/*.

Exhibit 3-4. Recommendations by Affected Parties for Considering Long-term Stewardship During Remedy Selection and Implementation

Long-term Effectiveness of Institutional Controls
• The goals of institutional controls, the types of controls required, and control implementation and maintenance should be evaluated for each alternative in the remedy selection process.[1] • DOE should retain ownership of land requiring institutional controls unless affected state or Tribal governments certify that adequate institutions and legal mechanisms exist to implement and enforce such controls.[1] • DOE sites need to prepare site stewardship plans that address the legal authority and enforcement of institutional controls, as well as the effects of property transfers to other agencies or non-federal owners.[6] • The Assistant Secretary should evaluate the applicability and reliability of available non-physical institutional controls, with particular attention to their effectiveness, enforceability, and permanence. The evaluation should consider controls on lands held in federal ownership and lands leased or sold to private individuals or entities.[7] • The Assistant Secretary should evaluate the capabilities of relevant public and private institutions to effectively implement and administer institutional controls over time; and should ensure that remediation and institutional controls have overlapping and/or redundant requirements.[7]
Monitoring/Maintenance of Engineered Units/Verification of Remedy Monitoring Data
• DOE should identify for each engineered control remedy the expected design life of the remedy and associated repair or replacement costs that can be expected to be incurred by future generations.[2] • DOE should establish a stewardship research program designed to understand the ecological and social impacts of residual hazards and to devise new and improved long-term remediation methods and technologies.[2] • DOE sites need to prepare site stewardship plans that address monitoring and maintenance of facilities and physical controls.[6] • The Assistant Secretary should require periodic review of all sites to evaluate the effectiveness of remediation decisions and institutional and physical controls with regard to technological developments, changing environmental and contamination conditions, and costs .[7]
Information Management
• DOE should establish mechanisms for the collection, retrieval, and storage of site data and information necessary for long-term stewardship and preservation of cultural and historic resources.[1,6] • DOE should collect, preserve, and integrate all information needed for long-term stewardship into its information management system, and incorporate stewardship activities into a project management and tracking system to track the progress of and provide stewards with timely notification of stewardship activities.[2] • DOE should implement effective procedures for managing contaminated land notices to ensure that they are found in property title searches, and incorporate information on land use restrictions in state, county, and city information systems.[2] • DOE should jointly manage and link databases of land use information with local land use agencies, and consider establishing cooperative planning entities with local and state planning agencies.[5] • DOE should immediately suspend the operation of protocols that require the routine destruction of relevant records. DOE should coordinate its information activities with the work of the Secretary's Openness Committee to identify and provide for the management of records relevant to long-term stewardship.[6] • DOE should create a geographically based or other type of database for stewardship information. The database should be a means to informing decisions, and any form that the database takes should be durable.[6] • DOE should identify its "stewardship baseline" – the specific items of information that are necessary to plan and carry out long-term stewardship.[6] • The Assistant Secretary should create a publicly available information system that identifies waste sites, location, characteristics, controls, and contingency plans; and should develop options for maintaining remediation and institutional control records at several government levels (local, state, tribal, national).[7]

Exhibit 3-4 (continued)

Uncertainty Management and Contingency Planning
• For decisions that include long-term institutional controls or monitoring and maintenance of engineered controls, DOE should develop methods for accurately reflecting such commitments in the decision process or identify and emphasize uncertainties surrounding such commitments.[1] • DOE sites should prepare stewardship plans that include contingency planning for potential identification of new contamination or potential remedy failures.[6] • The Assistant Secretary should develop contingency plans for reasonably forseeable failures of remediation and/or physical and institutional controls .[7]
Remedy Life-cycle Cost Analysis and Funding Mechanisms
• DOE's current method of costing long-term institutional controls does not accurately reflect the relative cost of long-term stewardship activities. If present worth values are used to compare the cost of remedial alternatives, annual costs associated with the use of institutional controls become negligible beyond a few decades. DOE should more fully explain and quantify the required long-term cost and funding commitment required for long-term institutional controls and develop plans to ensure availability of adequate funding for such controls.[1] • DOE should formally acknowledge that remedy decisions requiring long-term institutional controls will not be considered final until DOE can implement an acceptable stewardship program that includes an acceptable funding mechanism.[1] • For new facilities and missions, DOE should address the closure and long-term stewardship commitments associated with the facility or mission in the initial approval decision and make provisions for funding of the closure and post-closure operations of the new facility or mission.[1] • DOE should promote mechanisms for funding stewardship that do not depend upon annual appropriations, with trust funds being the preferred approach. At a minimum, an adequate principal should be set aside to produce sufficient income to fund long-term monitoring of residual hazards.[2] • Congress should establish a fund that will generate the required annual budget for stewardship. Until such an independent funding mechanism is established DOE should request stewardship funding as a specific line item in its annual appropriations process.[3] • DOE should estimate the cost, time frames, and types of activities that will be needed for long-term stewardship at DOE sites.[4] • DOE should define responsibilities for long-term stewardship, including early involvement of local governments and adequate long-term support to local agencies charged with stewardship responsibilities.[5] • The Assistant Secretary should require full consideration of the estimated life-cycle costs of remediation and long-term institutional controls in order to evaluate the tradeoffs between cleanup and stewardship.[7]

1. Closure for the Seventh Generation: A Report from the Stewardship Committee of the State and Tribal Government Working Group. National Conference of State Legislatures, Washington D.C., February 1999.
2. The Oak Ridge Reservation Stakeholder Report on Stewardship, Vol. 2. Oak Ridge Reservation Stewardship Working Group, December 1999.
3. The Oak Ridge Reservation Stakeholder Report on Stewardship, Vol. 1. Oak Ridge Reservation Stewardship Working Group, July 1998.
4. Probst, K. N., and McGovern, M. H. Long-Term Stewardship and the Nuclear Weapons Complex: The Challenge Ahead. Center for Risk Management, Resources for the Future, Washington D.C., June 1998.
5. Lowrie, K. Local Land Use Planning and Future Use of U.S. DOE Sites: Communication, Coordination, and Commitment, Report 32. Consortium for Risk Evaluation with Stakeholder Participation, September 1999.
6. Bodde, D., Environmental Management Advisory Board Long-term Stewardship Committee Report and Recommendations. October 8, 1998.
7. Bodde, D., and Bennett, Joel. Resolution on Institutional Controls on DOE Properties. Environmental Management Advisory Board, April 17, 2000.

- **Full life-cycle cost accounting**. The evaluation of each alternative should include an estimate of its full life-cycle cost, including costs for surveillance, maintenance or replacement of engineered controls, costs for the implementation and enforcement of institutional controls, and potential natural resource damages implications and liabilities. Although the annual long-term stewardship cost of an alternative may represent only a small fraction of the capital cost to implement the alternative, the long-term stewardship costs may be incurred for hundreds or thousands of years. Although engineered controls that are designed to last a long time and be easy to maintain may have large up-front costs, they may be less expensive in the long-term than controls that cost less to build initially but are not expected to last as long. The Department recognizes that it may be difficult to estimate life-cycle costs, particularly early in the remedy evaluation process. DOE also recognizes that existing cost methodologies (e.g., net present worth value) may not always be appropriate for comparisons. Where considerable uncertainty exists, it may be appropriate to develop a range of life-cycle cost estimates based on upper and lower bound design life scenarios to compare one alternative to others (see Chapter 8).

Chapter 4: DOE's Long-term Stewardship Activities

The Department established the Office of Long Term Stewardship in 1999 to help coordinate and communicate long-term stewardship efforts within the Office of Environmental Management (EM). Coordination is needed because the majority of long-term stewardship activities are conducted at individual DOE sites and managed by a variety of programmatic offices at headquarters and in the field. This ensures that DOE conducts its missions in a manner that protects human health and the environment.

This chapter describes how long-term stewardship is being planned, managed, and implemented at DOE sites.

4.1 What are the Drivers for Long-term Stewardship?

The principal drivers for existing long-term stewardship at DOE sites are: (1) the responsibility of DOE to protect human health and safety pursuant to the AEA; (2) CERCLA, RCRA, UMTRCA, other environmental statutes, and implementing requirements (including Consent Decrees, Federal Facility Agreements, licenses, and permits); (3) Executive Orders; and (4) applicable Treaty obligations pertaining to Tribal governments.[18] Many of these

APPLICABLE SCOPING COMMENTS
(see Exhibit 2 in Appendix B)

- The Assistant Secretary should ensure that the Office of Long Term Stewardship at headquarters has the responsibility and authority for directing policy for long-term stewardship, and for ensuring implementation and accountability in the field (4)
- DOE should create a specific long-term stewardship program office not limited to EM (STGWG)
- DOE should continue to work with stakeholders, regulators, and Tribes to develop an acceptable long-term stewardship program (3, 4, STGWG)
- DOE should discuss long-term stewardship responsibilities at multi-program sites (14)
- DOE should evaluate the pros and cons of different federal agencies performing long-term stewardship activities especially at sites with significant natural resources or historic preservation value (1)
- DOE should continue research and development activities to minimize residual contamination and reduce future long-term stewardship costs (4)
- DOE sites should each develop a long-term stewardship plan that defines costs, constituents, and implementation mechanisms (2)
- The *Study* should examine DOE's existing legislative mandates for maintaining institutional controls over contaminated sites and alternatives for sharing regulatory responsibilities with other federal agencies (6)
- The *Study* should examine alternative internal organizational and programmatic strategies needed to maintain long-term stewardship programs (6)

APPLICABLE ISSUES
(see Exhibit 3 in Appendix B)

4. *Regulatory Drivers, Negotiated Agreements, and Legislative Barriers*
7. *Science and Technology Development*
14. *Stewardship Responsibilities at Non-EM Facilities with Continuing Operations and Multi-Purpose Sites*
20. *Enforcement*
23. *Tie National Policy to Stewardship Legislative Mandate*

[18]The *Executive Memorandum for the Heads of Executive Departments and Agencies on the Government-to-Government Relations with Native American Tribal Governments* (April 29, 1994) enumerates the federal

requirements were developed for other purposes, not specifically for long-term stewardship. Specific requirements for long-term stewardship that apply to DOE include:

Public Comments Providing Recommendations on Regulatory Requirements (see Exhibit 2 in Appendix C)

- DOE needs to ensure adequate oversight and enforcement of long-term stewardship requirements, especially with respect to self-regulation (19, 29)
- DOE should establish external regulation (e.g., NRC licensing or regulation, CERCLA) for long-term stewardship (1, 4, 11, 28, 44)
- DOE should assist state and local government agencies in developing the legislation required for the maintenance of long-term stewardship (41)
- Periodic updates of legal and regulatory citations, summaries of specific concepts, examples, and other material would be helpful (4)
- Congressional legislation may be required for long-term stewardship directives (49)
- Site cleanups under LTS program should use CERCLA as it provides the most opportunity for community involvements (6, 11, 32, 34, 35)
- Federal, state, and local regulations that do not significantly contribute to doing or completing LTS should be revised or eliminated (8)
- A list of bibliographic and textural documentation of legal and regulatory requirements should be compiled (43)
- All major sites should complete EIS's under NEPA with LTS considerations included (45)
- There has been no definitive discussion with states to describe their roles or how they will be financially supported (25)
- Guidance is often ignored or slighted unless external pressure is exerted (29)
- The *Study* does not mention the DOE and NRC's

- Ensuring compliance through routine surveillance and monitoring under AEA and DOE Order 5400.1, *General Environmental Protection Program*, and DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, for sites contaminated with radioactive materials.

- Implementing the long-term surveillance and maintenance requirements established by Titles I and II of the Uranium Mill Tailings Radiation Control Act (UMTRCA) (10 CFR Part 40.27-28).

- Where contaminants are left in place, conducting five-year performance reviews for sites remediated pursuant to CERCLA (40 CFR Part 300.430).

- Implementing post-closure maintenance and monitoring and periodic performance reviews for sites remediated pursuant to RCRA, which requires a minimum of 30 years of post-closure care (40 CFR Part 264.117).

- Ensuring compliance with long-term monitoring, maintenance, and institutional controls requirements for the Waste Isolation Pilot Plant (WIPP) in New Mexico established by the WIPP Land Withdrawal Act (Public Law 102-579) and regulations promulgated under this statute (40 CFR Parts 191 and 194).

- Ensuring compliance with applicable statutory and regulatory requirements and Executive Orders protecting natural resources and cultural resources (see Chapter 9).

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government's responsibility to operate within a government-to-government relationship with federally-recognized Native American tribes.

- Ensuring compliance with DOE Order 1230.2, *American Indian Tribal Government Policy*, and ensuring that obligations under the Federal Indian Trust Responsibility (Seminole Nation v. United States, 1942) and treaty obligations are met.[19]
- Ensuring compliance with DOE Orders on facility and land use planning (430 Series).

- Ensuring compliance with DOE Order 435.1, *Radioactive Waste Management*, for designing and maintaining low-level waste disposal cells.

The concept of long-term stewardship is driven by CERCLA, RCRA, DOE Orders, NRC regulations, state laws, and supporting regulations and guidelines.[20] However, differences in requirements and standards in existing regulations, as well as the unique circumstances for each site, could lead to a patchwork of different regulatory requirements for similar long-term stewardship activities. The resulting patchwork of regulatory requirements could make it difficult to manage long-term stewardship activities. The Department is reviewing options for developing additional policy and guidance to clarify the requirements pertaining to long-term stewardship.

[19]Tribal governments have a special and unique legal and political relationship with the US Government, defined by history, treaties, statutes, court decisions, and the US Constitution. The United States has entered into more than 600 treaties and agreements with American Indian Tribes. These treaties and agreements create a variety of legal responsibilities for the United States toward Tribes and provide the basis for a government-to-government relationship. Although the Department of the Interior, through the Bureau of Indian Affairs, has the principal responsibility for upholding obligations of the federal government to American Indians, this responsibility extends to all federal agencies, including DOE. *Source*: DOE Order 1230.2 *American Indian Tribal Government Policy,* April 8, 1992.

[20]*The Long-Term Control of Property: Overview of Requirements in Orders DOE 5400.12 & DOE 5400.5*. U.S. Department of Energy, Office of Environmental Policy and Assistance, Information Brief. EH-412-0014/1099, October 1999.

Advisory Groups' Recommendations for Establishing a Long-term Stewardship Program within DOE

DOE should create a specific program office to manage stewardship responsibilities. This is needed because stewardship at DOE sites is not limited only to Environmental Management (EM) programs. Stewardship may be required during cleanup or closure and during operation of related facilities with continuing missions.

Source: Closure for the Seventh Generation: A Report from the Stewardship Committee of the State and Tribal Government Working Group. National Conference of State Legislatures, Denver CO, February 1999.

The Environmental Management Advisory Board recommends that the Assistant Secretary take the following steps in the coming months to assure that long-term stewardship remains a major focus of the EM program:

- *Promulgate a formal policy (that is, DOE Order or similar document) that requires the sites to plan for and implement long-term stewardship.*
- *Establish a distinct budget for long-term stewardship at Headquarters, Operations, and site levels.*
- *Ensure that the Long Term Stewardship Office in Headquarters has the responsibility and authority for directing policy for long-term stewardship, and for ensuring implementation and accountability in the field.*
- *Assure that relevant state, tribal, and local governments are fully informed of information resources and DOE activities relating to long-term stewardship.*
- *Provide the general public with ready access to long-term stewardship information and activities to facilitate public participation in decisions regarding long-term stewardship.*

Source: Letter from Dr. David L. Bodde and Joel H. Bennett, Co-Chairs, Environmental Management Advisory Board, April 17, 2000.

As long as DOE retains ownership or control of sites, long-term stewardship requirements established in site specific compliance agreements and in laws, regulations, and treaties that apply to DOE will remain applicable and enforceable. If ownership of a site is transferred to a non-federal entity (e.g., states, Tribes, local governments, private entities), it may be more difficult to ensure the effectiveness of long-term implementation of existing requirements and associated compliance oversight.[21] DOE has not traditionally established specific monitoring or oversight provisions for property transfers and other activities that rely upon local institutional control mechanisms.[22]

[21] *Cross-Cut Guidance on Environmental Requirements for DOE Real Property Transfers*, U.S. Department of Energy, Office of Environmental Policy and Assistance. DOE/EH-413/97/2, October 1997; *CERCLA Requirements Associated with Real Property Transfers*, U.S. Department of Energy, Office of Environmental Policy and Assistance, CERCLA Information Brief. EH-413-9808, April 1998.

[22] Specific monitoring or oversight provisions will be needed to ensure remedy protectiveness of human health and the environment when DOE transfers land to a non-federal entity (see the example of groundwater use restrictions at the Oak Ridge Reservation in Section 5.3) or leases on-site facilities to non-federal entities (see the example of site institutional controls at the Mound Environmental Management Project in Section 6.2).

The Department of Defense (DoD) has faced similar issues associated with property transfers under the Base Realignment and Closure (BRAC) process. Congress originally authorized BRAC under Public Law 100-526, the Defense Authorization Amendments and Base Closure and Realignment Act for FY 1988, and has modified the process in subsequent legislation, primarily through provisions contained in the National Defense Authorization Acts for FY 1992 through FY 1997. Since 1988, DoD has successfully transferred ownership of many former military installations for economic re-use or natural resource conservation under the BRAC program. Some of these installations need long-term stewardship after property transfer. Such long-term stewardship activities generally are conducted by DoD but may also be conducted by the property owner, local government, or other entities. When appropriate, DoD retains access rights to transferred BRAC properties for the purposes of conducting long-term stewardship and additional cleanup activities (if needed) under the provisions of the land transfer agreements.

ASTM Standards for Environmental Site Assessments

The American Society for Testing and Materials (ASTM) has developed standard practices for conducting environmental site assessments for commercial real estate. The standards were developed to assist purchasers of the property in qualifying for the "innocent landowner" defense to CERCLA liability; i.e., they had conducted "all appropriate inquiry into the previous ownership and uses of the property consistent with good commercial or customary practice" as defined in 42 U.S.C. §9601(35)(B). The standards include practices and procedures for the identification and documentation of the presence or likely presence of any CERCLA hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release into structures on the property or into the ground, groundwater, or surface water of the property.

Source: ASTM Standard E1527-97 Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process; ASTM Standard E1903-97 Standard Practice for Environmental Site Assessments: Phase II Environmental Site Assessment Process.

DoD currently requires that an environmental baseline survey be conducted for all DoD property that is under consideration for transfer by lease or deed to any non-federal government entity. Environmental baseline surveys are used to support Finding of Suitability for Lease (FOSL) and Finding of Suitability for Transfer (FOST) determinations, and are incorporated into property transfer documents. ASTM also has developed a standard classification of environmental condition of property for DoD BRAC facilities that is used to support the DoD environmental baseline survey and FOSL/FOST process.[23]

[23] ASTM Standard D5746-98 Standard Classification of Environmental Condition of Property Area Types for Defense Base Closure and Realignment Facilities.

Five Key Principles for Effective Long-term Stewardship

The National Research Council recently recommended that DOE commit the time and funding needed to develop and implement effective institutional management plans devoted to five key principles:

1. *Plan for uncertainty* by anticipating a range of possible outcomes of cleanup strategies and post remediation institutional management strategies and adding uncertainty by applying uncertainty ranges.

2. *Plan for fallibility* in cleanup strategies and post remediation institutional management strategies by selected site uses that are less likely to be subject to frequent change, and that assure that information about contaminated sites is preserved and communicated effectively to future site users.

3. *Develop appropriate and substantive incentive structures*, including stable long-term funding structures, access to needed resources, and encourage active citizen oversight of long-term institutional management.

4. *Undertake scientific, technical, and social research and development*, including research and development for contaminant reduction, contaminant isolation, and stewardship measures.

5. *Plan to maximize follow-through* by implementing an iterative, long-term institutional management strategy that allows for adaptation to changing conditions or unexpected outcomes and allows for follow through on successive phases of the institutional management plan.

Source: Long-Term Institutional Management of U.S. Department of Energy Legacy Waste Sites. National Academy of Sciences, National Research Council, August 2000

4.2 How is Long-term Stewardship Currently Managed and Implemented by DOE?

As with other Departmental activities, DOE's long-term stewardship responsibilities are divided among headquarters and field offices. Appendix E identifies the Department's major long-term stewardship activities, guidance, reports, and internet sites. DOE headquarters offices are responsible for developing policy, guidance, and DOE Orders; providing programmatic oversight; providing funding advocacy; and communicating with representatives of national stakeholder and Tribal organizations. The DOE field offices are responsible for implementing long-term stewardship through planning, developing budgets, and managing the projects that include long-term stewardship activities. Most of the Department's long-term stewardship activities are being conducted or coordinated by five organizations:

- The Office of Long Term Stewardship is responsible for long-term stewardship policy, planning, and interagency coordination. DOE has established procedures for the involvement and coordination among DOE Principal Secretarial Offices (PSOs) and Deputy Administrators (within the NNSA) in the development of policies, guidance, and DOE Orders. The Office has the lead for long-term stewardship policy implementation and guidance development and works in coordination with the Office of Environment, Safety, and Health (EH) to ensure that policy and guidance pertaining to long-term stewardship is consistent with existing Departmental policies and guidance.

Public Comments with Recommendations for How DOE Should Manage Long-term Stewardship as a Program (see Exhibit 2 in Appendix C)

- Preserve one Office of Long Term Stewardship at DOE headquarters with the authority to coordinate long-term stewardship activities, draft national policy, coordinate research, manage information, and provide guidance; the office should be isolated from the politics surrounding nuclear weapons production and the current cleanup program (5, 7, 24, 26, 36, 41)
- Establish a centralized responsibility for implementing long-term stewardship requirements (e.g., monitoring, maintenance, research and development, negotiations related to land transfer) in a single, special-purpose organization or agency (1, 12, 16, 24, 28, 36, 40, 44)
- DOE needs to ensure that long-term stewardship is fully institutionalized as a clearly identifiable, strong, national DOE program (7, 8, 19, 23, 24, 39)
- Each site should have a strong office focusing on long-term stewardship (24)
- Focus on day-to-day activities (39)
- Long-term stewardship planning and implementation should be decentralized to account for the different long-term needs and community structures at each site (33)
- The *Study* should discuss the potential organizational structures to manage long-term stewardship – what the system might look like, its characteristics, and the associated issues (48)
- DOE should not have the principal responsibility for implementing long-term stewardship (4, 49)
- The federal government should take a strong role in partnering with state and local entities (25)
- DOE should learn from the examples of other federal agencies already implementing stewardship (23)
- DOE and the *Study* should clearly delineate long-term stewardship responsibilities (7, 28, 43, 44)
- The EM program should be responsible for long-term stewardship at all DOE sites (5, 6, 11, 32, 34, 45)
- The long-term stewardship program should maximize the personnel assigned to field work and minimize administrative staff (8)
- Research should be coordinated from DOE headquarters, not Idaho. DOE should also establish site-level programs (24)
- Headquarters should mandate a structure for LTS decisions and implementation at sites then monitor compliance to make LTS nationally consistent. Local decisions would still reflect public and stakeholder input and thus funding would be more assured (26)
- DOE should continue the work that has been identified in this *Study* (13)
- Other agencies or non-profit entities may be best suited to give stewards incentives to manage their sites well (i.e., to prevent the spread of contamination) by including income-producing resources, which in turn support stewardship (4)

- The Long-term Stewardship Executive Steering Committee was established in May 2001 to provide senior management coordination, strategic planning, and policy development. The Committee includes senior managers from each DOE field office and major headquarters Program Secretarial Offices. The Executive Steering Committee is currently drafting a Strategic Plan for long-term stewardship which will be the basis for establishing specific roles and responsibilities and performance objectives for the Department.

- The Grand Junction Office, which reports to the Idaho Operations Office, has project management responsibility over the majority of the projects currently in the long-term stewardship phase (see Section 4.2.2). As cleanup actions are completed at a given site, the DOE organization with landlord responsibilities at the site will assume responsibility for long-term stewardship (see Section 4.3).

- The Idaho National Engineering and Environmental Laboratory (INEEL) is the lead laboratory for coordinating science and technology development related to long-term stewardship.

4.2.1 Office of Long Term Stewardship

The Office of Long Term Stewardship provides support and coordination among the other EM program offices, EH, and other PSOs. The Office has a major role in identifying policy and guidance needs, working with other offices within DOE – including the NNSA – to develop and implement policies and communicate with national stakeholder and Tribal organizations, and coordinating with research and development (R&D) organizations internal and external to DOE. To meet these responsibilities, the Office performs several functions:

- **Drafting policy:** The Office works with other DOE offices to draft policies for implementing and managing long-term stewardship activities at DOE sites. The Office also sponsors independent research on specific long-term stewardship policy issues and ensures integration with existing DOE policies.

- **Coordination and communication:** The Office coordinates the DOE Working Group on long-term stewardship, prepares reports such as this *Study* and the *Report to Congress on Long-term Stewardship*, maintains information systems such as the long-term stewardship web page (*http://lts.apps.em.doe.gov*), and provides liaison to national stakeholder and Tribal organizations involved in long-term stewardship.

Public Comments Providing Recommendations for Development of Long-term Stewardship Policy (see Exhibit 2 in Appendix C)

- DOE should establish the broad range of procedures, processes, mechanisms, and strategies necessary for effective long-term stewardship (17)
- DOE should establish a timeline for the resolution of critical issues identified in this document (36)
- The Conference of Radiation Control Program Directors should be included in the development of long-term stewardship policies and procedures (46)

- **Drafting guidance:** Although long-term stewardship activities at a site will be driven by site-specific factors and needs, some practices are addressed consistently across sites. The Office works with EH, other EM program offices, and other PSOs to draft guidance for issues such as contracting strategies, negotiated agreements, and development of site-specific implementation plans. Guidance for long-term stewardship is developed using administrative processes already established within DOE.

- **Developing performance measures:** The Office is working with other EM program offices to develop performance measures to evaluate whether long-term stewardship functions are being performed adequately and cost effectively and to determine whether needed research and development is being performed or given sufficient priority.

- **Managing data:** The Office coordinates with the DOE Chief Information Officer to develop and support policies that ensure the collection, preservation, and accessibility of the information necessary to support long-term stewardship activities.

DOE Long-term Stewardship Working Group

In 1998, DOE convened the Long-term Stewardship Working Group to provide a forum for field and headquarters personnel to coordinate and facilitate long-term stewardship planning and implementation.

- The initial objective was to ensure that personnel involved in cleanup and post-cleanup activities are informed of ongoing and planned research, planning, and implementation activities related to long-term stewardship. This improved opportunities for leveraging expertise and resources to efficiently address long-term stewardship issues and concerns.

- The near-term objective is to begin to address the many challenges associated with long-term stewardship in a coordinated fashion and to establish an understanding of how expertise within the Department (e.g., at Grand Junction Office and headquarters programs) can be applied to these issues and concerns.

- The longer-term objective is to develop an understanding of what will be needed to maintain a viable commitment to long-term stewardship over multiple generations and to define appropriate roles for headquarters and field elements in meeting that commitment.

In May 2001, the Working Group identified the six most important issues that should be addressed by the senior management Long-term Stewardship Executive Steering Committee:

- Developing a common, consistent understanding of the definition and scope of long-term stewardship
- Articulating a corporate vision for how the Department will protect human health and the environment
- Developing mechanisms for the transfer of long-term stewardship responsibilities at a site from the EM program to another authority
- Developing a clear understanding of what long-term stewardship activities are occurring and what they cost
- Developing expectations and mechanisms for public involvement in long-term stewardship decisions
- Identifying the circumstances under which periodic reviews of the selected remedy may in the future result in returning land to unrestricted use

Appendix F provides a listing of the current principal Working Group Members and the areas they represent. The list will be updated on the long-term stewardship information center web site: (***http//lts.apps.em.doe.gov***)

- **Identifying needs of science and technology for long-term stewardship:** The Office coordinates with organizations within the EM program responsible for planning and implementing long-term stewardship and EM program organizations responsible for science and technology development to identify new science and technology needed to enhance protectiveness and reduce costs during long-term stewardship and identify strategies for meeting these needs.

- **Incorporating research and development in science and technology:** To ensure that developments in science, technology, and other areas of knowledge are incorporated into long-term stewardship strategies at sites, the Office provides information to sites on strategies, science, and technologies that are available at other DOE sites, at other federal agencies, and in the private sector. The Office also performs analyses to re-evaluate and, in concert with other federal regulators, modify as necessary national long-term stewardship strategies based on new science and technology.

- **Supporting and reviewing proposed EM funding for long-term stewardship:** The Office reviews proposed budgets and plans for long-term stewardship and provides advocacy for long-

term stewardship funding in the annual budget process. The Office also evaluates alternative funding mechanisms as appropriate.

4.2.2 Implementation of Long-term Stewardship Activities

Long-term stewardship activities at the site level include RCRA post-closure monitoring, CERCLA five-year reviews, and long-term monitoring and maintenance activities pursuant to AEA, DOE Orders, NRC license requirements (e.g., at uranium mill tailings sites) and site-specific needs. DOE field offices also have begun to issue long-term stewardship guidance. For example, the Ohio Field Office has issued guiding principles for long-term stewardship that address stakeholder and regulator involvement, institutional controls, funding, review of cleanup remedies, technology development and implementation, communication, and conservation of resources.[24]

Long-term stewardship is budgeted and managed in different ways at different sites across the DOE complex. Some sites have established long-term stewardship as a specific project with a distinct budget. Other sites include long-term stewardship as part of each cleanup project. Many long-term stewardship activities (e.g., records management, site security) are included as part of the overall infrastructure maintenance activities. When long-term stewardship activities are budgeted within site overhead accounts, it is difficult to attribute costs to the precise areas undergoing long-term stewardship and identify the overall scope of long-term stewardship activities currently underway. This information should be most complete at sites where cleanup and closure are the sole mission, particularly where closure is expected before 2006. To better understand long-term stewardship activities and costs, many DOE sites will have an independent post-closure Project Baseline Summary (ledger for tracking cost and progress in support of the EM annual budget) for long-term stewardship by Fiscal Year 2003.[25] As noted in Chapter 1, the *Report to Congress on Long-term Stewardship* identifies sites or portions of sites where cleanup is complete or expected to be complete by 2006 and the scope of long-term stewardship activities anticipated for these areas.

The Grand Junction Office (GJO) in Colorado is currently responsible for long-term stewardship at 26 sites where cleanup is complete (Exhibit 4-1). Sites assigned to GJO include 21 disposal cells that contain encapsulated uranium mill tailings and associated contaminated material, entombed reactors in Nebraska and Ohio, and the Pinellas Site in Florida. Some of the sites that are anticipated to be transferred to DOE in the future are presently owned by private parties and regulated under NRC license (i.e., UMTRCA Title II sites).[26] Site-specific long-term stewardship plans are required by law for UMTRCA sites and must be approved by NRC. The Department also requests the development of a site-specific long-term stewardship plan before accepting long-term stewardship responsibilities for any site.[27] This plan should explain how to provide effective long-term stewardship for the site, including:

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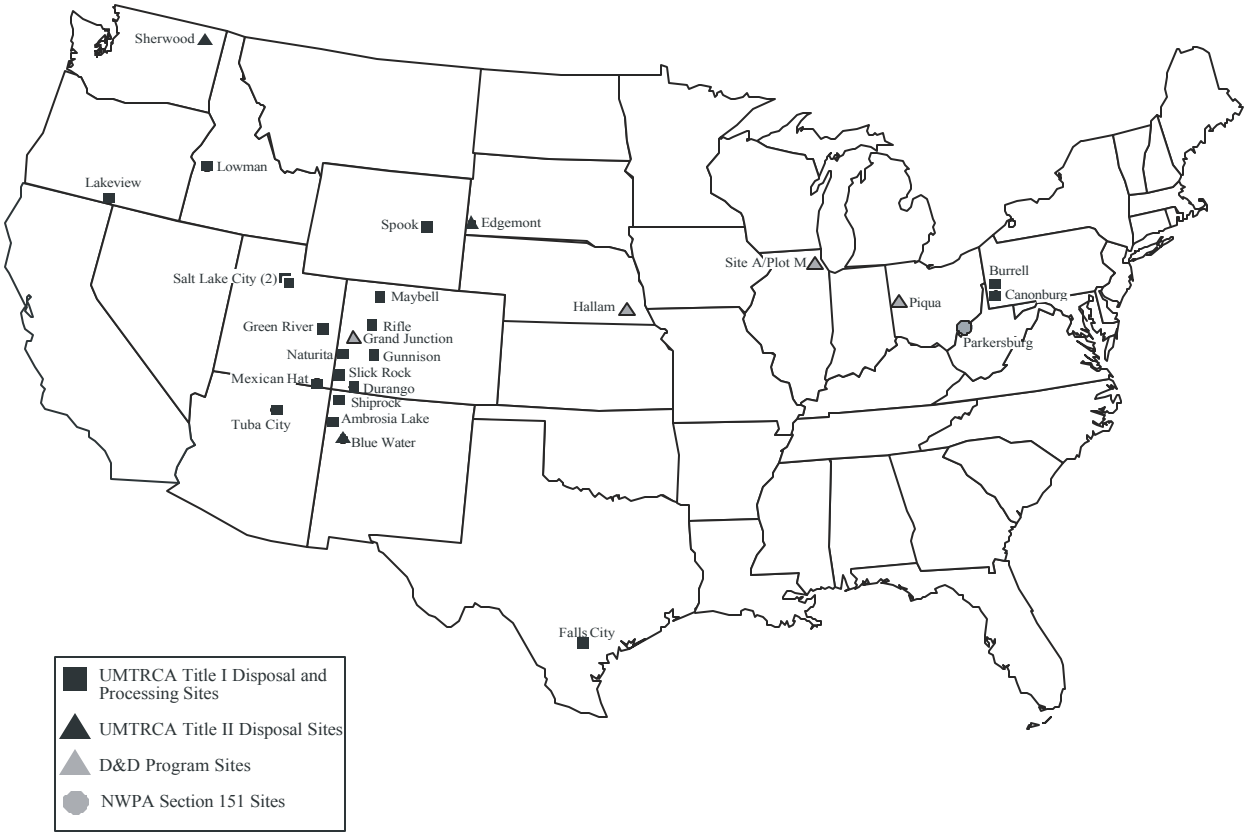
[24] *Guiding Principles for Long-Term Stewardship*. U.S. Department of Energy, Ohio Field Office, Miamisburg, OH, March 27, 2000.

[25] This applies to sites with EM program funding.

[26] *1999 Long-Term Surveillance and Maintenance Program Report*. U.S. Department of Energy, Grand Junction Office, Grand Junction, Colorado, March 2000.

[27] *Guidance for Implementation of Long-Term Surveillance and Maintenance at DOE Sites in Long-Term Stewardship*. U.S. Department of Energy, Grand Junction Office, Grand Junction, Colorado, December 30, 1999.

Exhibit 4-1. DOE's Grand Junction Office is Responsible for Long-term Stewardship Activities at 26 Sites



- Legal, regulatory, and other long-term stewardship needs.
- Institutional controls to be implemented.
- Physical and baseline conditions at the site when long-term stewardship begins.
- History of site operations and cleanup activities.
- Planned surveillance, monitoring, and maintenance activities.
- Emergency response provisions.
- Records management and public information.
- Cost and schedule.

At sites where it has programmatic responsibilities, the Office of Site Closure within EM has initiated a process to evaluate business close-out

Future Site Transfers May Increase DOE's Long-term Stewardship Activities

At most sites, long-term stewardship needs stem from the decisions made jointly by DOE, EPA, and state and Tribal governments, with input from the public during the cleanup process. At other sites where cleanup is not completed by DOE, Congress has authorized the transfer of long-term stewardship responsibility to DOE after cleanup is complete.

- Title II of the Uranium Mill Tailings Radiation Control Act (UMTRCA) requires the transfer of uranium processing sites that were under active NRC agreement state licence when the Act was passed to the host state or the federal government. If the state declines, then DOE becomes the site steward; to date no states have expressed an interest in permanent custody and long-term stewardship.
- Section 151(b) of the Nuclear Waste Policy Act allows certain NRC licensed, privately owned sites with low-level radioactive waste (and the land on which such waste is disposed of) to be transferred to DOE for long-term custody and care; but only if DOE accepts these sites.

activities to assist sites in developing management plans to expedite and monitor progress toward the completion of EM program projects and the transition to long-term stewardship.[28] The self-assessment will use a framework which includes 13 defined activities related to site close-out:

- Establishing contract incentives to maximize contractor efforts to complete EM projects.
- Planning to ensure that an early determination is made regarding the post-DOE use(s) of sites and that detailed planning for eventual re-use or disposition is developed and executed.
- Identifying post-contract benefit liabilities, including pension, medical and life insurance, and post-employment benefits such as severance pay.
- Developing and implementing plans for the disposition of site records (e.g., contaminated, electronic, and classified records) and the post-closure custodianship of these records.
- Mitigating the effect of any ongoing lawsuits on meeting the schedule for site closure.
- Ensuring that transition plans maximize, to the extent possible, employee options for re-employment or retirement and retain the appropriate labor skill mix.
- Ensuring the development of schedules and approaches for personal property disposal.
- Planning and implementing the re-industrialization or leasing of sites as appropriate.
- Identifying DOE Orders which are no longer necessary to maintain health and safety.
- Documenting effective site closure experiences.
- Providing assistance, as needed, to ensure that the specific needs of the communities near closure sites are being considered and addressed appropriately.
- Developing memoranda of agreement between EM and other DOE PSOs to establish responsibilities for conducting long-term stewardship activities.
- Identifying site-specific long-term stewardship responsibilities.

As the EM mission at a site is completed, current plans call for the EM program and the site landlord (if different from EM) to develop a long-term stewardship baseline for each site. The baseline will describe the scope of applicable long-term stewardship requirements, the technical activities and the projected schedule to meet these requirements, and expected costs.[29]

[28] *Self Assessment of Business Close-out Activities*. Memorandum from James J. Fiore, Deputy Assistant Secretary for Site Closure, Office of Environmental Management, March 15, 2000. The Draft Plans were completed by June 30, 2000.

[29] *Long-term Stewardship Transition to Site Landlord*. Memorandum from T.J. Glauthier, Deputy Secretary of Energy, to All Departmental Elements, December 15, 2000.

Public Comments Providing Recommendations for Site Long-term Stewardship Plans (see Exhibit 2 in Appendix C)

- Include the point at which the decision is made to extend [RCRA] monitoring beyond 30 years (1)
- Identify how the public will be involved in the decision making processes during long-term stewardship (1, 4, 7)
- Include the Department of Defense requirement for an environmental baseline survey (4)
- Develop contingency plans at the time of cleanup and periodically re-evaluate contingency plans (6, 11, 20, 30, 32, 34, 45)
- Plan for uncertainties in coordination between DOE and other parties, including Tribal nations (44)
- Include a funding mechanism (25)
- Include biological monitoring (27)
- Define how residual radioactive waste and radiologically contaminated material will be managed (29)
- Include the reduction in hazard over time as the result of radioactive decay and chemical degradation (33)
- Align land use planning with approaches used by state, local, and county governments (39)
- Expand or reference the Project Baseline Summary discussion to provide information on organizational structure, the current baseline planning window, and land use assumptions (41)
- Include an effective Conceptual Site Model, which could be in the form of a "cartoon" or a flow diagram (41)
- Evaluate the need for greater technical consistency and appropriate scope and scale of risk assessments (41)
- Integrate with other site management documents, including tribal site-specific roles (44)
- Manage long-term stewardship in small intervals of time (e.g., 20 years or a generation) (48)
- All sites should be mandated to establish long-term stewardship plans and ensure these plans are incorporated into the Site Comprehensive Plans (9)
- Place greater stress on ensuring that DOE sites already closed or currently undergoing cleanup develop the same types of long-term stewardship plans as "new" sites (12)
- Long-term stewardship plans should include optimal levels of cleanup and their associated impacts (37)
- Integrate management of DOE lands with adjacent federal or state lands for ecosystem management (4)
- The multiple layers of the planning process should be open to external input (4)
- Avoid transferring hazardous substances. Compensate local governments for LTS activities when contaminants are left in place (15)
- Address the lack of integrated LTS planning with regard to former assessments and decisions on the nature and extent of residual contamination (41)
- Long-term stewardship is critical to preventing off-site migration of contamination (25)

4.2.3 Entities External to DOE

EPA, NRC, state regulatory agencies, and Tribal governments have expressed a strong interest in long-term stewardship. Their role(s) in planning, implementing, and providing oversight of long-term stewardship activities varies among sites. At many sites, EPA, states, and Tribal governments currently provide oversight of DOE cleanup activities conducted pursuant to CERCLA, RCRA, and/or site-specific agreements. Although land use planning in the United States typically is conducted primarily at the local level, certain state and Tribal governments also have regulations pertaining to land use.[30]

[30]Certain states (e.g., Tennessee, Washington) have state regulations pertaining to land use planning. Tribal nations also have regulations governing land use and planning. For example, the Yakama Nation has promulgated regulations to encourage appropriate use of the land; to protect the social and economic stability of residential, agricultural, commercial, industrial, forest, reserved, and other areas within the reservation; to assure orderly development of such areas; and to otherwise promote the public health, safety, morals, and general welfare in accordance with the rights by the Yakama Indian Nation in the 1855 *Treaty with the Yakamas* (12 Stat. 951).

Depending on site-specific situations, local and Tribal governments may play a primary role in the operation of processes that support institutional controls through land and resource use permits, zoning, deed restrictions, easements, and other similar mechanisms (see Chapter 5).

Environmental Law Institute and Energy Communities Alliance Study
Recommendations for Improved Coordination with Local Governments

- DOE should work directly with local governments on long-term stewardship issues that affect them
- Local governments must be included in the decision-making process whenever they will be expected to carry out a role or responsibility in long-term stewardship
- DOE should continue to develop its national policy on long-term stewardship and should develop specific guidance for DOE field offices on how to implement this policy
- DOE, EPA, and the state regulators should integrate long-term stewardship into the cleanup decision-making process at all DOE sites, including investigating and analyzing the mechanisms for implementing long-term stewardship at the same time and to the same degree as engineering solutions to risk management
- DOE, EPA, and the state regulators should improve their knowledge and understanding of the local laws and other tools that will be used for long-term stewardship
- Before deciding to remediate a site to a level that would not allow unrestricted use, DOE should analyze the opportunity cost to the community of the restricted use compared to an unrestricted use
- DOE Operations or field offices should determine the specific information needs of their affected local governments and meet those needs with inforamtion in the form of maps, databases, or other formats most useful to the local government
- DOE should provide funding to local governments to pay for activities associated with long-term stewardship at DOE sites
- DOE should work with local governments to develop training in how to adapt their expertise to the new situations of contaminated property

Source: *The Role of Local Governments in Long-Term Stewardship at DOE Facilities*. Environmental Law Institute and Energy Communities Alliance, 2001. ELI Project #977206, ELI ISBN #1-58576-015-3, Document #D10.10.

As DOE moves forward with long-term stewardship, DOE needs to continue to build upon its existing partnerships with other federal agencies, Tribes, states, and local governments. All parties should share a common understanding of the nature of the residual hazards at DOE sites, the need for continued implementation of long-term stewardship activities, and the need for continued restrictions on land and resource use. These partnerships will need continuing open communication, information exchange, and coordinated planning to develop solutions. Coordinated planning is particularly important for land use controls, because state and local land use regulations are not applicable at federally owned sites (see Chapter 5).

Role of State Governments in Long-term Stewardship

The roles and responsibilities of state governments in implementing and overseeing long-term stewardship activities will vary depending upon the specific activities to be conducted, the legal authorities for such activities, and site characteristics. At many sites, the division of authority and responsibility among DOE, EPA and state regulatory agencies for remedy selection and implementation, including long-term stewardship, is specified in an Interagency Agreement.[1] For example, EPA and the Washington Department of Ecology oversee long-term stewardship activities associated with remedies for the Hanford Site under the terms of the Hanford Tri-Party Agreement.[2] Many states (referred to as "agreement states") regulate the handling and storage of radioactive material through state regulations pursuant to an agreement with NRC. States also may regulate long-term stewardship pursuant to state hazardous waste laws. States generally retain ownership of groundwater and surface waters, and many states retain authority for land use planning (and have delegated this authority to local governments). State governments are likely to be responsible for the enforcement of at least some institutional controls (e.g., deed restrictions). State governments may also need to establish their own long-term stewardship programs to address non-DOE sites. For example, states may need to establish programs for the long-term care of municipal landfills, and states currently are responsible for long-term surveillance and monitoring at Superfund "fund-lead' NPL sites (sites where the Superfund pays for remedial actions). State governments also may assume a more prominent role in managing long-term stewardship information and in promoting education and training to ensure the continuity of long-term stewardship across multiple generations. Such efforts could include developing educational curricula, providing funding support for museums and historical societies, and training local land use planners. The draft long-term stewardship plan for the Weldon Spring Site in Missouri[3] identifies the State of Missouri as an "oversight steward" for the site. The draft plan also identifies specific roles and responsibilities for the state government, including overseeing access agreements for long-term stewardship activities conducted by DOE on state-owned lands adjacent to the site and providing oversight of long-term stewardship activities required by state regulations as applicable. However, there is no final agreement between DOE and the State of Missouri concerning roles and responsibilities.

[1] *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents*. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. EPA 540-R-98-031, OSWER 9200.1-23P, July 1999.

[2] *Hanford Federal Facility Agreement and Consent Order*. U.S. Department of Energy, Richland Operations Office; Washington State Department of Ecology; U.S. Environmental Protection Agency, Region 10. EPA Docket Number: 1089-03-04-120, Ecology Docket Number: 89-54, May 15, 1989.

[3] *Stewardship Plan for the Weldon Spring Site, Revision A, April 1999*. Weldon Spring Site Remedial Action Project. DOE/OR/21548-771, April 1999.

Examples of Management Agreements between DOE and Other Federal Agencies

- *Argonne National Laboratory-East* – DOE is coordinating with state and local governments and the Department of Agriculture to manage the site deer herd.

- *Hanford Site* – The U.S. Fish and Wildlife Service has managed the Saddle Mountain National Wildlife Refuge (recently designated as the Hanford Reach National Monument) since 1971and the Fitzner/Eberhardt Arid Lands Ecology Reserve since 1987.

- *Idaho National Engineering and Environmental Laboratory (INEEL)* – The Bureau of Land Management is responsible for the administration of grazing permits and granting of utility rights of way on portions of the site. More than 300,000 acres are used for cattle and sheep grazing each year.

- *Savannah River Site* – The U.S. Forest Service has managed natural resources at the Savannah River Site since 1952, and responsibilities now include developing land management and ecosystem plans for wildlife and forest resource management, engineering support for soil erosion and watershed management, threatened and endangered species recovery and management, fire control, wetland restoration, and support for site-wide planning. Agricultural and timber land acquired for the site in 1952 was heavily degraded at the time, and the land has since been restored to provide both a sustainable crop of timber and enhanced habitat for endangered species.

- *Several sites* – DOE, in partnership with state and Tribal governments and other federal agencies, is creating land reserves from parts of DOE sites. For example, on June 24, 1999, DOE Secretary Richardson designated 10,000 acres of the Department's Savannah River Site as a biological and wildlife refuge, thereby creating the Crackerneck Wildlife Management Area. Similar preservation activities have been implemented at INEEL, Oak Ridge, Los Alamos National Laboratory, Lawrence Livermore National Laboratory, and Rocky Flats. State wildlife agencies or other federal agencies (e.g., the Bureau of Land Management) are responsible for management of areas to protect the unique habitat. DOE controls custody of the property and maintain responsibility for access controls.

Sources: Conference call with Chicago Operations Office, November 1, 1999; *Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (HCP EIS). DOE/EIS-02222-F, September 1999; *INEEL Comprehensive Facility and Land Use Plan*, 1997; *Http://www.srs.gov/general/srenviro/srfs/srfs.htm.* U. S. Forest Service, Savannah River Operations Office, April 6, 2000; *Land Reserves Created at Departmental Sites*, DOE This Month, August 1999.

4.2.4 Research & Development

The need for long-term stewardship reflects the costs and limitations of existing cleanup technologies. For example, the National Research Council noted that "although considerable effort has been invested in groundwater and soil cleanup, the technologies available for these cleanups are relatively rudimentary,"[31] and recently reaffirmed its support for greater investment in science and technology.[32] In addition, a recent audit report by the DOE Office of Inspector General found that:

[31] *Innovation in Ground Water and Soil Clean up: From Concept to Commercialization*. National Research Council, Washington, D.C. National Academy Press, 1997.

[32] *Natural Attenuation in Ground Water. Re-dedication and Research Needs in Subsurface Science*. National Research Council, Washington, D.C. National Academy Press, March 2000.

> "The Department's groundwater monitoring activities were not being conducted as economically as they could have been since some sites had not adopted innovative technologies and approaches to well installation, sampling operations, and laboratory analysis. This occurred in part because innovative groundwater monitoring techniques adopted by some sites had not been effectively disseminated, evaluated for applicability at other sites, and implemented."[33]

In response, the Secretary of Energy directed EH to be the lead office to improve the consistency and quality of ground water monitoring and reporting.[34]

The majority of the EM program's current science and technology development effort is focused on supporting near- and mid-term objectives, not long-term stewardship. Given the number of sites expected to need long-term stewardship by DOE, initial estimates suggest the annual cost of long-term stewardship will be approximately $65 million in FY 2006 (see Chapter 8). Environmental sampling and analysis is anticipated to be a significant long-term stewardship cost. For example, analysis of a single groundwater sample for volatile and semivolatile organic compounds and metals may cost $1,000 or more. Therefore, the Department invests in science and technology in order to improve the permanence of the cleanup remedies and reduce the monitoring and maintenance costs while maintaining or improving protection of human health and the environment.

Scope of Long-term Surveillance and Monitoring at DOE Sites

Current estimates indicate that approximately 548,000 acres of land currently are or eventually are expected to need long-term stewardship by DOE. DOE's long-term stewardship activities will include maintaining controls and/or monitoring for:

- Contaminated groundwater at 80 sites.
- Vaults, tank farms, and/or radioactive, hazardous, or sanitary landfills at 63 sites.
- Contaminated soils at 25 sites.
- Contaminated facilities at 13 sites.
- Contaminated surface water or sediment at nine sites.

DOE has initiated an effort to make investments in science and technology that may result in significant reductions in the risk, cost, and duration of long-term stewardship. In 2000, DOE identified the Idaho National Engineering and Environmental Laboratory (INEEL) as the lead laboratory for coordinating science and technology development related to long-term stewardship, but the Department expects significant participation from the other national laboratories, industry, and academic centers currently involved in EM science and technology development efforts. DOE is developing planning documentation for a long-term stewardship science and technology "roadmap" that will (1) identify new science and technology needs specific to long-term stewardship; (2) identify existing capabilities to meet these needs both within and external to DOE; (3) determine critical research and development priorities; and (4) direct specific efforts to meet these needs. A preliminary roadmap was developed in September, 2000; however, the Department intends to use an iterative process to identify and address science and technology needs as the scope of long-term stewardship becomes more certain.

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[33] *Groundwater Monitoring Activities at Department of Energy Facilities*. U.S. Department of Energy, Office of Inspector General, Office of Audit Services. DOE/IG-0461, February 2000.

[34] Memo: Departmental Position on the Office of Inspector General Report IG-0461, "Ground Water Monitoring Activities at Department of Energy Facilities." To: Phillip L. Holbrook, Deputy Inspector General for Audit Services.

Public Comments Providing Recommendations for Science and Technology Development (see Exhibit 2 in Appendix C)

- DOE should periodically re-evaluate remedies to reflect changes in health and environmental standards, technology, and performance of the remedy (20, 24)
- The goals should be to reduce the cost of long-term stewardship and to minimize or eliminate the need for continued long-term stewardship by eventually achieving cleanup to unrestricted use (6, 11, 13, 20, 23, 24, 30, 31, 32, 34, 45)
- DOE should look outside of DOE and the National Laboratories (e.g., other federal agencies, the private sector) for new science and technology (4, 23, 26)
- Other federal agencies, Tribes, state and local governments, and private entities will have stewardship responsibilities at other contaminated sites and should be advocates of and clients for new science and technology (4)
- DOE should clarify its schedule and products, which should include (1, 2, 4, 19, 24, 30, 31):
  - Improved water treatment technologies
  - Research on subsurface barriers (e.g., functional life, failure modes) to validate assumptions
  - Research on ecosystems, physical environment, and transport processes
  - Engineering and architecture
  - Information management technologies
  - Monitoring and sampling techniques
  - Engineered and institutional controls
  - Health effects
- DOE needs to complete the "roadmap" that establishes a baseline of science and technology needs and direct investments to meet the highest priority needs (19, 24)
- DOE should immediately provide a list of all current research and development efforts that pertain to long-term stewardship and describe what problem they address (24)
- DOE can build an R&D program before sites finish active remediation (24)
- Adequate funding mechanisms are needed for research and development (30)
- An active, long-term research program is essential (31)
- DOE should not be too reliant on its Focus Areas; it needs to develop a coherent research program, and then work with the Focus Areas to ensure it is carried out (26)
- DOE and other agencies involved in stewardship should invest more time and resources into studying the history of engineering and archeology (4)

Initial activities are focused on identifying current needs and capabilities, performing gap analyses, and developing an approach for meeting high priority needs. Because many science and technology investments that already have been made (e.g., more durable caps and covers, real-time monitoring equipment) can be deployed now to support long-term stewardship activities today, adapting available technologies to long-term stewardship is a high priority. Some long-term stewardship needs (e.g., information management) are not addressed within existing DOE research and development efforts. Over time, it will be necessary to continually re-assess science and technology needs as the longer-term EM projects begin to reach completion and additional information is collected at sites.

The EM program, and DOE itself, will not be the only source of new science and technology for long-term stewardship. The science and technology "roadmapping" effort noted above has explicitly assumed that other federal agencies, academia, and the private sector are potential sources that can be evaluated and integrated with ongoing and future DOE efforts. The initial roadmap assumes, for example, that the private sector will be the overwhelming source for new information technologies. As part of its science and technology development efforts, DOE needs to develop processes for informing external entities of long-term stewardship needs, identifying and evaluating potential new scientific

findings and technologies developed by external sources, determining when it is effective to implement new technologies, and determining how to integrate new scientific information into ongoing long-term stewardship strategies.

Science and Technology Investments for Long-term Stewardship

Two types of information will facilitate the understanding of long-term stewardship science and technology needs: (1) the end states to be achieved by EM projects; and (2) the resulting technical baselines for long-term stewardship, including the scope of activities, schedule, and cost estimates. Once the end states and baselines are known, it is then possible to identify opportunities for new science and technology to improve reliability and reduce costs. Based on current understanding, DOE has developed a preliminary list of science and technology opportunities:

- Information about durability of materials, and more durable materials - capping/barrier materials (e.g., clay, geotextile, plastic, rock), waste containers, and waste forms.
- Knowledge of fate and transport mechanisms and predictive capabilities.
- Monitoring and surveillance methods (e.g., methods of detection, analysis, remote sensing and data transmission).
- Information management - methods for identifying, recording, storing, archiving, and accessing relevant and necessary information for future site stewards and land/facility users.
- Support systems - renewable energy systems (e.g., geothermal heat pumps, solar photovoltaic systems) that can reduce the costs and improve the reliability of pump-and-treat and monitoring systems.
- Improved systems engineering and design to ensure that before new facilities are built and operated, decommissioning and waste disposition are considered carefully.

Although this preliminary list provides a starting point for science and technology development efforts, a reliable list awaits completion of more long-term stewardship baselines and plans. Many items on this list are already highly developed.

4.3 How will Long-term Stewardship be Managed at Sites with Ongoing Missions other than Cleanup?

DOE has organized its mission areas into the following categories: national security, science and technology, energy resources, and environmental quality. Some DOE sites have multiple ongoing missions, are being cleaned up by EM, and are performing long-term stewardship in portions of the site. DOE also has begun to promote private redevelopment at certain sites (e.g., Mound, Hanford, Oak Ridge). At sites where there will be continuing DOE missions other than cleanup, current plans call for the landlord PSO to be responsible for long-term stewardship after EM cleanup projects are complete (Exhibit 4-2).

Exhibit 4-2. Long-term Stewardship is Expected to Transfer to Site Landlords at 21 Sites

The Department has identified 21 sites where responsibilities for long-term stewardship is expected to transfer to a landlord PSO other than EM following completion of EM cleanup:

National Nuclear Security Administration Office of Defense Programs
- Kansas City Plant
- Los Alamos National Laboratory
- Lawrence Livermore National Laboratory – Main Site
- Lawrence Livermore National Laboratory – Site 300
- Nevada Test Site
- Pantex Plant
- Sandia National Laboratory – California
- Sandia National Laboratory – New Mexico
- Savannah River Site[1]
- Y-12 Plant (Oak Ridge Reservation)

Office of Nuclear Energy, Science, and Technology
- Argonne National Laboratory – West

Office of Science
- Ames Laboratory
- Argonne National Laboratory – East
- Brookhaven National Laboratory
- Fermi National Accelerator Laboratory
- Lawrence Berkeley National Laboratory
- Oak Ridge Institute for Science and Education
- Oak Ridge National Laboratory
- Princeton Plasma Physics Laboratory
- Pacific Northwest National Laboratory
- Stanford Linear Accelerator

[1]The EM Program is the current landlord at the Savannah River Site

Source: *Long-term Stewardship Transition to Site Landlord*. Memorandum from T.J. Glauthier, Deputy Secretary of Energy, to All Departmental Elements, December 15, 2000.

Chapter 5: Hazard Management

A key element of long-term stewardship will involve containing and preventing access to residual site hazards. Hazard management will involve the operation, maintenance, and periodic replacement of active and passive control mechanisms (e.g., treatment systems, access restrictions, warning signs) as well as contingency systems for addressing unexpected failures of control mechanisms or newly discovered environmental problems.[35] This chapter describes the types of active and passive controls that are used to manage residual hazards. This chapter also discusses how long-term stewardship is affected by current practices and presents alternatives for addressing uncertainty and contingency planning during long-term stewardship.

APPLICABLE SCOPING COMMENTS
(see Exhibit 2 in Appendix B)

- DOE should evaluate the reliability of institutional controls over extended periods of time, adopt redundant, overlapping functions to ensure efficacy of control measures, and recommend methods to prevent or minimize future failures (1, 4, 10)
- Every long-term stewardship plan should have an emergency response contingency plan to address potential failures of controls (7)
- The *Study* should address the relative roles of active vs. passive controls with guidance on determining the length of time of active controls (2, 8)
- Long-term stewardship should be expected to fail. DOE should plan for and consider the consequences of failure (18)

APPLICABLE ISSUES
(see Exhibit 3 in Appendix B)

2. Development of Site-specific Long-term Stewardship Plans
8. Institutional Controls
12. Risk Management
25. Minimize Risks/Hazards and Plan for Failures

5.1 Engineered and Institutional Controls

At sites where cleanup to levels appropriate for unrestricted use cannot be achieved, two general types of long-term controls are used to protect human health and the environment: engineered controls and institutional controls.[36] As noted in Chapter 3, these controls are established during the site cleanup process. Both types of controls are intended to block exposure pathways.

- ***Engineered controls*** include actions implemented to stabilize and/or physically contain or isolate waste, contamination, or other residual hazards. They include in-situ stabilization, caps on residual contamination, and vaults, repositories, or engineered landfills designed to isolate waste or materials.

[35] *RCRA Closure and Post-Closure Plans*, U.S. Department of Energy, Office of Environmental Guidance, RCRA Information Brief. DOE/EH -231-009/1291, December 1991; *Planning and Implementing RCRA/CERCLA Closure and Post-Closure Care When Wastes Remain Onsite*. U.S. Department of Energy, Office of Environmental Policy and Assistance, RCRA/CERCLA Information Brief. DOE/EH-413-9910, October 1999.

[36] Other terminology has been used to describe the types of controls involved in long-term stewardship. For example, EPA regulations (40 CFR Part 191) define the term "institutional controls" to broadly encompass all long-term stewardship activities, and divide activities into 'active' vs. 'passive' controls.

- ***Institutional controls*** are legal and other measures intended to affect human activities in such a way as to prevent receptors from reaching residual hazards. Institutional controls include land and resource management, deed restrictions, well-drilling prohibitions, building permits, hunting licenses or permits, physical measures such as markers, and facility security. For purposes of this *Study*, they may be divided into nine categories (Exhibit 5-1).

Exhibit 5-1. Categories of Institutional Controls

- *Easement* – A legal mechanism creating a limited interest in land belonging to another person (a positive easement), such as an easement granting access to conduct groundwater monitoring; or a limitation on the rights of the owner of the land (a negative easement), such as a prohibition on construction of housing.
- *Deed Notification* – A description in a property deed that conveys information about the property to future buyers (e.g., a notice that hazardous materials have been placed in a landfill on the property).
- *Deed Restriction* – A provision in a deed prohibiting certain uses of the property (e.g., a covenant that the property may never be used for housing). Certain deed restrictions may be enforceable through *reversion clauses*, which allow the former property owner (i.e., the federal government) to take back ownership of the property if terms of the deed restrictions are not followed.
- *Lease* – A document that outlines and restricts the conditions for temporary use of a property.
- *Covenant* – A promise by one landowner to another made in connection with a conveyance of property to use or refrain from using the property in a certain manner. Generally, covenants may be binding on subsequent landowners (i.e., "run with the land") if: (1) notice is given to the subsequent landowner; (2) there is a clear statement of intent to bind future owners; (3) the agreement "touches and concerns" the land; and (4) there is vertical and horizontal privity between the parties.
- *Permit* – A document that authorizes or prohibits certain land use activities (e.g., a building permit or a permit to withdraw groundwater) through approval by the appropriate federal, local, or state government entity.
- *Zoning* – Police power used by local governments to regulate or control the use of property by specifying zones or districts within which only specified uses or types of construction may occur as a means to implement a master plan.
- *Sign* – A marker that conveys messages regarding property and its use restrictions.
- *Fence* – A fixed structure used as a boundary or barrier to physical access.

For long-term stewardship to be successful, both engineered and institutional controls should remain effective until the residual hazards either have diminished to the point that unrestricted use is permitted or are no longer a concern to society. The National Contingency Plan under CERCLA, RCRA regulations, and NRC regulations all consider the use of institutional controls as a supplement to the use of engineered controls as appropriate for short- and long-term management to prevent or limit exposure to residual hazards.[37]

[37]CERCLA: 40 CFR Part 300.430 (a)(1)(iii)(D)6; RCRA: 61 FR 19448 (May 1, 1996); NRC: 10 CFR Part 20.1402.

Institutional Controls Terminology

Other terminology has been used to describe institutional controls for DOE sites. For example, EPA regulations (40 CFR 191) define the term "institutional controls" to encompass both of the following:

Active institutional control
- Controlling or cleaning up releases from a site;
- Performing maintenance operations or remedial actions at a site;
- Monitoring parameters related to disposal system performance; or
- Controlling access to a disposal site by any means other than passive institutional controls.

Passive institutional control
- Permanent markers placed at a disposal site;
- Government ownership and regulations regarding land or resource use;
- Public records and archives; or
- Other methods of preserving knowledge about the location, design, and contents of a disposal system.

5.2 Long-term Monitoring and Maintenance of Engineered Controls

Most engineered control systems will need inspection and periodic maintenance to ensure continued performance.[38] Engineered control systems, such as surface covers, subsurface barriers, and landfill caps and their components, have finite design lives. These systems are expected to fail at some point in time – although the effective design life of an engineered control can be extended with long-term inspection and routine maintenance[39] – and DOE sites are directed to develop a maintenance plan for DOE nuclear facilities, including all engineered controls.[40]

The effective design life of an engineered control, and the associated inspection and maintenance needs, depend upon the characteristics of the system, such as:

- A groundwater pumping system is designed to prevent migration of contaminated groundwater. It will need operation of groundwater pumps and possibly a groundwater treatment system. Such a system, involving powered equipment having moving parts and exposed to weather, will need frequent inspection and maintenance in order to guard against events such as power failure, clogging of system piping, blockage of wells, frost damage, corrosion, and other pump failure mechanisms. Active systems must be maintained on a regular basis to avoid risk of failure. Even with rigorous routine inspection and maintenance, powered equipment such as groundwater pumps are not expected to last for many years without requiring repair or replacement.

[38]For example, the UMTRCA disposal cell at Lakeview, OR has needed maintenance to correct potential erosion problems from animal activities adjacent to the cell. There also is some indication that the rock used in the disposal cell cover is deteriorating and may need to be replaced (letter from the State of Oregon to DOE, December 4, 2000 – Public comment letter no. 1).

[39]*Evaluation of Subsurface Engineered Barriers at Waste Sites*. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington D.C. EPA 542-R-98-005, August 1998, page 18.

[40]DOE Order 433.1 (0601/01), *Maintenance Management Program for DOE Nuclear Facilities*. Note that the Order does not explicitly require a "replacement plan" for property such as engineered controls, although such a need may be inferred.

- A subsurface engineered barrier is designed to prevent migration of subsurface contamination. It is a static system that does not need direct human intervention to function. However, a subsurface barrier system needs periodic monitoring to ensure that it continues to function as designed, and needs maintenance or replacement if and when its performance degrades. A recent study of 36 subsurface engineered barrier systems found few data available to assess their actual functional life and failure modes.[41] In contrast to active pumping systems, where groundwater monitoring data are typically collected quarterly or monthly to ensure that residual hazards are contained, essentially no post-construction monitoring is being performed on these systems to identify long-term environmental degradation mechanisms.[42] In addition, the industry baseline standard for subsurface barrier systems is that no post-construction monitoring is performed.[43]

- High Density Polyethylene (HDPE) is used in the construction of landfill liners and subsurface vertical barriers. The long-term durability of HDPE is not known, as the material has only been in use in liner and barrier system applications for several decades. HDPE is anticipated to have a design life in excess of 300 years based on available information, but the factors that may influence HDPE degradation are still being studied.[44]

- Surface covers for byproduct material and other radioactive waste (e.g., uranium mill tailings cell caps) are required by regulation to be designed to last for at least 200 to more than 1,000 years. Such performance requirements are unprecedented and there are no direct methods of predicting surface cover performance over such time frames. Potential surface cover failure mechanisms include human intrusion, water infiltration, frost penetration, erosion, and plant and animal intrusion.[45]

Long-term stewardship of uranium mill tailings surface covers, including surveillance and maintenance, is currently being conducted by DOE to assess, prevent, and mitigate effects of potential failures such as erosion and biological intrusion. Even assuming rigorous long-term surveillance and maintenance is conducted, performance of these surface covers over the time frames they are required can only be predicted, not demonstrated.

To address the uncertainties in surface cover performance over long periods of time, DOE Order 435.1, *Radioactive Waste Management*, directs DOE to develop a performance assessment (PA)

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[41] *Evaluation of Subsurface Engineered Barriers at Waste Sites,* U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington D.C., EPA 542-R-98-005, August 1998, page 78.

[42] *Ibid*, page 12.

[43] *Ibid*, page 55.

[44] *Subsurface Containment and Monitoring Systems: Barriers and Beyond - Overview Report*. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Technology Innovation Office, Washington D.C., March 1999, page 18.

[45] Waugh, W.J. et. al., 1995. Natural Analogs of the Long-term Performance of Engineered Covers. *Thirty-Third Hanford Symposium on Health and the Environment. In Situ Remediation: Scientific Basis for Current and Future Technologies, Part I*.; Waugh, W.J., and Richardson, G. N., 1995b. Ecology, Design, and Long-term Performance of Waste-Site Covers: Applications at a Uranium Mill Tailings Site. *National Academy of Sciences Workshop on Barriers for Long-term Isolation, Denver Colorado*, August 13, 1995.

and composite analysis (CA) for each low-level waste disposal facility.[46] The PA is an analysis of the expected future radiological exposure resulting from the waste disposed in the facility. The CA is a similar analysis that accounts for not only the radioactivity in the disposal facility, but all other sources of radioactivity at the site that could contribute to an overall exposure should a failure occur.

The distinction between operation and maintenance during cleanup and long-term stewardship is not clearly defined. Many activities that are considered part of an ongoing cleanup project could be classified as part of long-term stewardship (see Exhibit 5-2).

5.3 Long-term Maintenance of Institutional Controls

DOE and its predecessor agencies have been maintaining institutional controls over site hazards for decades. However, many institutional controls assumed continued federal ownership of the property in perpetuity. While government ownership and control is a central component of the legislation creating the Waste Isolation Pilot Plant (WIPP) repository[47] (i.e., the WIPP Land Withdrawal Act), DOE planning at some sites must now consider the possibility that the site will no longer have an ongoing mission other than long-term stewardship, and parcels of the site not needed as a part of a protective buffer zone may not need to remain federal property (see Chapter 4). In addition, DOE is now conducting cleanup and long-term stewardship at sites not owned or controlled by the Department. State, local, and Tribal governments already have a primary role in the maintenance of many institutional controls, and this role may grow if parcels of land are

[46] DOE Order 435.1, *Radioactive Waste Management*, July 9, 1999. Available at: *http//www.explorer.doe.gov:1776/htmls/currentdir.html.*

[47] The Waste Isolation Pilot Plant (WIPP) is the world's first underground repository licensed to safely and permanently dispose of transuranic radioactive waste left from the research and production of nuclear weapons. After more than 20 years of scientific study, public input, and activities to obtain regulatory approvals, WIPP began operations on March 26, 1999. Located in the remote Chihuahuan Desert of Southeastern New Mexico, project facilities include disposal rooms mined 2,150 feet underground in a 2,000-foot thick salt formation that has been stable for more than 200 million years. Transuranic waste is currently stored at 27 locations nationwide. Over the next 35 years, WIPP is expected to receive about 37,000 shipments. *Source*: *http://www.wipp.carlsbad.nm.us/*

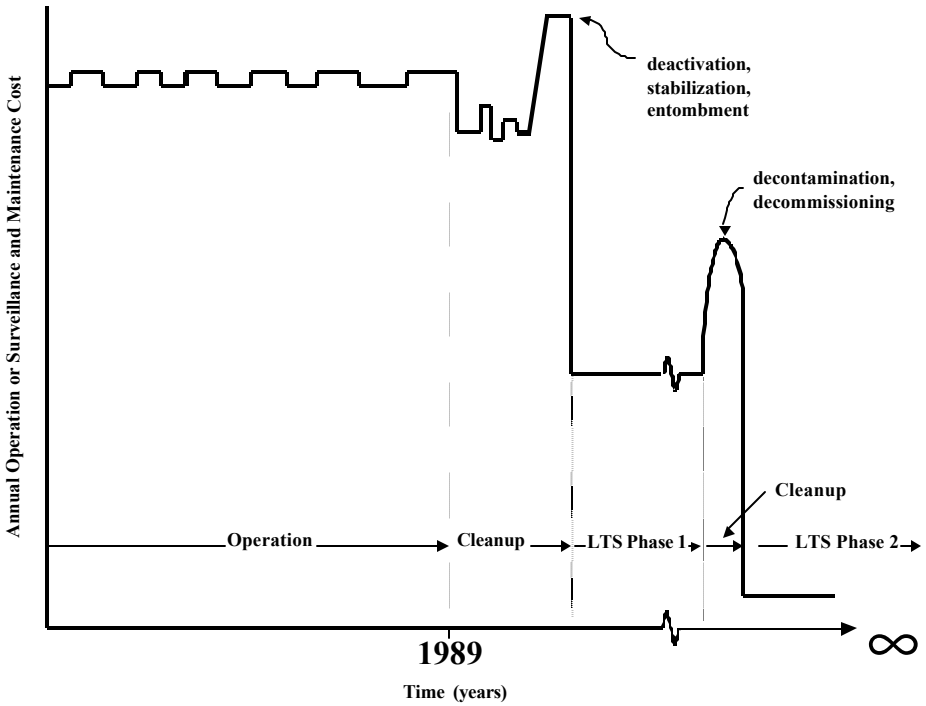
Affected Parties Are Critical Long-term Stewardship Partners

At most sites, the roles and responsibilities of local governments for implementing and overseeing long-term stewardship activities are not defined explicitly. Local governments already have a primary role in the maintenance of many institutional controls, including preserving easements, deed restrictions, and parcel maps; implementing groundwater use controls; and issuing zoning approvals and building permits. Local governments also have primary responsibility for land use planning and also maintain emergency response capabilities (e.g., fire, rescue). Where parcels of land have been transferred or leased to local governments (e.g., Hanford, Mound, Pinellas), local governments have assumed additional responsibilities such as ensuring that re-use of site facilities and infrastructure is consistent with restrictions necessary to protect human health and the environment. Local governments also may assume a more prominent role in managing long-term stewardship information and in promoting education and training to ensure the continuity of long-term stewardship across multiple generations. For example, the long-term stewardship plan for the Weldon Spring Site in Missouri[1] identifies the local government as an "oversight steward" for the site. The plan also identifies specific roles and responsibilities for the local government, including a primary role in permitting, zoning, and enforcing institutional controls such as easements. There is no final agreement between DOE and the State of Missouri concerning roles and responsibilities.

[1]*Weldon Spring Site, Stewardship Document for Operation and Maintenance*. Weldon Spring Site Remedial Action Project. DOE/OR/21548-771, August 2000.

Exhibit 5-2. When Does Long-term Stewardship Begin?

Long-term stewardship generally begins when active cleanup, stabilization, or disposal has been completed in accordance with an applicable regulatory requirement or management plan. In some cases, particularly at the large, complex sites, the cleanup plan addresses an entire geographic site; in other cases, long-term stewardship may occur at a portion of a site long before cleanup of the entire site is completed. For many sites and facilities, there also are two phases to performing long-term stewardship. In most cases, "terminal" long-term stewardship begins when cleanup of a site or portion of a site has been cleaned up to the agreed-upon end state. For some



facilities – particularly reactors and large processing canyons – an initial "interim" phase of long-term stewardship is needed after a facility has been stabilized, but where further remedial action or decontamination and decommissioning is not expected to occur for a significant period of time after the stabilization is completed. The above exhibit illustrates the relative timing of the two phases of long-term stewardship. The exhibit illustrates a hypothetical cost profile for a large facility that operated for several years, underwent initial deactivation and stabilization, and was entombed for several decades while a final disposition strategy was determined (e.g., original reactors and the PUREX Plant at Hanford). After several decades, the facility underwent final decontamination and decommissioning. The activities that occurred during the period of entombment could be defined as the interim phase (phase 1) of long-term stewardship. Once decontamination and decommissioning are complete, the facility would be considered in the terminal phase (phase 2) of long-term stewardship. The interim phase of long-term stewardship was identified specifically in the FY 2000 National Defense Authorization Act report language that requested the *Report to Congress on Long-term Stewardship*:

> *"The report shall ... identify the long-term stewardship responsibilities (for example, longer than 30 years) ... for ... portions of sites for which ... facility stabilization is expected to be completed by the end of calendar year 2006."*

transferred from federal control. Over time, a given parcel of land may cycle again and again between multiple missions and, if federal control is not maintained, may change ownership many times, creating additional challenges for the maintenance of institutional controls.

Public Comments Providing Recommendations Related to Institutional Controls (see Exhibit 2 in Appendix C)

- Layering and redundancy are critical and must include multiple oversight or enforcement mechanisms and cooperative relationships with state and local governments (4, 41, 46)
- The steward must be able to respond to both failures and long-term changes in values and site conditions; it is not clear that the steward should determine when action is warranted (4)
- DOE should request a written opinion from the state Attorney General to determine whether proposed institutional controls are legally enforceable against subsequent landowners (16, 19)
- DOE should be required to monitor and enforce compliance with institutional controls; this may require an ongoing presence at the site (6, 11, 29, 32, 34, 45)
- DOE needs to intensively review the maintenance and effectiveness of engineered and institutional controls (3, 22, 43, 44)
- DOE should compensate local governments for protective equipment, emergency preparedness, and record-keeping (15)
- DOE needs to establish a comprehensive and consistent approach to long-term monitoring, including (1) developing a risk-based process for identifying needs; (2) selecting the right systems for each site; (3) establishing a research and development program to fill gaps; (4) developing a monitoring tracking program; and (5) establishing a web-based system for public access to monitoring data (26)
- It is not clear that DOE should be the primary enforcer of institutional controls on transferred properties (4)
- DOE appears to have changed the EPA regulatory terms – "active" controls are now "engineered," and only "passive" controls retain the "institutional" label (49)
- The *Study* should recognize that states will be among the primary enforcers of institutional controls (16, 19)
- The *Study* should recognize that deed restrictions are applicable to federal lands because proprietary controls may be necessary to ensure that institutional controls are enforceable against private entities granted easements on federal lands (16)
- The historic use of institutional controls has been problematic. DOE, states, tribes, and stakeholders will need to develop new tools to ensure controls remain effective (50)
- Engineering controls and their maintenance will be more important than institutional controls at DOE sites (3, 22)

Both DOE and EPA Regions have developed guidance on the selection and enforcement of institutional controls when residual hazards remain onsite.[48] DOE also has enforced easements and other restrictions in the course of mission-related activities. For example, Oak Ridge Operations Office transferred land to a local community with deed restrictions that included a prohibition on the use of groundwater because DOE did not know whether a contaminant plume might eventually migrate to the area. DOE did not conduct regular monitoring to ensure the deed restriction was being enforced and accidentally discovered that the community later drilled groundwater wells to irrigate a golf course. DOE met with the community, mandated immediate removal of the wells, and threatened to revert the

[48] *RCRA Closure and Post-Closure Plans*, U.S. Department of Energy, Office of Environmental Guidance, RCRA Information Brief. DOE/E -231-009/1291, December 1991. *Planning and Implementing RCRA/CERCLA Closure and Post-Closure Care When Wastes Remain Onsite*. U.S. Department of Energy, Office of Environmental Policy and Assistance, RCRA/CERCLA Information Brief. DOE/EH-413-9910, October 1999. *Use of Institutional Controls in the RCRA Corrective Action Program*, U.S. Environmental Protection Agency, Region 5, March 2000.

land to DOE; the community complied.[49] Other sites have obtained easements for access to off-site property to conduct monitoring activities or to build and maintain utility rights of way or infrastructure. DOE also has experience maintaining institutional controls after real property transfer (see Chapter 6).

Institutional controls can be used individually or in combination (referred to as "layering"), depending on the legal status of the property and the nature and extent of residual hazards on the property. EPA and other federal agencies managing sites containing residual hazards have recommended the layering of multiple institutional control mechanisms to increase protectiveness.[50] All types of institutional controls may be used on any DOE property; however zoning is only relevant for sites where the federal government (e.g., DOE) will *not* retain ownership of the land (such as when land is transferred to non-federal entities pursuant to CERCLA §120(h)).[51] Deed restrictions and similar proprietary controls may be necessary on sites where DOE retains ownership. Federal agencies may grant easements to private parties over land that remains in federal ownership; therefore proprietary institutional controls may be necessary to ensure that the controls will be binding on the holder of any such easement. Under some circumstances, it may be important to consider the use of institutional controls for off-site areas adjacent to DOE sites (e.g., as buffer zones for residual hazards onsite).

"Layering" of Institutional Controls at Department of Defense Sites

The U.S. Air Force and EPA have agreed to use layering of notices, deed restrictions, permit approvals, and access rights to limit subsurface use at former Minuteman Missile Silo sites in North Dakota, South Dakota, Missouri, and Minnesota. The concrete silos were dismantled by imploding the structures and capturing contamination within the concrete structures. Each structure was capped with three feet of soil and a plastic liner, and the landscape was contoured with an additional seven feet above the buried structure. The silo site properties may be transferred to non-federal entities under CERCLA §120(h). The agreement calls for the General Services Administration (GSA) to be involved in any property disposal and for GSA to notify federal and state regulators when the property is transferred. GSA is also to provide prior notice of and obtain approval of federal and state regulators for any construction or other activity on the sites that would affect buried structures or groundwater monitoring wells. GSA also is required to place restrictions in the deed of conveyance to prohibit future property owners from installing water wells or otherwise penetrating the surface of the site to a depth of more than two feet. Both the U.S. Air Force and federal and state regulators retain rights of access to the sites under any transfer agreement.

Source: *Institutional Controls: What They Are and How They Are Used*. U.S. Department of Defense, Office of the Deputy Under Secretary of Defense, Environmental Security, Base Realignment and Closure (BRAC) Environmental Program Fact Sheet. Spring, 1997.

The temporary failure of institutional controls at Oak Ridge noted above suggests that enforcement of institutional controls for the extended periods of time involved in long-term stewardship will need new

[49] *DOE Long-term Stewardship -- Real Estate Issues*, U.S. Department of Energy, Office of Environmental Management, Office of Long Term Stewardship, January 10, 2000.

[50] *A Guide to Establishing Institutional Controls at Closing Military Installations*, U.S. Department of Defense, February 1998.

[51] A land transfer from the federal government to a non-federal entity is necessary to create the deed restriction in the first place, because transfers within the federal government would not result in the creation of a deed. Local governments cannot enforce zoning restrictions on the federal government.

oversight systems, especially procedures for monitoring compliance with institutional controls after land transfers have occurred. If such a failure can occur at an active site, where affected parties are exceptionally knowledgeable about site hazards, EM program activities, and long-term stewardship issues, it is reasonable to anticipate similar failures at other sites if monitoring and oversight are not maintained. DOE has in place formal procedures and directives that establish programmatic responsibilities to enforce institutional controls, and the Office of Long Term Stewardship will work with other programs to develop and implement "layering" strategies and contingency plans to address potential or actual failures.

The long-term effectiveness of institutional controls is a much-debated topic, although there is little historical precedent or empirical information upon which judgments can be based. Consistent enforcement of easements and other deed restrictions by the owner that originated the restrictions appears to be essential.[52] Some studies have estimated the probability of human intrusion into waste disposal cells under different scenarios.[53] There are inherent obstacles to the long-term effectiveness of every common type of institutional control (Exhibit 5-3). Over time, the sustainability of institutional controls may be affected by changes in real property law, which already varies from state to state, socioeconomic developments affecting land use, and the potential information loss that could accompany multiple changes in land ownership. DOE may need to expand its focus beyond enforcing land use restrictions and other institutional controls within site boundaries. Where property transfers or leases have occurred, it may be necessary for DOE to actively monitor compliance with existing institutional controls and take steps to enforce, extend, or replace them when necessary. This may need new procedures, funding, and authority. For transfers within the federal government, DOE may need to enter into specific agreements with the receiving agency to ensure continued enforcement of institutional controls.

Public Comments Concerning Public Health
(see Exhibit 2 in Appendix C)

- The primary purpose of long-term stewardship is to provide maximum, long-term protection of public health and the environment (5, 25, 32, 35, 47)
- Long-term stewardship activities at each site should include distribution of health information to the public and a health monitoring plan (5, 6, 11, 32, 34, 45)
- DOE-EH should work with other federal, state Tribal and local health agencies to develop health monitoring plans (5)
- Health information should include possible disease outcomes and should be targeted at physicians and public health providers (5, 6, 11, 32, 34, 45)
- When failures of long-term stewardship lead to disease, the federal government should provide adequate care and compensation (5)
- The Study should include damage estimates from tritiated groundwater (31)

It is likely that entities other than DOE will have significant roles in monitoring and enforcing institutional controls. Institutional controls are likely to be imposed in cleanup decisions reached

[52]English, M., Feldman, D, Inerfeld, R. and Lumley, J, "Institutional Controls at Superfund Sites: A Preliminary Assessment of Their Efficacy and Public Acceptability." July 1997. This report summarizes much of the recent research on institutional controls. The Environmental Law Institute is conducting extensive case studies on the topic at numerous sites, including DOE sites.

[53]Black, P., et al. A Common-Sense Probabilistic Approach to Assessing Inadvertent Human Intrusion into Low-level Radioactive Waste at the Nevada Test Site. *Paper presented at Waste Management 2000*, Tucson AZ.

among DOE and federal and state regulators. The ability of DOE (or the state) to enforce the same institutional control against subsequent property owners may vary from state to state. Consultation with the appropriate state authorities prior to establishing an institutional control will be useful in determining whether such a control is, in fact, enforceable in that state.

Exhibit 5-3. Possible Obstacles to the Long-term Effectiveness of Common Institutional Controls

Deed Notices	• Over time, deed records may be destroyed, lost, or corrupted • New property owners may not search the deed records adequately or may miss the deed notice • New owners who receive property by gift or inheritance may not review the deed records • Transfers of land among federal agencies may not generate deeds on which to place notices • New deeds that do not include the restriction may be created legally after certain transfers • Some states have enacted statutes that extinguish deed notices if the deed is not re-recorded after a certain period of time
Deed Restrictions	• Enforceability of deed restrictions is being eroded by changes in state laws • Deed restrictions frequently cannot be enforced by anyone except landowners who share a chain of title with the restricted parcel • Deed restrictions frequently cannot be enforced against anyone who does not have legal notice of the restriction
Negative Easements	• Prohibitions on the use of property, such as negative easements for lesser requirements, are disfavored and may be overturned by courts or legislatures • State laws allowing negative easements for conservation or historic preservation need to be broadly interpreted to cover long-term stewardship needs • DOE, as the transferor of real property covered by an easement, would be the only party that could enforce the easement; enforcement could not be transferred or delegated to a Tribal, state, local, or private party
Zoning	• Local zoning ordinances are probably not enforceable against federal agencies if the agency asserts sovereign immunity • State law creating local zoning authority may change over time • Local zoning ordinances may be amended or repealed • Local governments may not enforce zoning restrictions
Source: Applegate, J.S., and Dycus, S. Institutional Controls or Emperor's Clothes? Long-term Stewardship of the Nuclear Weapons Complex. *Environmental Law Reporter*, November 1998; Pendergas, J., Use of Institutional Controls as Part of a Superfund Remedy: Lessons from Other Programs. *Environmental Law Reporter*, March 1996.	

Although DOE and other federal agencies take steps to ensure that institutional controls will not be *inadvertently* breached, it is not possible to fully protect against *intentional* breaching. An example from the Bureau of Land Management (BLM) illustrates the serious consequences that may result from intentional breaching of institutional controls. BLM implements institutional controls such as warning signs, fences and steel gratings to protect people from risks associated with abandoned mine sites under its jurisdiction, but these institutional controls are sometimes intentionally breached. BLM reported in a recent internal agency advisory that two men in Virginia City, Nevada breached a fence in order to explore a closed mine. The men were later discovered within 75 feet of the mine entrance, asphyxiated as a result of carbon dioxide poisoning.[54]

[54]U.S. Department of Interior, Bureau of Land Management, BLM Internal Advisory, Nevada *http://www.blm.gov/narsc/aml/hazards2.htm#top*

A report by the International City/County Management Association, based on a survey of state and local government officials, points out the importance of working closely with local governments and the need to increase their level of expertise with respect to institutional controls. The study concludes that nearly 75 percent of local government respondents presently do not have experience implementing institutional controls at former hazardous waste sites (probably the closest analog to DOE sites released for restricted use). The respondents reported minimal efforts to enforce controls and reliance on institutional memory, citizen complaints, and informal inspections as triggers for the majority of enforcement efforts. The study also notes that over 60 percent of respondents believed that it was "likely" or "highly likely" that institutional controls could be breached without the knowledge of the implementing local government.[55] According to a recent case study, if the public perceives a substantial residual risk, there is increased public acceptance of institutional controls and greater public cooperation in implementing the controls.[56] These studies emphasize the importance of continuing to maintain and enhance partnerships between DOE and local communities to maintain the continued effectiveness of institutional controls.

Consequences of Lapses in Stewardship

A number of commenters on the draft study addressed issues pertaining to the potential for lapses in stewardship. The proper maintenance of stewardship functions and systems is important wherever contamination remains in place, but, it is recognized that the potential consequences from such lapses vary considerably between different sites and facilities. Furthermore, the consequences and likelihood of lapses depend on factors such as the residual concentrations of hazardous and radiological constituents, the physical and administrative barriers put in place, the form of the material and site-specific factors like weather, natural resources, geology, and regional demographics. Historically, stewardship measures have been successfully employed in a graded manner commensurate with the risks posed by the site and the likelihood of intrusion. Conservation of the factors that an affect the magnitude of risk and potential lapses in institutional or engineered controls is an essential element of stewardship decision-making. Given the wide variation in site-specific factors found across the DOE complex, not every site will have or require the same level or type of institutional or engineered controls, and, as a result, the resources needed to implement appropriate stewardship measures to maintain protection and avert lapses in control will vary accordingly.

Given the uncertainty associated with the long-term effectiveness of institutional controls, DOE may need to investigate new approaches for ensuring the protectiveness and effectiveness of institutional controls. This research would be in addition to existing efforts to develop new science and technology to increase the protectiveness and effectiveness of engineered controls.

5.4 Identifying Uncertainty and Contingency Planning

DOE currently considers the long-term implications of each proposed remedy during the remedy selection process and has developed guidance on the use of conceptual site models and uncertainty

[55]Gaspar, C. and VanBurik, D., *Local Government Use of Institutional Controls at Contaminated Sites*. International City/County Management Association, April 1998. Of particular interest is the fact that although the respondents reported that traditional zoning (56%) and groundwater restrictions (26%), both of which are generally implemented by local governments, were the most common controls, they also reported low levels of enforcement and high likelihood the controls would be breached.

[56]*Institutional Controls Case Study: Grand Junction*. Environmental Law Institute, Research Report, 1999.

management matrices to assist with contingency planning during cleanup.[57] However, uncertainties exist for long-term performance of cleanup remedies, and it is not possible to fully understand their long-term viability or reliability.[58] Engineered and institutional controls are selected and implemented based on an understanding of current site conditions.[59] However, site conditions, as well as changes in social and economic values, regulatory standards, etc., may differ from those assumed or may change with time. Major deviation from expected site conditions could result in unacceptable risks to human health and the environment. Therefore, DOE needs to develop the capability to identify, plan for, and respond to potential changes in site conditions and possible failures of engineered or institutional controls. DOE needs a dual capability to (a) identify and rapidly respond to actual or threatened failures of controls, and (b) monitor and respond to more gradual changes in regulations, site conditions, values, etc. to ensure the continued protectiveness of remedies. Many of these issues have been addressed in the development of regulations governing radioactive waste disposal. These examples should be considered for application to cleanup activities.

5.4.1 Contingency Planning and Emergency Response During Long-term Stewardship

Monitoring during long-term stewardship may identify conditions that indicate deterioration of the performance of the remedy or changes in site conditions that need corrective measures. Ideally, the long-term monitoring plan for a site should be designed to identify changing conditions at an early stage, before the protectiveness of the remedy is compromised. The monitoring plan should also include contingency plans to respond to the changes in conditions in order to maintain protectiveness. However, site stewards also need to recognize the need for emergency response when necessary. Emergency response activities may involve fire and rescue responses, responding to spills and other chemical or radionuclide releases, or responding to natural disasters such as earthquakes or tornados. Emergencies may directly involve residual hazards onsite (e.g., discovery of new contamination) or may involve such hazards indirectly (e.g., a fire may sweep across onsite areas containing radioactive or chemical hazards).

Many affected parties maintain emergency response capabilities; therefore, site stewards should coordinate emergency response training and contingency planning with appropriate state, local, and Tribal governments. It will be important to identify clear roles and responsibilities for specific responses (e.g., what actions are needed, who does each action) and to conduct joint exercises to practice responses. Such coordination also should include coordinated special training for emergency response personnel to ensure they have the knowledge to respond to anticipated emergencies as well as avoid unnecessary risks from potential exposure to residual hazards. Emergency preparedness personnel also

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[57] *Assessment of Short-term and Long-term Risks for Remedy Selection*. U.S. Department of Energy, Office of Environmental Policy and Assistance, CERCLA Information Brief. DOE/EH-413/9708, August 1997; *Uncertainty Management: Expediting Cleanup Through Contingency Planning* U.S. Department of Energy, Office of Environmental Management and Office of Environment, Safety and Health, U.S. Environmental Protection Agency, DOE/EH/(CERCLA)-002, February 1997; *Planning and Implementing RCRA/CERCLA Closure and Post-Closure Care When Wastes Remain Onsite*. U.S. Department of Energy, Office of Environmental Policy and Assistance, RCRA/CERCLA Information Brief. DOE/EH-413-9910, October 1999.

[58] *Standards for Remedial Actions at Inactive Uranium Processing Sites*. 48 FR 590, 597, January 5, 1983.

[59] *Development of Remediation Goals under CERCLA*, U.S. Department of Energy, Office of Environmental Policy and Assistance, CERCLA Information Brief. DOE/EH-413/9711, August 1997.

will need appropriate up-to-date information about residual site hazards (e.g., fire fighters responding to a brush fire onsite would need to know the location(s) of residual site hazards and what types of personal protective equipment is necessary).

DOE Orders, CERCLA, and RCRA require DOE to respond to actual or threatened releases of hazardous substances that present an imminent and substantial threat to human health or the environment,[60] even for sites where remediation has been completed. Although monitoring the performance of remedies will be an important element of long-term stewardship, unexpected deviations or failures can be expected to occur. For example, engineered controls may fail to contain contaminants or waste, or unknown sources of contamination may be discovered. Therefore, DOE needs to retain the capability to detect and respond to unexpected conditions, preferably before a release occurs.

5.4.2 Monitoring and Responding to Uncertainties During Long-term Stewardship

Environmental remediation is a relatively new field. There is little information on remedy performance over a 30-50 year time frame, and no information on remedy performance over very long periods of time (e.g., centuries). There also are no examples of past environmental remediation projects to provide a basis for evaluating uncertainties over very long periods of time (e.g., how land use changes have impacted remedies over the last two hundred years, or how accurate life-cycle cost estimating methodologies are). Hence, protectiveness may not be borne out over even moderate periods of time without continued monitoring of site conditions and remedy performance. An integral part of long-term stewardship activities, whether performed by DOE or other entities, is the need to improve knowledge and understanding related to:

- **The reliability, long-term effectiveness, and permanence of remedial actions**. One reason that monitoring is needed is to ensure that implemented remedies are functioning as intended.

- **Natural processes and their interactions with hazards and remedies**. The natural processes at a site, and therefore geochemical interactions with residual hazards, may change over time. For example, climate changes can affect the performance of surface covers and other engineered structures. The understanding of these processes is not complete at this, as demonstrated by the recent affirmation by the National Academy of Sciences of the benefits of better science and technology with respect to natural attenuation processes.[61]

- **Exact extent and level of contamination**. The understanding of the extent and level of contamination is based on sampling and monitoring. Sampling presents an approximation of site characteristics. More sampling or continuous monitoring may provide better estimates of site characteristics over time. However, economic factors often limit the amount of sampling that can be conducted, and even unlimited sampling does not eliminate all uncertainties.

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[60] 42 U.S.C. §6973(a), RCRA §7000(a).

[61] *Natural Attenuation in Ground Water. Re-dedication and Research Needs in Subsurface Science*. National Research Council, Washington, D.C. National Academy Press, March 2000.

- **Land use**. Many remedial approaches rely upon restricted land use to ensure protection of human health and the environment. While it is feasible for decisionmakers to assume a particular land use in the near future, the long-term effectiveness of land use restrictions is uncertain (see above).

If adapted to long-term stewardship, two of DOE's existing tools for managing uncertainty during environmental cleanups – conceptual site models and uncertainty management matrices – could provide critical information needed for successful contingency planning.

- **Using Conceptual Site Models During Long-term Stewardship**. Conceptual Site Models (CSMs) are used during cleanup actions to depict the relationship among existing hazards, environmental transport mechanisms, exposure pathways, and ultimate human and ecological receptors.[62] CSMs can also be used to distinguish between known and unknown site conditions (e.g., the existence of fractured bedrock or preferential pathways for groundwater flow). While CSMs have traditionally been used for individual Operable Units or Areas of Concern, it may be possible to develop a long-term stewardship CSM for broader areas of a site (encompassing multiple Operable Units or Areas of Concern). A long-term stewardship CSM, however, may be difficult to develop or impractical to apply at large, complex sites. Functional equivalents could include management plans specific to particular biological resources or area management plans.

  Long-term stewardship CSMs could be used to illustrate the characteristics of a site and its residual hazards, how hazards have been contained, how exposure pathways have been blocked, and the uncertainties that may affect the performance of engineered and institutional controls. Where significant uncertainties exist, a CSM could identify the range of scenarios that are probable or otherwise indicate the importance of the uncertainties. The resulting model could serve as the basis for evaluating the likelihood and consequences of events such as barrier failures, identifying how stewards can plan to mitigate these events, and predicting the ability of future generations to ensure protectiveness based on improved technology and increased understanding of science. A CSM also could serve as a tool for communicating with local governments and stakeholders. An example of a long-term stewardship conceptual site model is presented in Appendix G. The Department also has considerable experience in modeling associated with the performance assessment and composite analysis process required pursuant to DOE Order 435.1. These may be useful tools to help address these cleanup issues.

- **Developing Uncertainty Matrices to Communicate Uncertain Conditions**. Uncertainty matrices can be used to describe the expected condition and performance of an engineered or institutional control, the likelihood of potential failures, expected impacts, monitoring strategies to prevent or detect failures, and contingency plans to mitigate failures. Uncertainty matrices also can be used to evaluate the relative need for "layering" of controls. Greater "layering" (e.g., multiple engineered and institutional controls, more frequent monitoring and reporting) will be needed if there are many uncertainties, uncertainty is very large, and/or the consequences of potential failures are very high. Appendix H presents an example of an uncertainty matrix.

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[62]For Example, DOE's Office of Environment, Safety, and Health has developed the Site Conceptual Exposure Model (SCEM) Builder, a computer graphics tool that generates SCEMs. The SCEM Builder and User Manual can be downloaded from: *http://www.tis.eh.doe.gov/oepa/programs/scem.cfm*.

Long-term Stewardship at Maralinga, Australia

The British government, with the agreement and support of Australia, carried out nuclear tests between 1952 and 1963 at three sites in Australia. Maralinga in South Australia was the most used site, and hosted two major and several hundred minor trials, as well as various assessment tests and experimental programs. The trial resulted in the dispersal of roughly 24 kilograms of Plutonium-239 in the area of Maralinga. The site was officially closed in 1967 following the cleanup effort termed *Operation Brumby*.

Maralinga was Tjarutga Aboriginal land prior to the testing. The Tjarutga were displaced in 1953, and were allowed to return to their land in 1984. Between 1984 and 1996, the Australian Radiation Protection and Nuclear Safety Agency assessed the extent, quantities, and physical characteristics of plutonium that remains and conducted dose assessment studies. In cooperation with the Tjarutga, the Agency agreed to remove surface soil from the most contaminated areas and to restrict the use of another 120 square kilometers of land to transitory activities such as hunting and travel. Planned institutional controls include:

- A buffer zone surrounding the contaminated land.
- Removal of regular travel tracks and paths through the contaminated area.
- Construction of alternative tracks and paths outside the contaminated area and buffer zone.
- Installation of boundary markers and signs.
- Construction of a fence around the perimeter of the contaminated area and buffer zone.

Sources: Australian Radiation Protection and Nuclear Safety Agency website (*http://www.arpansa.gov.au/er_mrp.htm*); Australian Department of Primary Industries and Energy internet website (*http://webserver.dpie.gov.au*)

Chapter 6: Managing Real Property

DOE conducts cleanup of real property (land and facilities) owned by the federal government, states, and private parties. DOE real property – primarily land – is a key focus of long-term stewardship. It will be difficult if not impossible to ensure long-term protection of human health and the environment without the ability to maintain appropriate controls on the use of real property. Real property includes land and structures on the land such as buildings, mission-related infrastructure, waste disposal facilities, and other waste management units. Long-term stewardship must also address issues associated with groundwater, surface water, natural resources, and cultural resources. However, rights to water and mineral resources may be managed differently than surface property rights. At Rocky Flats, for example, DOE owns the land but only a small part of the mineral rights beneath the land.

DOE currently has an inventory of about 2.4 million acres of land. Much of this property once supported weapons production and energy research activities or was used as buffer zones, and DOE retains ownership or control of nearly 90 percent of the land acquired for these missions since 1942. This chapter describes how DOE currently plans the development and use of the real property it controls; how land and other real property is managed, how property is transferred out of DOE, and how DOE may maintain certain control over property for long-term stewardship purposes after the property has been transferred. This chapter also describes some of the challenges associated with integrating long-term stewardship concerns into current planning practices and presents alternatives for addressing these challenges. Appendix I provides a more detailed discussion of the technical and legal aspects of real property management and transfer.

APPLICABLE SCOPING COMMENTS
(see Exhibit 2 in Appendix B)

- Long-term stewardship commitments associated with proposed new missions and new facilities should be identified in approval decision documents for the facility (15, STGWG)
- When starting new projects, DOE should be required to provide a technical and financial plan to clean up and maintain any resulting waste (18)
- DOE should retain ownership and control of lands for which institutional controls are necessary unless adequate legal mechanisms and institutions exist to enforce such controls against future landowners (STGWG)
- DOE needs to make distinctions between parts of sites that are very contaminated and parts of sites that are clean (18)
- DOE should explicitly show how liability will be transferred in the event of the failure of a subsequent landholder to perform long-term stewardship adequately (e.g., bankruptcy) (16)
- The *Study* should discuss the approaches to long-term stewardship and land use control used by other federal agencies and other nations (2)
- DOE should ensure effectiveness of mechanisms for restricting future land use (10)
- The *Study* should carefully review, document, and provide recommendations on the transfer of cleanup and long-term stewardship liability for properties that are sold into the private sector or to other governmental agencies (16)

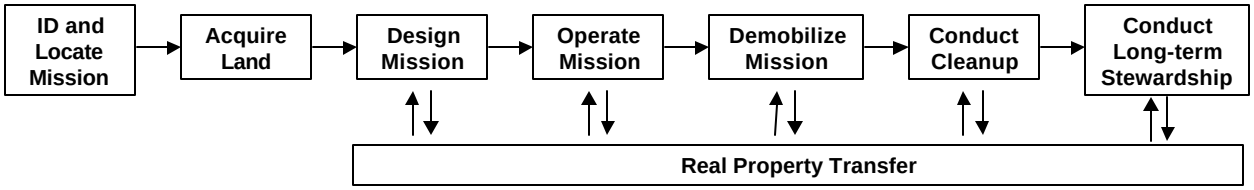
APPLICABLE ISSUES
(see Exhibit 3 in Appendix B)

6. Relationship of Facility Development Planning to Long-term Stewardship Needs
10. Property Transfer Policies and Procedures

6.1 Planning

The life-cycle of DOE mission activities at a site may include up to seven stages (Exhibit 6-1). Each of the initial stages of the mission life-cycle, and several of the later stages, are covered by planning processes that are mandated by a variety of laws, regulations, and internal DOE directives. Different authorities, including statutes and internal DOE directives, create land use planning needs.[63] Statutes establishing the requirements for cleanup, particularly CERCLA and RCRA, also can play a prominent role in planning at different points in the life-cycle of DOE activities at a site.[64] In principle, reviews under the NEPA process and DOE Orders such as DOE Order 430.1A, *Life Cycle Asset Management* (LCAM), cover the entire mission life-cycle. In practice, it has been difficult to cover the entire life-cycle within a single planning activity such as preparation of an Environmental Impact Statement (see Exhibit 6-2).

Exhibit 6-1. Life-Cycle of DOE Activities at a Site

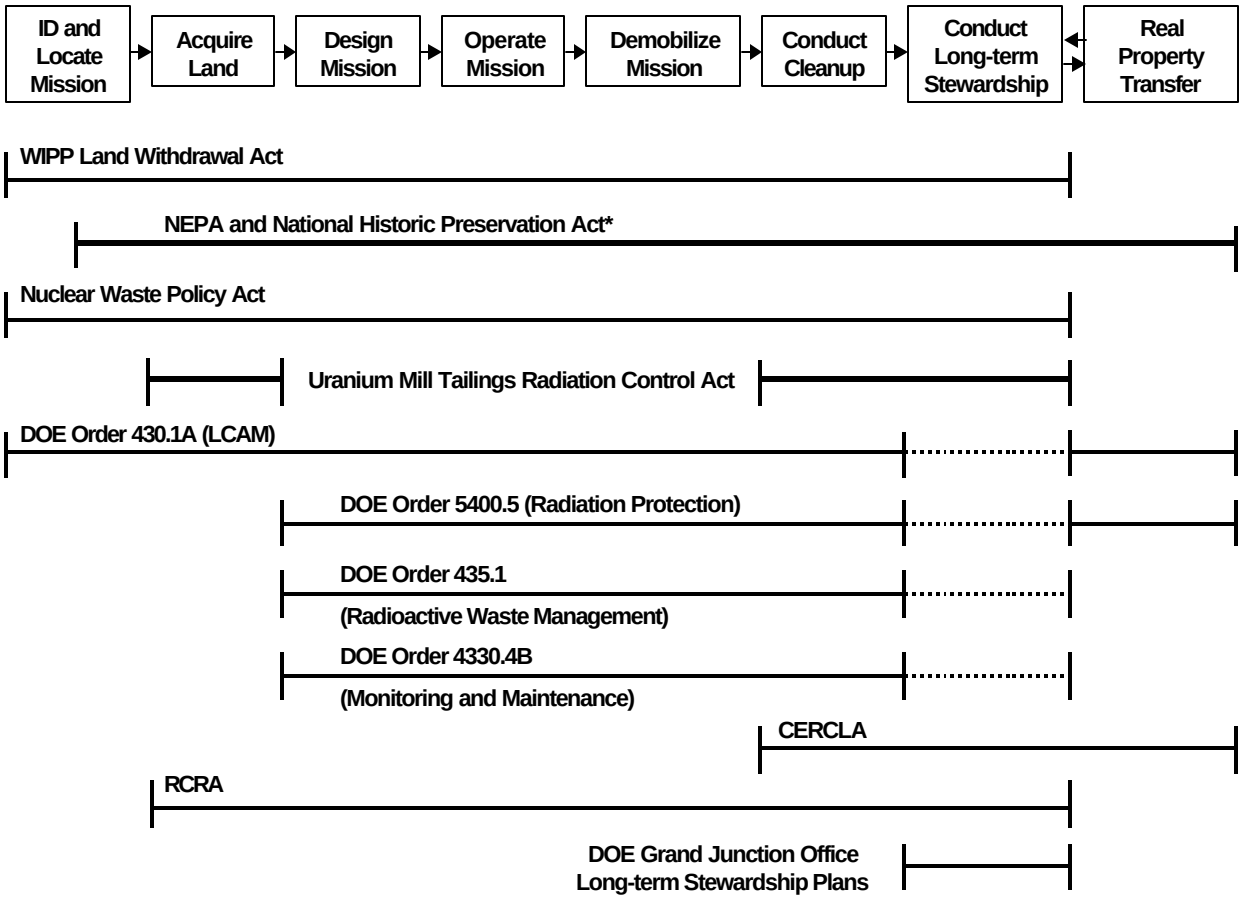


The mission life-cycle begins when DOE identifies and selects a site for the mission. DOE then must acquire the land, with appropriate buffer areas for safety and security, to support the mission. In the mission design stage, DOE must design and build the facilities, infrastructure, and other assets needed to support the mission. During operation, DOE performs the mission in accordance with applicable laws and regulations. After operation, DOE demobilizes the mission. During and after operation, DOE completes needed decontamination and decommissioning, waste management, environmental restoration, and material disposition. In some cases, site missions other than long-term stewardship also continue beyond cleanup. When cleanup is complete, DOE conducts appropriate long-term stewardship. If the property is no longer needed for a DOE mission or for buffer zones to protect public health and safety and the environment, DOE may transfer it to other federal or non-federal entities if DOE environmental; health, safety, and security; and other requirements are met.

[63]For example, the National Defense Authorization Act for Fiscal Year 1997 requires the Secretary of Energy to create future land use plans for the Hanford Site, INEEL, the Rocky Flats Site, and the Savannah River Site.

[64]Four federal statutes enact special planning activities for three particular categories of DOE sites. The Waste Isolation Pilot Plant (WIPP) Land Withdrawal Amendment Act (Public Law 104-201, as amended) places specific planning requirements on DOE for WIPP. UMTRCA addresses uranium milling sites. The Nuclear Waste Policy Act addresses high-level waste disposal facilities. Section 632 of the Departments of Commerce, Justice, and State, the Judiciary, and Related Agencies Appropriations Act for Fiscal Year 1998 required DOE to transfer particular parcels of land at or in the vicinity of Los Alamos National Laboratory to local governments.

Exhibit 6-2. Relationship Between DOE Planning Processes and the Life Cycle of DOE Mission Activities at a Site



*36 CFR Part 800, Advisory Council on Historic Preservation (Protection of Historic Properties; December 12, 2000) directs federal agencies to coordinate compliance with NEPA and the requirements of the National Historic Preservation Act (NHPA) and to consider NHPA requirements as early as possible in the NEPA process (36 CFR Part 800.8).

Planning processes under a variety of federal laws and DOE directives collectively cover the full life-cycle of DOE mission activities at a site, but no single law or directive has been used to cover the full life-cycle. The solid lines indicate the stages of DOE mission activities that have been covered by each specific statute or directive. For example, the Uranium Mill Tailings Radiation Control Act requires DOE to take ownership of certain Title II sites after cleanup (solid line on the left) and to conduct cleanup and long-term stewardship at Title I sites (solid line on the right). However, the Act does not address the possibility of property transfer from DOE ownership and control. A dotted line indicates where a specific directive applies to all DOE activities but does not specifically identify long-term stewardship (or its functional equivalent) as an activity. For example, DOE Order 435.1 directs DOE to manage radioactive waste but does not specifically direct DOE to conduct long-term stewardship for residual radioactive contamination.

6.1.1 Planning Pursuant to NEPA

Although many DOE sites were established before its enactment, NEPA now plays an important role in site planning. NEPA and its implementing regulations require DOE and other federal agencies to evaluate the environmental impacts of proposed actions that may have significant environmental effects (e.g., a major change in the structures or operation of an existing facility; decontamination, decommissioning, and disposition of an existing facility; the siting, construction, operation,

decontamination and decommissioning (D&D), and disposition of a new facility). However, documents produced under NEPA at early stages in the planning process are not always able to fully consider the complete life-cycle of a proposed action. For example, potential impacts of decontamination and decommissioning activities on future land use for a proposed action may be considered too speculative for analysis at the beginning of a project (i.e., during the initial planning process), although NEPA requires a reasonable effort to obtain such information.[65]

Because information related to the "back end" of the life-cycle of a proposed action tends to be difficult to quantify during the planning process, initial NEPA analyses are limited in their ability to consider the longer-term environmental impacts of the various alternatives for the proposed action. This makes it necessary to periodically review more complete information about long-term stewardship as it becomes available to see whether decisions should be revisited or if an earlier NEPA review should be supplemented. For example, it may become apparent that DOE has selected an alternative that will result in significant long-term stewardship liabilities, when another alternative also capable of meeting the mission objective would result in fewer or less costly long-term stewardship needs.

6.1.2 Planning Pursuant to DOE Orders

DOE's internal operating procedures and directives include planning needs. Land use planning at DOE sites historically has focused on developing facilities and infrastructure to support DOE missions (including cleanup), often assuming that these missions would continue indefinitely.[66] Planning documents developed prior to 1994 generally did not consider land use patterns in surrounding communities, or the potential consequences of completing site missions and transferring site lands to other owners. In fact, many plans were classified or otherwise controlled because they contained sensitive information.

In 1994, DOE land use planning was re-organized under DOE Order 430.1A, *Life Cycle Asset Management* (LCAM). LCAM is focused on performance-based management of real property over its entire life-cycle: from planning to acquisition, through operation, decommissioning, and disposition or transfer out of DOE control. LCAM, which is still in effect, provides overall performance-based process requirements, but otherwise allows programs and sites the flexibility to specify their planning process. Although LCAM requires a comprehensive land use planning process with stakeholder involvement, the quality and content of land use plans are left to the discretion of DOE program directors.[67] In 1996, the Department issued DOE Policy 430.1, *Land and Facility Use Policy* (July

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[65]For example, in the Final Environmental Impact Statement for the Advanced Mixed Waste Treatment Project facility at the Idaho National Engineering and Environmental Laboratory, DOE stated that: "The nature, extent and timing of future D&D activities are not known at this time. No meaningful alternatives or analysis of impacts can be formulated at this time since D&D is so remote in time that neither the means to conduct D&D, nor the impacts of the actions, are foreseeable in the sense of being susceptible to meaningful analysis now. Accordingly, D&D activities are not analyzed in detail." *Advanced Mixed Waste Treatment Project. DOE/EIS-0290, January 1999, Section 3.1*.

[66]Until 1994, planning was governed by DOE Order 4320.1b, supplemented by additional planning directed at radiation protection (DOE Order 5400.5) and later by radioactive waste management (DOE Order 431.5).

[67]LCAM-based plans have won awards from the American Planning Association and have peer respect. For example, the INEEL Comprehensive Facility and Land Use Plan was recognized as the Outstanding Federal Planning Project for 1997 by the Federal Planning Division of the American Planning Association for its original and

9, 1996), which further addresses life-cycle planning activities for DOE land and facilities. The policy promotes the involvement of the surrounding communities and the integration of missions, ecology, cultural, and social factors in a regional context.[68]

Although LCAM is intended to apply over the entire life-cycle of DOE's management of real property, it has been difficult to develop operational requirements specific to long-term stewardship. For example, the Order does not explicitly identify long-term stewardship as a requirement, or explicitly require development of long-term stewardship plans prior to project design or execution. As a consequence, a recent analysis of land use plans developed by sites pursuant to LCAM suggests that land use planning for long-term stewardship is not always addressed in a comprehensive and coordinated manner by the sites and their surrounding communities.[69]

Bureau of Land Management (BLM) Land Use Planning

BLM's planning processes are established primarily by the Federal Land Policy and Management Act (FLPMA). The FLPMA requires BLM to prepare land use plans to provide management direction for the public lands. Since 1984, BLM has completed 108 Resource Management Plans; 56 earlier and smaller Management Framework Plans (MFP) are still in place. These plans are periodically evaluated, amended or revised to respond to new circumstances or proposals. Some of the MFPs are replaced by new Resource Management Plans when the decisions in the MFPs are no longer valid and it is not feasible to update the decisions through the MFP amendment process. Planning Regulations at 43 CFR Part 1610.2(b) require BLM to annually publish a planning schedule identifying plan amendments and new Resource Management Plans in progress or planned over the next three years. Six Resource Management Plans were scheduled to be completed in FY 1999, and one is scheduled to be completed in FY 2000.

Source: U.S. Department of Interior, Bureau of Land Management
http://www.blm.gov/nhp/what/PAC_support/planschedule0.htm

To improve future project planning documentation and life-cycle cost analyses, DOE may need to place greater emphasis on identifying and addressing any long-term stewardship activities that are needed for real property assets. In addition, LCAM needs to be revised to include needs of long-term stewardship as they are determined in DOE policy.

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comprehensive analysis of the environmental, historical, cultural, and economic assets of the region and their relationships to the future growth of the site.

[68]In some cases, state planning requirements also may be pertinent, as may county and city government-derived authority for land use planning (e.g., local governments adjacent to the Hanford Site pursuant to Washington State's Growth Management Act).

[69]Lowrie, K. *Land Use Planning On and Around U.S. DOE Sites: Communication, Coordination, and Commitment*. CRESP-EOHSI, Draft, September 1999. This study was based on a survey of 21 off-site municipal or county planners and on-site planners at 13 major sites. The study concluded that "although sites are required to do land use planning, there have been so many different initiatives in this direction that sites have been, at best, free to adopt or pursue what type of land use planning suits their needs, and, at worst, confused as to how to meet requirements and have therefore done nothing." The study identified a need for substantially more direct communication between the sites and local planners, which would include more mutual review and comment on land use plans between the sites and neighboring jurisdictions, the early involvement of local officials in developing and defining roles and responsibilities for stewardship, and the coordination and linkage of on-site and off-site databases of land use information with local land use agencies.

6.1.3 Integrating Long-term Stewardship More Effectively Into Planning

Comments and suggestions forwarded to DOE have noted three general options for improving planning to more effectively integrate consideration of long-term stewardship in land use plans. The three suggested approaches summarized below are not mutually exclusive.

- **DOE could develop site-specific long-term stewardship plans at all DOE sites**. Congress has directed that the Waste Isolation Pilot Plant and uranium mill tailings sites have long-term stewardship plans. High-level waste repositories and low-level waste disposal facilities must meet long-term planning requirements. As a management tool, DOE requests the development of a site-wide plan prior to accepting a new site into the long-term surveillance and monitoring program. CERCLA Operation and Maintenance Plans and RCRA post-closure permits may cover some long-term stewardship needs for specific areas. Sites will continue to conduct the planning activities that are directly needed by other applicable requirements. Many sites may develop site-specific long-term stewardship plans that incorporate the planning activities conducted pursuant to those directives. Other sites may address long-term stewardship planning in a different manner that is consistent with the needs of stakeholders, regulatory agencies, and Tribal nations.

- **DOE could adopt Environmental Management Systems (EMS) and pollution prevention concepts into mission planning and operation to increase the reliability of and reduce the need for long-term stewardship**. The use of EMS[70] and pollution prevention[71] principles in long-term stewardship planning can address, in the initial planning stages, the potential impacts after mission completion. At DOE sites with ongoing missions, DOE could incorporate long-term stewardship considerations in all planning efforts, consistent with an EMS approach. Because the effectiveness of long-term stewardship is uncertain, the best way to ensure against ineffectiveness is to minimize the need for long-term stewardship through careful consideration of the long-term stewardship implications of DOE decisions. Decisions concerning the continued generation of an existing waste stream at a site could consider the extent to which that generation is creating or contributing to residual hazards that will need long-term stewardship. Decisions concerning constructing and operating a new facility could consider the ability to decontaminate and decommission the facility after the mission is completed. DOE could draw upon the experience that other federal agencies have with life-cycle mission planning that includes long-term stewardship. DoD regulations direct life-cycle planning for new missions and programs, including the following life-cycle phases: manufacture, test and evaluation, deployment, maintenance, demilitarization, and

[70] An Environmental Management System (EMS) is a set of management tools and principles designed to create the administrative procedures that an organization needs to integrate environmental concerns into its daily practice. The EMS process is guided by ISO 14000, a series of international voluntary standards that provide a common framework for managing environmental issues. The guiding principles of ISO 14000 are: it must result in better environmental management, it must be flexible and applicable in all nations, it must be scientifically based, and it must be practical and useful.

[71] The concept is to (1) recognize from the start that all ongoing and new missions will eventually come to an end (e.g., every new facility will eventually need to be decommissioned); and (2) design and operate missions and facilities in ways that minimize future long-term stewardship needs (e.g., design facilities so that decontamination and dismantlement are as straightforward as possible).

disposal.[72] Life-cycle planning and analysis for new DoD missions and programs include NEPA analysis. The National Park Service also conducts planning for long-term stewardship, including NEPA analysis, under its Disturbed Lands Restoration Program and Abandoned Mine Lands Program.[73] The concepts of pollution prevention, waste minimization, stewardship minimization, and EMS should be incorporated, as appropriate and to the extent possible, into the NEPA process for the evaluation of proposed actions and alternatives.

- **DOE could coordinate land use planning processes more thoroughly with planning processes conducted by affected parties**. Such coordinated planning would be beneficial in two situations. First, where uncertainty exists with respect to the potential migration of contamination off-site (e.g., groundwater plumes), coordinated planning could enhance the protectiveness of long-term stewardship. For example, DOE could work with local communities or Tribes in determining where use or zoning restrictions would prevent exposures in the event that a groundwater plume were to migrate off-site. Second, decisions about transfers of property to non-federal owners are contingent on compliance with applicable requirements, including DOE Orders. If property is considered for restricted release, it is important to understand whether the federal government, local governments, or the new owners can and will enforce long-term restrictions on property use and perform periodic maintenance. Coordinated planning could help define the roles and responsibilities of federal, state, local, and Tribal governments with respect to the creation and maintenance of land use controls. It also could be a means through which local governments take an active role in monitoring properties or maintaining and enforcing land use controls. Coordinated planning and management of natural resources on adjacent federal and non-federal lands may be appropriate at some sites.

Public Comments Providing Recommendations on Preventing the Need for Long-term Stewardship (see Exhibit 2 in Appendix C)

- Long-term stewardship should be emphasized as an essential component of all new programs and facilities (7)
- DOE should do what private entities routinely do: develop decommissioning plans prior to constructing new facilities and incorporate pollution prevention concepts into the design of new facilities and processes (16)
- DOE should work harder to ensure that the weapons complex of the future does not result in additional intractable long-term stewardship needs (16, 19)
- The *Study* should clarify how the concept of pollution prevention differs from existing requirements pursuant to RCRA, the 1990 Pollution Prevention Act, and NEPA (12, 41)

6.2 Property Transfer

At the conclusion of current cleanup activities, lands and other real property owned or controlled by DOE may be retained indefinitely in federal control or transferred to non-federal ownership (if release requirements are met). A variety of options are available for the transfer of DOE property to other federal agencies and non-federal owners.

[72]Department of Defense Regulation 5000-2-R - Mandatory Procedures for Major Defense Acquisition Programs and Major Automated Information System Acquisition Programs.

[73]13 Steps to a Restoration Project, U.S. Department of Interior, National Park Service.

The Department may transfer the property under a variety of authorities, including the AEA, General Services Administration (GSA) regulations, and specific Congressional legislation such as the Federal Property and Administrative Services Act, the Hall Amendment to the DOE Organization Act, and Public Law 105-119. Real property may be transferred to the Secretary of the Interior, under direct management of the Bureau of Indian Affairs, to be held in federal trust for Tribal nations.[74] Where supported by a mission need, other federal agencies have the right of first refusal for the ability to assume control of DOE excess property. Excess land that was withdrawn from the public domain is relinquished (returned) to the controlling agency (e.g., BLM, U.S. Department of the Interior, U.S. Department of Agriculture) pursuant to 41 CFR 101-47§201-3. These disposition paths will affect long-term stewardship in different ways. DOE restrictions on real property transfers are discussed in more detail in Appendix I.

The least complicated transfer will occur if the property is not needed for any continuing DOE mission (or for buffer zones to protect public health and safety and the environment) and if the property has been cleaned up to levels that support unrestricted use. In that case, the only long-term stewardship obligations that will accompany the property or remain with DOE are routine record-keeping.

The transfer of property that needs long-term stewardship to another federal, state, Tribal, local, or private entity presents challenges to long-term stewardship implementation. In this case, as part of the transfer process, DOE and affected parties will need to determine:

- The parcels for which long-term stewardship is needed.
- Whether the receiving entity has any restrictions, concerns, or issues associated with its ability to accept the property and conduct long-term stewardship.
- What types of management or use restrictions are necessary for the parcel.
- Whether use restrictions should affect only the entity to whom the property is transferred or apply more broadly to all subsequent owners.
- Procedures for overseeing all restrictions or limits that are imposed. Note that providing oversight may be difficult (see Exhibit 5-3).
- Funding and responsibility for long-term stewardship activities.

A variety of factors will affect the choice of a disposition path. DOE needs, as a first step, to determine the suitability of the property for disposition. This means systematically assessing sites and portions of sites to determine if they are needed for a continuing DOE mission other than long-term stewardship (or for buffer zones to protect public health and safety and the environment). Unused property must then be given a second screening to determine whether it should remain in DOE possession for long-term

[74] As part of the Federal Indian Trust Responsibility, the federal government must hold and appropriately manage land for federally-recognized tribes. However, the Department of the Interior is committed to promoting tribal control and self-determination over tribal trust lands and resources (*Principles for the Discharge of the Secretary's Trust Responsibility*, Department of Interior Order 3215, April 28, 2000).

stewardship or it can be released with or without restrictions. To date, these decisions have been made under a variety of statutory and regulatory authorities and via different processes (see Appendix I). The following factors will be

Public Comments Providing Recommendations for Property Transfer
(see Exhibit 2 in Appendix C)

- The federal government should retain control of sites (including mineral rights) where long-term stewardship is required, except where the durability of institutional controls can be guaranteed (24, 25, 27)
- The weakness of institutional controls should have a major effect on DOE decisions to convey property (49)
- Long-term stewardship responsibility at DOE sites could be assigned to other federal agencies better suited to land management (4, 39)
- Other federal agencies may have restrictions or concerns about accepting residually contaminated real estate, or may not have sufficient budgets for long-term stewardship (4,29)
- DOE should consider Tribal rights, Tribal treaties, and preferences by some stakeholders for biological and habitat protection in land transfer decisions (4, 44)
- If property is transferred, DOE should retain long-term stewardship responsibility in perpetuity unless the new owner has altered the property, violated a legal deed restriction, or contaminates the environment (6, 11, 20, 32, 34, 45)
- DOE needs to determine how it will enforce restrictions on land owned by someone else, particularly if ownership changes (1, 43)
- Any proposed transfer of DOE land should require a review and comment by the state (25)
- DOE should identify future site stewards and allow stakeholder to interface with these stewards prior to the completion of cleanup (36)
- The *Study* should provide more discussion of the management of property already transferred to the public, but not cleaned up (25)
- The *Study* should examine radioactive materials removed from sites being cleaned up and disposed at facilities that are not regulated under the Atomic Energy Act; such actions may increase DOE's long-term stewardship liabilities and challenges (37)
- Once federal lands are conveyed into private hands, the treaty rights to hunt and gather foods and medicines could be extinguished (49)
- The *Study* should outline what happens to 151(b) sites if the private owners refuse to invest in the necessary long-term stewardship (43)
- The "Hands Off Policy" is not clear and is hard to visualize (30)

particularly important for evaluating the potential for transferring real property from DOE control to another federal or non-federal entity:

- **Potential legal restrictions**. Under current law, parcels of land which are part of a larger site that is listed in its entirety as a single site on the CERCLA National Priorities List (NPL) cannot be transferred unless (a) EPA concurs with the transfer or (b) the larger site is deleted from the NPL.[75] If the site is not on the NPL, then DOE must obtain concurrence from the appropriate state agency. If a parcel contains residual radioactive contamination or materials at levels subject to regulation under the AEA, or if the parcel is needed as a buffer zone to protect public health and safety and the environment, it may not be possible for DOE to transfer responsibility for long-term stewardship over those materials to another federal or non-federal entity without the NRC or an agreement state licensing the entity for their possession.

[75]State concurrence is required to delete the site from the NPL.

Leasing Property at DOE Sites

Several mechanisms are available to implement leases of DOE property. DOE has implemented guidance on the protection of workers using DOE leased facilities.

- DOE can lease property under section 161(g) of the Atomic Energy Act, provided that the property was acquired by DOE in connection with functions pursuant to the Act or the property will be used to carry out objectives of the Act.
- Section 649 of the DOE Organization Act authorizes DOE to lease facilities that are temporarily not needed for up to five years if leasing is in the public interest. Unused facilities at the Hanford Site have been leased under this authority.
- The Hall Amendment to the DOE Organization Act allows DOE to lease excess property for up to 10 years at DOE facilities to be closed or reconfigured. The Hall Amendment provides EPA with the authority to concur in the DOE determination that lease conditions are "consistent with safety and protection of public health and the environment." Several facilities at the Mound Environmental Management Project have been leased under this authority.

Sources: *Selecting a Suitable Transfer Mechanism: Benefits and Limitations*, U.S. Department of Energy, Office of Environmental Management, May 13, 1997.

Joint DOE/EPA Policy Statement on Leasing under the "Hall Amendment," Memorandum from Timothy Fields, Assistant Administrator, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency; James M. Owendoff, Acting Assistant Secretary for Environmental Management, U.S. Department of Energy; Robert W. DeGrasse, Jr., Director, Office of Worker and Community Transition, U.S. Department of Energy; and G. Thomas Judd, Director, Office of Field Management, U.S. Department of Energy, June 30, 1998 (*www.epa.gov/swerffrr/doc/halltran.htm*).

Guidance on the Protection of Workers using DOE Leased Facilities, U.S. Department of Energy, Office of Worker and Community Transition, August 6, 1999 (*http://www.wct.doe.gov/owct/Documentation/Authorities%20and%20Guidance.htm*).

- **Tribal Treaty Rights and Federal Indian Trust Responsibility**. Tribal nations have reserved legal rights to pursue certain activities (e.g., hunting, gathering plants, pasturing livestock) on certain lands identified in treaties (e.g., "open and unclaimed lands"). There is disagreement as to whether these treaty rights apply to certain withdrawn lands (e.g., at Hanford).[76] In addition to specific treaty rights, the Federal Indian Trust Responsibility is a legally enforceable fiduciary obligation, on the part of the United States, to protect Tribal lands, assets, resources, and treaty rights, as well as duty to carry out the mandates of federal law with respect to American Indian and Alaska Native Tribes. DOE's implementation of this responsibility is directed by Executive Memorandum and DOE Order.[77] In several cases, the Supreme Court has used language suggesting that the Trust Responsibility entails legal duties, moral obligations, and the fulfillment of understandings and

[76] *Hanford Comprehensive Land-Use Plan Environmental Impact Statement,* DOE/EIS-02222-F, September 1999.

[77] *Memorandum for the Heads of Executive Departments and Agencies – Subject Government to Government Relationship with Native American Tribal Governments*, Executive Memorandum, April 29, 1994; DOE Order 1230.2, *American Indian Tribal Government Policy*; *U.S. Department of Energy American Indian & Alaska Native Tribal Government Policy*, U.S. Department of Energy, Office of Congressional and Intergovernmental Affairs, October 2000.

expectations that have arisen over the entire course of dealings between the United States and the Tribes.[78]

- **The nature and extent of residual contamination and other site hazards**. These must be considered in determining both whether to transfer property and what restrictions should be placed on that property if transferred. Documents that assess the environmental baseline, such as discharge permits, release sites, sampling plans and results, and descriptions of all waste management units will be needed. Federal and state regulators involved in the decision process will need to be notified at the start. In most cases, their concurrence with DOE's decision to transfer the property will be needed.

- **Property rights that do not convey with surface rights**. Minerals in place (in many states) may be conveyed by deed separately from the overlying property. Generally, the ownership of land overlying a groundwater resource determines access to the resource. However, in some states a permit to withdraw groundwater may be required. Also, in some states, groundwater may be withdrawn for use either on or off the overlying land even if this interferes with use by another landowner.

- **Needs for buffer zones and other "set-asides."** Uncontaminated property may be needed as a safety buffer zone around contaminated areas or for continuing or future mission needs. Other areas may be set aside to protect valued natural resources or cultural resources.

- **Local interest in site re-use for economic development and other socio-economic or environmental justice considerations**. Public and Tribal government involvement should be sought throughout the process to determine suitability for transfer. DOE may need to continue to build upon existing public involvement processes (e.g., Federal Advisory Committees such as Site-Specific Advisory Boards, site planning boards) to more effectively involve affected parties in property management issues (see also Chapter 9).

DOE has developed guidance outlining the information relating to the past as well as the current history and condition of the parcel that is needed before property can be transferred.[79] The necessary information includes CERCLA Records of Decision or other decision documents that identify cleanup end states and long-term stewardship strategies, NEPA review, safety/hazard analyses, and detailed real property records. In most cases, new property surveys and deed registrations will be needed to prepare for long-term stewardship activities or reduce acreage needed to support ongoing site missions (or for buffer zones to protect public health and safety and the environment). Real property records, to be complete, also should identify all infrastructure on the parcel, current and past facilities, boundaries, and all easements or covenants. For buildings, information about zoning and code compliance, structural integrity, and electrical and mechanical systems should be included, although as-built drawings and other records for older facilities may not be available (see Chapter 7).

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[78]Seminole Nation v. United States, 1942, 316 U.S. 286 (1943); see also *http://www.doi.gov/oait/q&a.htm.*

[79]*Cross-Cut Guidance on Environmental Requirements for DOE Real Property Transfers*. U.S. Department of Energy, Office of Environmental Policy and Assistance. DOE/EH-413/97/2, October 1997.

Indemnification Following Property Transfer

Section 3158 of the National Defense Authorization Act of 1998 authorizes the Secretary of Energy to hold harmless and indemnify a person or entity to whom property is transferred against any claim for injury to person or property that results from the release or threatened release of a hazardous substance or pollutant or contaminant as a result of DOE activities at the defense nuclear facility on which the real property is located. This indemnification does not apply to the extent that the persons and entities contributed to any such release or threatened release. (42 U.S.C. 7274q(b); 10 CFR 770)

DoD has extensive experience in property transfer through implementing the Base Realignment and Closure (BRAC) Program. DoD has received explicit statutory authority to conduct transfers of DoD property at closing and realigning military bases, and is implementing the program under an extensive series of regulations and guidance documents.[80] DoD has developed a classification system for properties intended for disposal, and property must qualify for disposal through an Environmental Baseline Survey and either a Finding of Suitability for Transfer (FOST) or Finding of Suitability for Lease (FOSL). Typically, DoD property transfer is accomplished through an Economic Development Conveyance to an approved Local Redevelopment Authority.

6.3 Post-Transfer Property Management

DOE's role in long-term stewardship may not end if property is transferred, particularly if that property needs the maintenance of access or use restrictions.[81] As Chapter 5 described, such restrictions could take several forms:

- **Planning restrictions**, in which the transferee is required under enforceable provisions of the transfer document (e.g., an enforceable deed restriction incorporated into a sale agreement or condition of a lease agreement) to adopt and enforce the existing land use plan. Without such restrictions, planning decisions may be difficult to enforce. For example, even if a site-specific land use plan has been developed under NEPA (e.g., at Hanford),[82] the Record of Decision can be changed if the revised decision is adequately supported by an existing EIS. If the property or portion of the property is transferred to another federal agency or consulting Tribal government that was included in the NEPA process, a DOE Record of Decision is not binding on the cooperating agency or consulting Tribal government and does not create an obligation for a cooperating agency or consulting Tribal government to implement the plan. Once the property leaves DOE control, DOE would not have control over the use of the land unless the property is conveyed with deed or other legal restrictions.

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[80] *The Environmental Site Closeout Process Guide,* U.S. Department of Defense, Air Force Base Conversion Agency, September 1999; *A Guide to Establishing Institutional Controls at Closing Military Installations*, U.S. Department of Defense, February 1998; *Guidance on the Environmental Review Process to Reach a Finding of Suitability to Transfer for Property where Release or Disposal has Occurred,* U.S. Department of Defense, June 1994.

[81] *CERCLA Requirements Associated with Real Property Transfers*, U.S. Department of Energy, Office of Environmental Policy and Assistance, CERCLA Information Brief. EH-413-9808, April 1998.

[82] *Hanford Comprehensive Land-Use Plan Environmental Impact Statement*, Section 1.4.3. DOE/EIS-02222-F, September 1999.

- **Traditional land use restrictions**, which are created by covenants, deed restrictions, reversionary clauses, or similar provisions. The availability of such restrictions and special circumstances governing their enforcement and persistence generally would be established by state law and therefore would be likely to differ from state to state. DOE might also create and enforce easements to ensure continued access to sites for monitoring and maintenance of waste disposal facilities. The availability and limitations of land use restrictions that can be implemented by DOE or regulators would also vary according to state law.

- **Zoning restrictions**, which would need the cooperation and continuing involvement of Tribal and local governments because they probably could not be enforced directly by DOE. The roles and responsibilities of the federal, local, and Tribal governments would need to be defined and agreed upon, and DOE might need to supply necessary technical expertise.

DOE has used deed restrictions (e.g., reversion clauses) to retain the authority to ensure the continued maintenance of institutional controls after property has been released. Examples include:

- Disposal of property on the Monticello, Utah, site involves deed restrictions establishing prohibition of residential development without prior DOE approval and prohibition of groundwater use.

- In 1973, 2,200 acres surrounding the Argonne National Laboratory East facility were transferred to a local forest preserve district. The deed included future use limitations because shallow groundwater and surface water contaminated with volatile organic compounds had migrated into the preserve.

- At the Oak Ridge Reservation, disposals of land to the City of Oak Ridge by means of quit-claim deeds included deed provisions in which DOE reserved rights of continuing access and specified that the property could only be used for certain purposes or it would revert to DOE.

Three issues for long-term stewardship are raised by these experiences with post-transfer controls:

- Additional staff and resources, focused on monitoring institutional controls and enforcing land use restrictions, may be needed if more properties, with more complicated and numerous restrictions, are transferred by DOE.

- DOE may need to be prepared to enforce institutional controls through judicial or administrative means if local governments or private individuals to whom property has been transferred do not adhere fully to the restrictions.

Recent DOE Land Transfer Experiences

Hanford Site. The State of Washington and EPA determined that the 1100 Area at Hanford poses no significant threat to public health and the environment and deleted the Area from the CERCLA National Priorities List in 1996. The 870 acre property was transferred to private ownership pursuant to section 161(g) of AEA. GSA was not involved in the transaction, although the general structure of GSA's land transfer process was used. An Environmental Assessment (EA) was prepared pursuant to NEPA. The EA concluded that all hazardous materials would be removed prior to transfer of ownership, and a Finding of No Significant Impact was made. Prior to the transfer, historical records were reviewed, and potentially problematic areas were surveyed for radiation using DOE Order 5400.5 radioactive release criteria. After the transfer, DOE Richland radiology staff requested additional surveys, which will be completed in the near future. DOE does not have an easement to conduct a survey, simply a good faith agreement. Contingency provisions within the land transfer agreement allow for future DOE remediation on the property if post-transfer surveys or sampling identify any contamination.

Sources: *Environmental Assessment for the Transfer of 1100 Area, Southern Rail Connection and Rolling Stock*. Hanford Site, Richland, Washington, U.S. Department of Energy, August 1998, DOE/EA-1260; 61 FR 51019, September 30, 1996.

Mound Site. In 1998, DOE agreed to sell the Mound Environmental Management Project Site (formerly the Mound Plant) to the Mound Miamisburg Community Improvement Corporation (MMCIC). DOE will convey the entire site to MMCIC in discrete parcels, or "release blocks." The sales contract specifies that a release block must be remediated pursuant to CERCLA, and each conveyance must be formally approved by EPA. DOE operations and decontamination and decommissioning activities are continuing at the site. Some parcels have been occupied by private sector tenants prior to the remediation of the entire release block. The tenants are generally not familiar with DOE operating procedures. In advance of the title transfer, leases of facilities are authorized by section 3154 of the National Defense Authorization Act of 1994 (the Hall Amendment to the DOE Organization Act), which allows for below market rate transactions for economic development. MMCIC in turn subleases parcels to private entities. A recent study by the Environmental Law Institute reviewed the master lease between DOE and MMCIC and the subleases between MMCIC and its subtenants. The study identified several provisions that serve as controls to ensure compliance with regulatory requirements and to ensure that exposures during reuse of the site are consistent with cleanup to industrial reuse standards. However, the study questioned whether lease restrictions or deed restrictions alone would be effective in managing residual hazards.

Sources: *Miamisburg Environmental Site Management Project Site Profile*, DOE Office of Oversight, Environmental, Safety, and Health, June 1999; *Institutional Controls Case Study: Mound Plant*. Environmental Law Institute, 1998; *Integrated Safety Management Evaluation of the Miamisburg Environmental Management Project*. U.S. Department of Energy, Office of Environment, Safety, and Health, July 1998. EM2MGT/07-98/01SH; *Mound's Land Transfer Process*. U.S. Department of Energy, Miamisburg Environmental Management Project, Miamisburg, Ohio, 1999; *Commercialization of the Mound Plant, Miamisburg, OH*, DOE/EA-1001; *Disposition of Mound Plant's South Property, Ohio*, DOE-EA-1239.

Los Alamos National Laboratory (LANL). In 1997, Congress passed Public Law 105-119, the *Departments of Commerce, Justice, and State, the Judiciary, and Related Agencies Appropriations Act, 1998*, which directs DOE to convey or transfer certain parcels of DOE land in the vicinity of LANL to the Incorporated County of Los Alamos, New Mexico, and to the Secretary of the Interior, in trust for the Pueblo of San Ildefonso. DOE's responsibilities under the Act include identifying potentially suitable tracts of land, conducting a title search on each tract, identifying and conducting any environmental restoration and remediation needed for each tract, and conducting a NEPA review of the proposed conveyance. DOE has no role in the designation of recipients nor how the parcels of land will be allocated between the recipients.

Source: *Final Environmental Impact Statement for the Conveyance and Transfer of Certain Land Tracts Administered by the U.S. Department of Energy and Located at Los Alamos National Laboratory, Los Alamos and Santa Fe Counties, New Mexico*. U.S. Department of Energy, Los Alamos Area Office, Los Alamos, NM, DOE/EIS-0293, October 1999.

- For transfers within the federal government, DOE and/or Congress will need to decide whether the funding/budget authority needed to conduct long-term stewardship activities transfers with the parcel or remains with the program that transferred the parcel.

Other federal agencies have experience enforcing institutional controls after real property transfer. For example, Findings of Suitability for Transfer and land transfer agreements for DoD property that needs long-term stewardship are required to include provisions allowing for continued access by DoD to conduct CERCLA five year reviews and monitor the effectiveness of engineered and institutional controls.[83] NRC has also addressed decommissioning of NRC-licensed sites and transfer of sites for restricted use, requiring institutional controls to maintain future land use restrictions.[84] The licensee (ordinarily the property owner) is required to demonstrate that required institutional controls are effective, enforceable, and funded prior to property transfer. The licensee also must demonstrate how the responsibility for such controls will be passed on to future responsible parties.

[83]DoD Guidance on the Environmental Review Process to Reach a Finding of Suitability to Transfer for Property where Release or Disposal has Occurred. U.S. Department of Defense, June 1, 1994.

[84]*Nuclear Material Safety and Safeguards, Decommissioning, Chapter 16.0, Restricted Use/Alternative Criteria*. Nuclear Regulatory Commission, NUREG-1727, September, 2000.

Chapter 7: Information Management

As DOE sites make the transition from cleanup to long-term stewardship, site stewards will need detailed, accurate information about the location and nature of residual hazards and the processes and cleanup strategies that generated these hazards. Other people will need to have access to this information, including health professionals, neighbors who live and work in the surrounding communities, and off-site entities who are responsible for some institutional controls, emergency response, and community planning and development. Even where sites have been cleaned up to levels that support unrestricted use, information that documents the levels of cleanup that were achieved will be needed.[85] The information needs to be available in a useful and readily accessible form. In order for long-term stewardship to be effective, appropriate information should be readily available to the public and all entities conducting long-term stewardship activities.

APPLICABLE SCOPING COMMENTS
(see Exhibit 2 of Appendix B)

- DOE needs to provide adequate information to the public (4, 18)
- DOE should discuss approaches for preserving information about a site and its past activities and contamination history (2)
- DOE needs to institute a reliable documentation update/revision system to ensure that crucial data on each site are preserved (4)
- DOE should identify processes whereby owners and neighbors are made aware of, in perpetuity, the nature and extent of contamination and use restrictions so that any attrition of personnel and changes in filing and computer systems do not result in a loss of corporate memory (16)
- DOE should establish mechanisms for the collection, retrieval, and storage of information needed for long-term stewardship and site historic preservation programs (1, STGWG)
- DOE should dedicate part of each former site as a historic site or museum (1)

APPLICABLE ISSUE
(see Exhibit 3 of Appendix B)

5. Information Management

This chapter summarizes recent recommendations for improving DOE's information management responsibilities and practices to better serve long-term stewardship needs. The chapter also describes DOE's efforts to improve the identification, preservation, and future accessibility of this information.

7.1 Current Responsibilities and Practices

Recent studies have described DOE's information management responsibilities and practices as they pertain to long-term stewardship.[86] Many DOE information management practices were developed to support nuclear weapons production. The basis for these practices (e.g., a need to protect national security, the assumption that site access will be restricted) was and continues to be critical to the

[85] Even at sites where cleanup achieves unrestricted use, it may be necessary to demonstrate that cleanup to a specified level actually was achieved and/or waste actually was removed to another location (e.g., for litigation or property transfer). It also may be necessary to re-evaluate these sites in response to changes in scientific information or health standards.

[86] *Roadmap to the Year 2000*, U.S. Department of Energy, Records Management Quality Improvement Team, Revision 1, August 1995; *Responsible Openness: An Imperative for the Department of Energy*. U.S. Department of Energy, Openness Advisory Panel, Secretary of Energy Advisory Board, August 25, 1997; *Managing Data for Long-term Stewardship*, Working Draft Report Prepared by ICF Kaiser Consulting Group, March 1998.

success of national security missions. Conversely, long-term stewardship needs public awareness and institutional openness to facilitate continued protection of human health and the environment.

Exhibit 7-1 provides an overview of current DOE records management practices.[87] Five major aspects of current information management practices are likely to affect DOE's ability to implement long-term stewardship:

1. **Uniform criteria are needed for identifying information critical for long-term stewardship**. A large amount of information is generated every day at DOE sites in support of regulatory and mission needs. The Department needs to develop a standard methodology for identifying the portion of this information that will be critical to support long-term stewardship.

2. **Data quality must meet current and future needs**. Current uses of data involve evaluations such as whether an engineered control is functioning properly. Future uses of data may involve evaluations such as temporal trends in contaminant concentration or migration.

3. **Information must be accurate**. DOE and affected parties must be confident that they can rely on the accuracy of long-term stewardship information. This is particularly important for information on the real and potential harm posed by residual hazards.

4. **There must be public trust in the information**. Affected parties must be confident that they can trust the information provided by DOE and other site stewards. Establishing and maintaining trust may be difficult when some information must be withheld for national security reasons.

Openness vs. Protection

Although long-term stewardship generally is facilitated by open public access to information, some exceptions are necessary to protect national security (e.g., classified material), privacy (e.g., personnel records), and sensitive natural resources and cultural resources. While the need to maintain these protections presents some challenges for long-term stewardship, it should be possible to preserve the mechanisms currently in place to achieve protection during long-term stewardship. For example, DOE currently provides public access to unclassified information at a site (e.g., information related to cleanup) while at the same time maintains classified information in a variety of secure databases. In addition, some information about cultural resources (e.g., location of archeological sites) is currently exempt from the Freedom of Information Act, and there is no reason to remove such an exemption for long-term stewardship. Tribes and resource management agencies currently use a variety of techniques to inform the public about the existence of sensitive resources without disclosing their exact locations. There is no reason to anticipate that these techniques are incompatible with long-term stewardship.

[87] Although the focus of this chapter is on DOE information management practices, management of some long-term stewardship information is governed by external regulation. For example, section 113(k) of CERCLA requires the establishment of an administrative record file containing all information and documentation used in the selection of a response action. This file must contain documents relevant to the selected remedy as well as relevant comments and information, site-specific data, guidance documents, and technical references that the lead agency considered in the ultimate response selection decision. The administrative record file must be made available for public inspection. Regulations in 40 CFR Part 300.800 pertaining to the administrative record establish procedures for public involvement in the development of the administrative record file. *Source: RCRA, Superfund & EPCRA Hotline Training Module, Introduction to Superfund Community Involvement*. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. EPA540-R-98-027, June 1998.

Exhibit 7-1: Current Records Management Practices

Information is generated at DOE sites to support a variety of regulatory and mission needs, including cleanup. Once a given piece of information is generated, it may become a "record" as defined by the National Archives and Records Administration (NARA). Records are used for a period of time and when no longer in active use, are either preserved permanently or saved for a specified period of time and then destroyed.

Books, reports, maps, and other "hard copy" records typically are preserved by placing them in boxes, indexing the boxes, and shipping the boxes to an interim repository at the site. Records are stored in the interim repository for varying periods of time (e.g., 1 year, 25 years, or longer) until they are either destroyed or shipped to an archival repository managed by NARA.

What is a Record?

The National Archives and Records Administration (NARA) defines records to include all books, papers, maps, photographs, machine readable materials, or other documentary materials, regardless of physical form or characteristics. To be managed by NARA, records must be made or received by an agency of the United States Government under Federal law or in connection with the transaction of public business and must be preserved by that agency or its legitimate successor as evidence of the organization, functions, policies, decisions, procedures, operations, or other activities of the government or because the records contain information of value.

NARA retains the records either permanently or for varying periods of time (e.g., 75 or 80 years). Records retention schedules approved by NARA establish specific requirements for preserving and destroying records. Information management practices for electronic materials are evolving. Some electronic materials (e.g., electronic copies of reports) are considered identical to their "hard-copy" counterparts and are preserved in a similar manner. The status of other electronic materials (e.g., databases) is unclear at present. Access to preserved records is achieved by request. The person requesting a record submits a request to NARA (or the organization that manages the onsite repository). Requests for specific records (e.g., an annual report) are filled by locating the box containing the record, retrieving it from storage, extracting the record, and sending a copy to the requestor. Requests for more general information (e.g., all reports that cover groundwater monitoring) are filled by first searching indexing systems to locate potentially relevant records and then following the above retrieval and shipping process. DOE also has developed searchable electronic indexes to certain types of electronic records and has made copies of these records available via the Internet and has developed electronic indexing systems for a variety of hard copy records.

5. **Future generations must be able to locate and readily access the information**. At present, it is difficult to locate and retrieve information from storage repositories without specific knowledge about the existence and archiving of the specific records containing the needed information. For this reason, many of DOE's unclassified documents are effectively unavailable to the general public.[88] Locating information using general search criteria (e.g., "all soil contamination records from 1995 to 1998") seldom works. The search for information is also complicated by the lack of standard methods (e.g., indexing, keywords, geospatial coordinates) for describing and referencing critical information.

In spite of all the cleanup accomplishments to date, without improvement in current practices, future generations may not have access to adequate information to conduct long-term stewardship, and critical information on where and why residual hazards exist may be lost. Failure to generate, identify, and

[88] *Responsible Openness: An Imperative for the Department of Energy*. U.S. Department of Energy, Openness Advisory Panel, Secretary of Energy Advisory Board, August 25, 1997.

preserve critical information may result in unnecessary exposure to residual hazards, delays in desired site re-use or property transfers, and increased long-term stewardship costs.

7.2 Improving the Ability to Meet Long-term Stewardship Information Needs

The studies cited at the beginning of this chapter identify several recommendations for improving DOE's ability to meet long-term stewardship information management needs. These recommendations, and DOE's efforts to implement them, are discussed below.

Public Comments Providing Recommendations for Information Management
(see Exhibit 2 in Appendix C)

- DOE needs to establish criteria for identifying what information to keep using an open public process (4)
- The public must have open access to up-to-date, reliable long-term stewardship information, even at National Nuclear Security Agency (NNSA) sites (17, 19, 20, 23, 27, 30, 31)
- Major aspects of information management must include accuracy and public trust in DOE information (49)
- DOE should establish a record management facility accessible to the public at the local, regional, national, and international access points (6, 11, 32, 33, 34, 45)
- Designate a federal manager for long-term stewardship information to supplement state land records (12)
- Long-term stewardship records must be periodically reviewed, updated, translated, and re-recorded (12)
- DOE should work in partnership with other federal agencies; state, local, and Tribal governments; and local individuals and institutions to develop and implement systems for managing data (4, 17)
- Information baselines should include (4, 20, 29, 34, 49):
  - Independent review and validation
  - A public comment process
  - Instructions for where and how to get information
  - Current record of the management of a site
  - Definition of contaminated areas, areas proven to be clean, and monitoring areas
  - The complete data record behind risk analyses
  - Pending FOIA requests and declassification
  - Regulatory records
  - Detailed information on residual hazards and their real and potential effects on human health and the environment
  - Natural resource damage assessments
  - GIS referencing with uniform standards
  - Adequate cataloguing and cross-indexing
- Records should be available in hard copy as well as electronic form and information on FOIA requests and declassifications should be publically available (34)
- Records should be durable and available over the period of time of potential risk (23, 27, 34)
- Redundancy is more important than consistency (4)
- Consider Native American cultural norms supporting oral transmission of knowledge (4)
- Develop institutional and educational capabilities to perpetuate institutional and cultural memory and to ensure the existence of some agency to manage sites (23)
- Maintain the long-term stewardship website and include links to EPA guidance (5, 34)
- Explore measures such as universal symbols of hazard, granite markers, and the Clock of the Long Now (40)
- Provide long-term funding and in-kind support to local communities (17)
- DOE should continue to work on the "1995" list of sites and should create a database about each site, including contractor sites (5, 6, 11, 30, 32, 34, 45)

- **Develop criteria for identifying critical information**. The first step in such an effort would be to develop consensus on the types of activities onsite and in the surrounding communities that will

occur during long-term stewardship. The second step would be to identify the information needed to support these activities. The third step would be to develop criteria and guidance for identifying specific site records that meet these information needs. These three steps should involve input from affected parties, both regionally and in surrounding communities. Although complex-wide guidance may ensure a more systematic approach to identifying critical information, individual sites could begin the process independently. Sites should seek input from subject matter experts and other individuals (including representatives from affected parties) at each site to identify the subset of current, active records that appear to have long-term value. Site records management organizations could ensure that these records are retained and preserved. Preserving information could provide significant long-term benefit at relatively low cost.

Information Management System for Uranium Mill Tailings Sites

DOE is required to conduct long-term surveillance and maintenance of uranium mill tailings sites in accordance with NRC licensing regulations. Information required by NRC regulations includes a detailed description of the final disposal site conditions, frequency and extent of groundwater monitoring, and procedures for site inspections, record keeping and quality assurance (10 CFR Parts 40.27 and 40.28). DOE's Grand Junction Office has developed a document management system to manage more than 50,000 records for nine DOE projects comprising more than 30 DOE sites. Documents in the system contain the following information:

- Present and historical chemical, radioactive, and physical hazards, both natural and man-made, and present and historical releases of contaminants.
- Active and passive devices for preventing exposure to humans and the environment.
- Current (including post-closure) and historical site processes and infrastructure, such as buildings, utilities, pipelines, tanks, and wells.
- Current and historical agreements, regulations, permits, and other legal requirements associated with long-term stewardship.
- Property records related to the site, easements, and other on-site access rights.
- Off-site access rights through public and private property for monitor wells and active or passive control systems, as well as mineral, water, and other natural resources rights.
- Locations and descriptions of cultural resources and habitats and species of concern.
- Relationship of site resources and access to Native American Tribes or interest groups.
- Site topography, hydrogeology, and geology.
- Site and surrounding property land use.
- Public exposure data.
- Current and historical concerns expressed by the public.

Source: Edge., R. and Pavelka-Zarkesh, L. *Document Systems for Site Stewardship at the U.S. Department of Energy Grand Junction Office*. U.S. Department of Energy Grand Junction Office, Grand Junction, Colorado, March 1999.

- **Establish a clear information baseline at the completion of cleanup**. The baseline information would fully describe the location, condition, and status of all former and residual hazards, a summary of site activities as they pertain to those hazards, and the history of significant public health and environmental impacts to the surrounding communities. This baseline would form the core of information needed for long-term stewardship. As noted in Chapter 4, the site-specific long-term stewardship plans needed by DOE's Grand Junction Office (GJO) establish an information baseline for sites entering into long-term stewardship, but these plans are developed only for closed sites for

which GJO has responsibility. In addition, the independent Project Baseline Summaries for long-term stewardship (to be developed by Fiscal Year 2003) will provide a basis for establishing a baseline at many DOE sites (see Chapter 4).

Information on Former Sites

In September 2000, the Secretary of Energy and others made a commitment to compile information about and re-examine possible contamination issues at privately owned sites formerly contracted to DOE and/or its predecessor agencies. The objectives are to (1) assemble a database of information on these sites based on the existing Case File for DOE's Formerly Used Sites program; (2) solicit other agency input on the database; (3) make the database available to the public; and (4) use the database to re-examine disposition of these sites. On January 11, 2001, the Secretary of Energy made public initial lists of sites, including beryllium vendors, DOE sites that used radioactive materials, and facilities where atomic weapons workers may have been employed. The list names 317 sites in 37 states, Puerto Rico, the District of Columbia, and the Marshall Islands. [66 FR 4003]

- **Make critical information available to offsite entities**. DOE needs to work proactively with affected parties, including states, Tribes, and local communities, to make information available to allow them to be informed and serve an appropriate role in long-term stewardship. In this way, the information needed for site-specific long-term stewardship activities can be readily identified and utilized as early as possible. This would reduce information management costs during cleanups, help ensure that adequate baselines are established, and ensure that information transfer protocols are established well before all projects at a site are complete. At the same time, sites should work with the offsite entities to improve long-term preservation and access. DOE sites have begun to establish formal agreements to share and disseminate critical information with regulators and local communities. For example, the Rocky Flats Cleanup Agreement among DOE, EPA, the State of Colorado, and several local governments required DOE to create a database of monitoring data and related documents that is accessible to all parties to the agreement. The short-term objective of the database is to improve the effectiveness and efficiency of current monitoring programs, while the long-range goal is to integrate all environmental and natural resource monitoring at the site.[89]

Public Comments Providing Recommendations for Historic Sites or Museums at DOE Sites (see Exhibit 2 in Appendix C)

- DOE should evaluate establishing historic sites or information centers or museums to perpetuate knowledge of residual contamination and institutional controls with the following characteristics and functions: (16, 17, 19, 24, 29, 34, 38, 42)
  - Modeled after Presidential libraries with museum and research facilities
  - Maintain information and enhance community awareness
  - Serve as educational and research centers that work with research and development program
  - Assist in maintaining engineered and institutional controls
  - Transmit information into the future
  - Maintain a DOE presence at the site
- Museums or information centers could be funded by a DOE trust fund (38)

[89]Rocky Flats Cleanup Agreement, Part 23, Sampling and Data/Document Availability. July 19, 1996.

- **Establish historic sites or museums**. One mechanism for perpetuating knowledge of residual hazards and institutional controls would be to establish information repositories at historic sites or museums at appropriate sites or in local communities. Museums already exist at certain DOE sites (e.g., Hanford, Los Alamos National Laboratory, Oak Ridge National Laboratory, Sandia National Laboratory), although information management is not currently part of their mission. Such museums could be modeled after the Presidential libraries, which have both museum and research facilities. The combination of a continued DOE presence and library, archive, and educational functions could assist in maintaining institutional controls and transmitting information to the future. The advantages and disadvantages of establishing a museum should be assessed on a site-specific basis.

Information Management Systems at the Bureau of Land Management (BLM)

Although BLM does not have a long-term stewardship program in place, its current information management systems and practices have the potential to support long-term stewardship planning and implementation. BLM operates an extensive land use information management system and possesses expansive current and historical information about land ownership, use, and condition in the United States. The Bureau maintains cadastral survey and historical data on lands patented, along with information on the mineral estate, resource conditions, and permits or leases on federal lands. BLM also provides other agencies, customers, and the public with efficient and effective means to retrieve and use this information. Preserving records is critical to resolving ownership disputes and are an important source of both historic and resource information.

BLM is using information technology to speed up workflow, improve accuracy, and share information with customers, agency partners, and the public. Determining user needs, developing systems, collecting and storing data, maintaining systems, and providing for security and training is part of the information technology development process at BLM. BLM uses geospatial tools, including geographic information systems, mapping, remote sensing, and global positioning systems, to acquire and process information. Land managers can use the information to determine the location, extent, and condition of natural resources and to monitor activities on public lands. To respond to demands for faster and more accessible records, the Bureau's land ownership, land status, and other records are being automated. Deployment of this automated system, known as the Automated Land and Mineral Record System (ALMRS), began in fiscal year 1998.

Source: U.S. Department of Interior, Bureau of Land Management, *http://www.blm.gov/nhp/what/index.htm*

- **Modify existing records retention schedules to meet long-term stewardship information needs**. Federal records retention schedules establish specific requirements for preserving and destroying records, including the length of time records must be retained in an archival repository. Retention times for information critical to long-term stewardship range from essentially zero (e.g., information for obsolete facilities and infrastructure is required to be destroyed immediately)[90] to essentially forever (certain records of injuries and residual hazards are required to be retained permanently). Thus, retention times for some critical data should be examined and adjusted to meet long-term stewardship needs. The EM program has begun discussions with the DOE Chief Information Officer to modify DOE records retention schedules to better meet long-term stewardship needs.

- **Develop appropriate indexing and metadata standards**. The term "indexing" refers to the process of referencing the content of records through keywords, subject codes, and other

[90] *DOE Records Retention Schedule 14: Design and Construction Drawings and Related Records.*

identifiers. The term "metadata" refers to the content, quality, condition, and other characteristics of data, particularly for electronic formats. Metadata and indexing provide important contextual information (e.g., where and when data were collected, quality assurance protocols, uncertainties in the data) necessary for interpreting and using information. While certain standard indexing and metadata protocols exist,[91] specific protocols could be developed for DOE issues and residual hazards. The Office of Long Term Stewardship has established a Central Internet Database that provides available information on waste, contaminated media (e.g., water, soil, sediments), spent fuel, materials in inventory, and facilities.[92] The system for referencing these data provides a starting point for developing a more comprehensive referencing system for long-term stewardship data.

[91]For example, Executive Order 12096, *Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure* directs federal agencies to ensure that all geospatial data are collected in a manner that meets all relevant standards adopted by the Federal Geographic Data Committee, an interagency committee established by the Office of Management and Budget.

[92]Available at *http//cid.em.doe.gov*.

Information Management Requirements for the Proposed Geologic Repository at Yucca Mountain

NRC has proposed licensing criteria for disposal of spent nuclear fuel and high-level radioactive waste in the proposed geologic repository at Yucca Mountain. As proposed, prior to permanent closure of the repository, DOE would be required to provide to NRC a detailed description of the measures to be employed (e.g., land use controls, construction of monuments, preservation of records) to regulate or prevent activities that could impair the long-term isolation of emplaced waste within the geologic repository and to assure that relevant information will be preserved for the use of future generations. Specific information management requirements proposed by NRC include:

- Identification of the site and geological repository operations area by monuments that have been designed, fabricated, and emplaced to be as permanent as is practicable.
- Placement of records in the archives and land record systems of local, state, and federal government agencies, and archives elsewhere in the world, that would be likely to be consulted by potential human intruders–such records to identify the location of the geologic repository operations area, including the underground facility, boreholes, shafts, and ramps, and the boundaries of the site, and the nature and hazard of the waste.
- Preservation and maintenance of geologic, geophysical, geochemical, hydrologic, and other site data that are obtained during the operational period.
- Preservation and maintenance of records of the receipt, handling, and disposition of radioactive waste are required to contain sufficient information to provide a complete history of the movement of the waste from the shipper through all phases of storage and disposal.
- Preservation and maintenance of records of the construction of the geologic repository operations in a manner that ensures their usability for future generations.
- Preservation and maintenance of records associated with a program of material control accounting and accidental criticality reporting.

Each record must be legible throughout the retention period (specified by NRC regulations). The record may be the original or a reproduced copy or a microform provided that the copy or microform is authenticated by authorized personnel and that the microform is capable of producing a clear copy throughout the required retention period. The record may also be stored in electronic media if it is capable of producing legible, accurate, and complete records during the required retention period. Records such as letters, drawings, and specifications must include all pertinent information such as stamps, initials, and signatures, and DOE is required to maintain adequate safeguards against tampering with and loss of records.

Source: 64 FR 8639, February 22, 1999. Disposal of High-Level Radioactive Wastes in a Proposed Geological Repository at Yucca Mountain, Nevada; Proposed Rule, Nuclear Regulatory Commission, Proposed 10 CFR Parts 2, 19, 20, 21, 30, 40, 51, 60, 61, and 63.

- **Develop a system to facilitate public access to and retrieval of critical information**. A system should be developed to enable a person with limited knowledge of DOE sites to be able to easily search, find, and understand relevant information. An effective system might include both "hard copy" and electronic elements. An effective "hard copy" system might include information centers or displays at the site or in nearby communities, maintenance of site files in local libraries, and periodic updates of all hard-copy materials and records indices. An effective electronic system might include (1) an electronic archive where digitized copies of all critical records are kept; (2) an electronic index consisting of a standard thesaurus of reference terms, uniform metadata, and consistent geospatial referencing; (3) a system for delivering electronic copies of records to its user;

(4) a user interface with a search engine to identify and locate relevant records; and (5) a maintenance system to ensure that electronic technologies remain current. The Central Internet Database provides a step in this process. The overall system also may include periodic training and education of local librarians and other information management professionals.

Communication Through Time Using Non-Electronic Means

Suggestions on information management presented in this section are intended to supplement, but not replace, existing protocols established by authorities such as the National Archives and Records Administration. Due to the ephemeral nature of electronic technologies, the electronic archiving of long-term stewardship data will not, by itself, provide a secure means to transfer information critical to long-term stewardship to future generations.

The Department intends to use non-electronic means such as monuments and markers to communicate information through time. For example, DOE intends to provide archived records, maps, and other information pertaining to the Waste Isolation Pilot Plant in New Mexico to be stored at many locations around the world. At the site itself, DOE also will institute a number of passive controls to warn future generations about the radioactive hazards present in the below-ground repository. These controls will not need continual maintenance, but assume that society in general will maintain some knowledge of the wastes. The controls will include:

- Granite monuments with inscriptions in seven languages.
- A berm surrounding the site that includes radar and magnetic indicators.
- On-site warning markers with information about the waste.
- Informational inscriptions on granite walls.

Source: *Citizens' Guide to the Waste Isolation Pilot Plant Compliance Certification Application to the EPA*. U.S. Department of Energy, Carlsbad Area Office, Carlsbad, NM, November 1996. DOE/CAO-96-1207.

Other organizations have begun to examine approaches for both thinking and communicating across large periods of time. For example, the Long Now Foundation (*http://www.longnow.org*) was established in 1996 to develop the Clock/Library Projects as well as to become the seed of a very long term cultural institution. The foundation is developing a large, mechanical "10,000 Year Clock" to serve as an iconic focal point for thinking about time. The foundation also intends to establish a library of and for the future to meet the need for content to accompany the long-term context provided by the Clock. The library could become a repository for information deemed especially useful over long periods of time, such as extreme longitudinal scientific studies or 'Responsibility Records' of policy decisions with long-term consequences.

- **Integrate information management considerations into all site missions**. Under current business practices, information management is considered a "support" or "overhead" function that is adjunct to DOE site missions. It is not given commensurate priority with project completion. This is likely to continue until DOE recognizes information management as an integral and critical part of *all* missions, including national security, cleanup, and long-term stewardship. Such recognition could be achieved by including information management needs in all business transactions. DOE has not initiated a specific effort to projectize information management. However, the Office of Long Term Stewardship has identified information management as a high-priority science and technology need (see Chapter 4).

7.3 Developing an Institutional Framework for Managing Critical Information

Although DOE sites can take many steps now toward improving information management practices, a more systematic approach may be needed to coordinate and focus efforts throughout the DOE

complex. The necessary framework would include an organization, or a network of organizations, which would have the authority, mission, and funding to identify, preserve, and provide access to information critical to long-term stewardship. There are three general options for developing such a framework: dispersed, concentrated, and hybrid (Exhibit 7-2).

Exhibit 7-2. Options for an Institutional Framework to Manage Critical Information

Option	Advantages	Disadvantages
Dispersed – multiple, regional or site-specific entities would be responsible for managing information. No central management entity would exist.	Most flexible alternative. The number, structure, and responsibilities of entities could be matched with site-specific needs.	Coordination among numerous entities would be difficult. Difficult to ensure that existing and future requirements, standards, and protocols are being followed. Configuration control would be difficult.
Concentrated – a single, national entity would be responsible for managing information. No site-specific entities would exist.	Relatively easy to maintain standards and practices and to ensure technologies are current. Configuration control would be maximized.	Least flexible alternative. Uniform approach to diverse, site-specific information management needs may not be appropriate.
Hybrid – some information management responsibilities would be concentrated in a single entity; others would be dispersed among multiple, site-specific entities.	Intermediate in terms of flexibility and coordination. A single entity could maintain overall responsibility for managing system (e.g., ensuring standards and protocols are followed, updating technologies). Other entities could be responsible for specific types of information (e.g., local governments could manage real estate records, regional libraries could serve as information repositories).	

Finding the appropriate balance between localized (dispersed) and centralized strategies for the archival and management of information will be challenging. The architecture of the World Wide Web provides a useful model for discussion – the servers upon which databases reside represent the data archives; the internet represents the means of accessing data; search engines represent the means of finding data; and desktop computers represent the points of access. Search engines can be updated rapidly, and it clearly would be advantageous for points of access to be widely dispersed. The more difficult choice is how to distribute critical information among one or more servers. On the one hand, there appears to be a clear need for one or more central repositories as a backup so that failure of one or more local or regional servers does not result in information loss. A central repository also would provide maximum configuration control over data, hardware, and software. On the other hand, long-term stewardship information needs and preferences for archiving and disseminating this information will be somewhat regional or site-specific, so a degree of flexibility in the design of databases and search engines will likely be needed. This, in turn, would make configuration control more difficult, especially with respect to hardware and software. The ultimate solution is likely to be some type of hybrid between dispersed and central control, but more dialogue among DOE and affected parties is needed before these issues can be resolved.

Other federal agencies have established institutional frameworks for managing stewardship information. NRC procedures for transfer of information (10 CFR Part 61.80) provide an approach that could be used to improve information management at DOE sites. NRC requires records to be maintained for the duration of the license. Upon termination of the license, information is to be transferred to local, state, and federal agencies, unless the property is being transferred to another licensee. The NRC nuclear material safety and safeguards criteria note that any transfer of land for restricted use by a licensee should be accompanied by a transfer of information and information management procedures for the property.[93] The Bureau of Land Management has established information management systems for its land records. The National Park Service has established a Geologic Resources Department to manage data and information for more than 2,400 sites in the Abandoned Mine Lands Program.[94] The Geologic Resources Department is currently in the process of collecting information on these sites, and the Department is anticipated to remain in operation for the duration of remedial activities at the Abandoned Mine Lands Program sites, which will be at least several decades.

[93]*Nuclear Material Safety and Safeguards, Decommissioning, Chapter 16.0, Restricted Use/Alternative Criteria*. Nuclear Regulatory Commission, NUREG-1727, September, 2000.

[94]U.S. Department of Interior, National Park Service, *www1.nature.nps.gov/facts/faml.htm.*

Information Management Systems for Radioactive Waste Disposal Sites

The International Atomic Energy Agency has issued guidance for developing a system for maintaining information pertaining to near surface radioactive waste disposal sites and geologic repositories. The guidance calls for the identification of:

- The types of information of most value to future generations.
- The physical form, location, indexing, and retention schedules for this information.
- Measures to be taken to ensure the continued collection and maintenance of records.
- A schedule for transfer of the collected information into a Records Management System (RMS) during the lifetime of the site.
- Methods to ensure that the information will remain accessible and understandable to future generations.
- Remedial actions to be taken in the event of records deterioration.

The guidance advocates establishing a hierarchal structure of long-term stewardship information for disposal sites, including:

- A Primary Level Information Set, consisting of all of the records continuously developed during the lifetime of the site.
- An Intermediate Level Information Set, consisting of the condensed important documentation that is necessary to ensure an understanding of the disposal site system and the contents and location of the Primary Level Information Set. This data set consists mainly of the records needed to meet the regulatory and licensing requirements of the disposal site.
- A High Level Information Set, consisting of the information sufficient to provide a more fundamental understanding of the disposal system. This data set should provide sufficient information for future generations to make informed decisions concerning the consequences of intentional actions and unforeseen occurrences pertaining to the disposal site.

The rationale for creating a hierarchal structure of information, rather than managing all of the information in a single manner, is to ensure that information most critical to future generations is preserved. A condensed and essential set of data may be more useful and understandable to future generations than a massive archive of both essential and nonessential information that would be provided by a Primary Level Information Set. The guidance advocates national and international archiving of the High Level Information Set to counteract threats to a single repository of information.

Chapter 8: Funding and Financial Management

Estimating future costs for long-term stewardship remains uncertain. The *Report to Congress on Long-term Stewardship* provides the Department's most recent estimate. The estimates in the *Report to Congress* are based on the known or anticipated scope of long-term stewardship activities at individual sites, which, in turn, are based on known or anticipated cleanup end states. The funding options for long-term stewardship will depend partly on the magnitude of estimated long-term stewardship costs. However, regardless of this estimate, some consideration of how long-term stewardship will be funded is warranted. Congress currently funds most environmental cleanup and stewardship activities through annual budget appropriations for the EM program. As EM completes more cleanup projects, many DOE sites (or portions of sites) will close or may be transferred to different entities. DOE and other site stewards might have to secure and maintain funding to conduct stewardship activities, but the long-term and uncertain nature of those activities complicates the ability to estimate long-term funding needs.

APPLICABLE SCOPING COMMENTS
(see Exhibit 2 in Appendix B)

- DOE should describe funding approaches available for long-term assurance oversight without relying on Congressional appropriations (1)
- DOE should seek alternative funding for long-term stewardship in terms of trust funds or endowments, fee-generating schemes, etc. because Congressional appropriations are uncertain (4)
- DOE should explore the option of setting up funding for long-term stewardship separately from operational and programmatic funding for the contractors, and supported by a source not subject to the annual appropriations process (16)
- DOE should consider forming a joint long-term stewardship assessment group involving state and Tribal governments and other stakeholders to independently conduct long-term stewardship under a "trust" funding mechanism (17)
- DOE should not consider decisions requiring institutional controls to be final until an acceptable funding mechanism is implemented (STGWG)

APPLICABLE ISSUES
(see Exhibit 3 in Appendix B)

3. Funding Mechanisms

This chapter reviews DOE's current approach to estimating costs for long-term stewardship. It also examines current funding practices, as well as several alternative approaches.

8.1 Estimating Long-term Stewardship Costs

Estimates of long-term stewardship costs will need to account for routine activities (e.g., surveillance, monitoring, and periodic repairs or refurbishment of engineered systems) as well as any periodic large-scale replacement of systems (e.g., large capital outlays). Funding for routine activities is often referred to as "operational" funding; funding for unexpected or unusual needs is often referred to as "contingency" funding. Because long periods of time may be involved, long-term stewardship cost estimates also need to consider economic factors affected by time (e.g., inflation, "discounting" to account for the value of money over time). In some cases, it may be beneficial to consider non-monetary costs or qualitative cost comparisons in decisions that affect long-term stewardship.

Current Estimate of Long-term Stewardship Costs at DOE Sites

DOE's current estimate of long-term stewardship costs is presented in the *Report to Congress on Long-term Stewardship*. According to this report, the Department currently spends approximately $64 million annually on long-term stewardship and expects to spend approximately $100 million annually when all EM program cleanups are completed (see below).

- Costs are presented in constant 2000 dollars.
- Although the use of life-cycle costs has been the normal method of presenting cost information since the Department's first baseline report in 1995, annual costs are used instead. Defining "life-cycle costs" for the long term is not meaningful in most cases because there is no clear end point for long-term stewardship.
- Although long-term stewardship will be needed in perpetuity at many sites, costs are reflected only through 2070. These cost estimates should be viewed as an indicators of the "magnitude" of the projected long-term stewardship costs rather than a point where all long-term stewardship activities will end.
- Cost estimates for some sites include operational and contingency funding; estimates for other sites include operational funding only.

Cleanup status	2000		2006		2050	
	No. Sites	Estimated Cost	No. Sites	Estimated Cost	No. Sites	Estimated Cost
Entire site complete	34	$64 million	96	$65 million	129	$101 million
Some portions complete	12		12			
Surface complete Subsurface not complete	12		17			

Source: *Report to Congress on Long-term Stewardship*. U.S. Department of Energy, Office of Environmental Management, January 2001 (DOE/EM-0653).

DOE's current approach to estimating long-term stewardship costs follows the general approach used for developing the DOE's annual budget. DOE field office staff and their contractors prepare annual cost estimates for EM program activities (including long-term stewardship). These cost estimates are developed for individual projects and include either a single, integrated baseline or several interrelated baselines. The project baseline(s) identify objectives, information needs, and performance measures; estimate annual and "life-cycle" costs;[95] and establish overall schedules and major milestones.[96] Sites use a variety of techniques to develop cost estimates for the current 70-year planning time frame, including activity-based cost estimating, parametric estimating techniques, and extrapolations based on current funding levels. EM's baselines provide accurate information on long-term stewardship costs for the 26 sites currently managed by the Grand Junction Office (i.e., sites where the only EM mission is long-term stewardship). However, the accuracy of long-term stewardship cost estimates may be highly variable.

[95]The"life cycle" planning horizon for the EM program is currently 70 years. Within this time frame, all EM cleanup projects are anticipated to be completed; however, this time frame is not intended to encompass the life cycle of long-term stewardship, which may be hundreds or even thousands of years.

[96]*Integrated Planning, Accountability, and Budgeting System Information System (IPABS-IS) Guidance*. U.S. Department of Energy, Office of Environmental Management, December 1999.

Public Comments Providing Recommendations for Estimating Long-term Stewardship Costs (see Exhibit 2 in Appendix C)

- Subject long-term stewardship programs to aggressive cost-benefit analyses (8)
- Include the generation of legacy waste/contamination and their associated costs from current operations (11)
- Clearly articulate non-monetary costs and uncertainties in the process of selecting cleanup strategies (12)
- Extend cost analyses for time periods equivalent to the required duration of institutional controls (13)
- The present-worth method hides actual costs (13)
- Conduct research into costing and cost comparison methodologies that account for long-term expenditures (29)
- Separate costs of stewardship, closure, and operating activities to develop a record of actual costs that will inform and improve estimates (29)
- DOE's long-term stewardship obligations will be higher if on-site waste treatment and disposal facilities are used instead of commercial facilities (44)
- Long-term stewardship cost estimates should include a factor for natural resources damages liability under CERCLA and an explanation of how natural resources damages are estimated (49)
- The *Study* should clarify whether costs to states and local governments were included and whether such entities were consulted on their perceived needs (40)
- The *Study* should address what can be done to reduce uncertainty (4)
- The "full life-cycle accounting" that DOE uses to evaluate alternatives does not provide an accurate estimate of future long-term stewardship costs. While the DOE's definition of life-cycle currently extends 70 years, many DOE sites will remain under stewardship for much longer periods of time (50)
- This section should include a full analysis of non-economic life-cycle impacts (1)
- The *Study* should include the cost estimates in the NDAA Report and DOE should commission an independent assessment of long-term stewardship costs (24)
- The importance of a complex-wide evaluation of science and technology needs highlights the need for a cost estimate of stewardship activities that are national, rather than site-specific, in nature (29)
- There is a need for research on life cycle cost estimation and cost comparison methodology that accounts for long-term expenditures (29)
- NDAA cost estimates should include estimates for remedy reevaluation and rework in the 2030 to 2050 timeframe (29)

EM's baselines provide a tool for managing cleanup activities more efficiently. They are used to coordinate schedules, identify regulatory compliance requirements, and identify science and technology needs. Similar estimates could assist DOE's long-term stewardship program to secure and manage its resources efficiently. However, the current approach for estimating life-cycle costs, an activity-based cost approach, needs more and better data for long-term stewardship than are currently available (Exhibit 8-1). Given these data limitations, DOE has undertaken several efforts to improve its ability to estimate long-term stewardship costs:

- **DOE has developed a 'Post-Closure' Project Baseline Summary**. Guidance for preparing the EM life-cycle estimates directs sites to prepare an independent 'post-closure' Project Baseline Summary (PBS)[97] by Fiscal Year 2003. At sites where this PBS is implemented, as cleanup projects are completed, budget requests, cost estimates, and performance metrics for

[97] A PBS is a management tool used by the EM program for planning, budgeting, and evaluation. The PBS summarizes information on the scope, schedule, cost, risk, technical approach, end state, regulatory drivers, safety and health, and performance metrics of each EM program project.

Exhibit 8-1. Limitations of the Activity-Based Cost Approach for Estimating Long-term Stewardship Costs

- DOE's activity-based cost estimation approach is derived from large capital projects that generally have a well-defined beginning and completion. In contrast, the beginning of many long-term stewardship projects is difficult to determine, and the end of long-term stewardship is difficult to estimate due to the uncertainties in planning that far into the future.
- Activity-based cost estimates become more accurate when there is a clear understanding of the type, number, and timing of activities to be undertaken. The major determinants of the accuracy of cost estimates are the status of the project in terms of completion and what uncertainties remain. Cost estimates for some DOE sites (e.g., uranium mill tailings sites managed by the Grand Junction Office) are reasonably accurate because: (1) the sites have clearly defined long-term stewardship needs; (2) cleanups have been completed and the sites already are in long-term stewardship; and (3) mill tailings disposal cells are relatively simple systems compared to systems at other sites.
- Knowledge of historical costs can assist DOE in projecting costs for future stewardship activities. However, DOE's historical cost knowledge is limited because: (1) DOE has encountered a limited portion of the long-term stewardship scope that will ultimately be needed; and (2) most long-term stewardship costs for work completed to date have not yet been formally defined.
- Long-term stewardship may involve costs or situations that are not accurately estimated with activity-based cost estimation techniques. These include non-traditional costs associated with damage to or lost use of environmental resources and changes in long-term stewardship needs.

the follow-on long-term stewardship activities will be shifted into this PBS.[98] This information base will continue to grow as DOE makes more cleanup decisions, completes more cleanup activities, and develops more experience with long-term stewardship. Separating long-term stewardship costs explicitly from the costs of cleanup and other site operations will provide a basis of actual cost data for improving estimates of future costs. As confidence in the activity-based baseline estimates of long-term stewardship costs increases, DOE may be able to explore efforts to include additional cost factors, including impacts to natural resources, opportunity costs, and benefits of infrastructure re-use.

- **DOE is working to improve cost estimates based on existing data**. DOE recently began to develop and implement a more standardized methodology for defining and estimating long-term stewardship costs based on the Environmental Cost Element Structure (ECES).[99] DOE and other federal agencies developed ECES to provide a consistent framework for estimating and managing

[98] *Integrated Planning, Accountability, and Budgeting System Information System (IPABS-IS) Guidance*. U.S. Department of Energy, Office of Environmental Management, December 1999.

[99] The ECES is the result of an inter-agency effort to develop a standardized method for estimating and tracking environmental management costs. DOE's Applied Cost Engineering (ACE) team has worked with representatives from the EPA and the U.S. Army Corps of Engineers to develop a comprehensive, hierarchical list of work activities (e.g., tasks, items, products) that may be required to accomplish cleanup projects. Its activity-based structure provides a consistent and visible cost management framework, with sufficient detail and coverage of project types, to track project costs and summarize into higher-level cost elements in a standardized fashion. Although additional efforts would be required to adapt ECES to long-term stewardship activities, ECES could serve as a model for developing a Work Breakdown Structure for long-term stewardship.

environmental management costs. The National Energy Technology Laboratory Center for Acquisition and Business Excellence (CABE) is currently leading efforts to develop separate modules for long-term stewardship. A web-based ECES is also being developed as a data repository for actual environmental management costs, including long-term stewardship. The CABE will maintain the ECES database and perform quality control and analyses on the data as required. In 1999, the Rocky Flats Site developed an activity-based methodology to estimate their annual long-term stewardship costs. DOE's Grand Junction Office develops activity-based annual cost estimates for the long-term stewardship activities it currently conducts at DOE sites. These estimates are based on the guidance issued under DOE's Order 430.1A, Life Cycle Asset Management.[100]

- **DOE is using available cost estimation techniques**. DOE sites are using cost estimation techniques other than activity-based techniques to develop and improve long-term stewardship cost estimates. One technique is the *level of effort* estimate that considers certain long-term stewardship activities as a maintenance or operating mission rather than a series of individual projects. Another technique is the *parametric estimate* that generates estimates based on historical long-term stewardship costs combined with a set of reasonable programmatic assumptions (e.g., factors to adjust for the relative size and complexity of sites and activities).

Given the limitations of available data, considerable uncertainty will be associated with any long-term stewardship cost estimates. DOE could employ statistical uncertainty or scenario analysis to identify this uncertainty more explicitly (i.e., estimate upper and lower bounds for long-term stewardship cost estimates). To develop the upper and lower bounds, DOE could also measure the uncertainties related to long-term stewardship costs using statistical tools such as Monte Carlo modeling in a process similar to that used by DOE for the FY 1999 Consolidated Financial Statements (Exhibit 8-2).

Exhibit 8-2. Use of Statistical Analysis to Establish Upper and Lower Bounds for Cleanup Cost Estimates

During the formulation of the FY 1999 Consolidated Financial Statement, DOE initially scored programmatic risks to assign an uncertainty range for each applicable cleanup activity. The approach assumed three key factors influenced cost uncertainty:

- Project definition, the level of site-specific information and engineering available;
- Innovation, the extent to which the project relies on "tried and true" vs. new technical approaches; and
- Complexity, the number of process steps needed to execute a project.

Projects with high uncertainty in each of the three factors have the largest range of costs, whereas projects with low uncertainty in each factor have the smallest range of costs. Given cost ranges for each project, DOE used the Monte Carlo simulation to develop a cost uncertainty range for the total life-cycle costs.

[100] *1999 Long-term Surveillance and Monitoring Report*. U.S. Department of Energy Grand Junction Office, April 2000.

8.2 Potential Funding Mechanisms

The long-term and uncertain nature of long-term stewardship activities presents challenges not only for estimating costs but also for identifying sustainable funding mechanisms. This is one of the most frequently identified concerns from DOE advisory groups and the public. DOE's EM program currently requests and receives funds for long-term stewardship activities through the annual federal budget appropriations process. The federal budget process allows an annual debate about national priorities that results in funding appropriations for long-term stewardship and all other government functions. A number of commenters have expressed the concern that the annual budget process does not provide guaranteed funding for long-term stewardship activities. Where non-federal entities become site stewards, other mechanisms also may be needed to facilitate the dialogue on funding priorities.

Public Comments Providing Recommendations for Long-term Stewardship Funding (see Exhibit 2 in Appendix C)

- DOE should pursue reliable long-term stewardship funding that does not rely upon annual appropriations (6, 7, 11, 17, 19, 24, 25, 29, 30, 32, 34, 43, 44, 45, 50)
- Long-term stewardship budgeting and management should be uniform throughout the complex (13)
- DOE should consider alternative funding mechanisms, including: (1, 4, 7, 23, 24, 25, 27, 33)
  - perpetual care and maintenance closure trust funds
  - trust funds managed by an outside entity and trust funds created throgh the sale or lease of DOE's assets
  - escrow accounts
  - combination of trust funds and fees
  - entitlement fund or Executive Order requiring sufficient funding
- DOE should conduct research on long-term stewardship costs and funding mechanisms, including required statutory authorities and uncertainties (1, 7, 28, 44)
- DOE should commit to funding for long-term stewardship, and the local community should have a role in managing the funds (20)
- DOE should commit to providing financial assistance to state and local governments regarding long-term stewardship activities (6, 15, 18)
- DOE should formally involve the public in planning and implementation, use actual cost data to drive research and development, and use life-cycle planning (26)
- DOE should provide information and guidance on the appropriate mechanisms for funding and long-term operation and maintenance at information centers (36)
- DOE should provide adequate funding for tracking illnesses and caring for exposed people (5)
- Our generation should consider funding mechanisms to complete true cleanup (44)
- The *Study* should outline a specific set of tasks DOE will perform to facilitate the resolution of long-term stewardship funding issues at sites (19)
- The *Study* should address the issues associated with funding alternatives, including cost inflation (1, 3, 22)
- The *Study* might better distinguish between operational funding and contingency funding (4, 25)
- The report should address DOE's funding uncertainties and specify reevaluation of selected remedies and continued funding, not just on the CERCLA five-year interval (1, 28, 44)
- DOE should work with local and state communities and organizations to develop LTS funding. Funding could be directed to LTS organizations to fulfill DOE's obligations as part of a broader charter (17)
- The "Rolling Stewardship" concept must include monitoring of financial performance to be truly effective (26)

There are several alternative approaches to funding long-term stewardship, depending upon the entity responsible for conducting the long-term stewardship. This report assumes that the primary responsibility for funding long-term stewardship will continue to be assigned to the federal government, although states, Tribes, local governments, and private parties may assume some financial responsibility for particular sites or parcels of land that are transferred to their control or ownership. Consequently, the funding alternatives discussed reflect the range of options available to DOE or another federal agency.

Resources for the Future Study of Trust Funds

A new analysis by Resources for the Future looks critically at the potential use of trust funds administered by the federal government, states, or private organizations as a means for funding long-term stewardship. The study concludes that state and private trust funds are more likely than a federal trust fund to successfully assure financing and oversight of long-term stewardship. It is unclear whether federal agencies currently have the legal ability to use federal funds to finance state or private trusts. According to the study, the biggest weakness of federal trust funds is that the terms could be changed unilaterally in the face of political or economic pressures. This could lessen the certainty that money will be available when needed. The authors of the report conclude that private charitable trusts are the preferred option for funding long-term stewardship, with state and local trust funds close behind. The analysis:

- Calls for new research into the legal considerations involved in establishing trusts that are funded by the federal government but administered by other entities.
- Urges EPA to develop a coherent and transparent long-term stewardship program that spells out what is required and who is responsible for actions at sites under its jurisdiction.
- Recommends that EPA and other federal agencies develop estimates of the annual costs of long-term stewardship for private and federal sites.

Source: *Long-Term Stewardship of Contaminated Sites: Trust Funds as Mechanisms for Financing and Oversight*. Carl Bauer and Katherine Probst, Resources for the Future, Discussion Paper 00-54, December 2000.

For this *Study*, DOE identified four types of funding mechanisms that could be used to support long-term stewardship activities at current and former DOE sites. These alternatives are described briefly below and in Exhibit 8-3. These alternatives are not mutually exclusive, and Congress could decide to fund long-term stewardship activities through a variety of mechanisms. For example, annual appropriations might be used for operational funding (routine activities), while other funding mechanisms might be used for contingency funding to cover unusual or unexpected needs.

1. *Annual Congressional Appropriations*. DOE would prepare a proposed budget for long-term stewardship that would be submitted to the Office of Management and Budget (OMB). After review and revisions carried out in negotiations among DOE, OMB, the Department of the Treasury, and the Executive Office of the President, a budget for long-term stewardship could be included in the President's budget proposal to Congress. The Congressional Committees with jurisdiction over DOE funding would review the budget proposal and could adjust funding levels, increase or decrease funding for particular activities or sites, and add or eliminate programs.

2. *Long-term Stewardship Funds(s)/Escrow Account.* Establishing a long-term stewardship trust fund (or funds) or escrow account would address the uncertainty associated with the annual appropriations process by producing a consistent, predictable funding source for long-term stewardship activities. DOE would need new legislative authority to establish such accounts. Annual funding would be provided from trust fund/escrow account income or escrow account principal. The trust funds or escrow accounts could be created at the

Exhibit 8-3. Potential Mechanisms for Funding Long-term Stewardship

Description	Advantages	Disadvantages
Annual Congressional Appropriations		
• DOE prepares a proposed budget and submits to the Office of Management and Budget (OMB); after review and revisions by OMB and Congress, funding appropriated for long-term stewardship	• Currently in place • Provides process with annual feedback that helps to optimize the amounts of funds provided • Burden of funding shared by current and future beneficiaries of long-term stewardship activities • Potentially able to respond quickly to unexpected costs or programmatic risks through increases in the next annual appropriation or re-allocation of spending • More funding may be available for long-term stewardship as cleanup is completed at other sites • Annual debate on national funding priorities	• High annual transaction costs (e.g., budget preparation) • Short planning horizon • Funding subject to significant uncertainties • May be decreased incentives to fund long-term stewardship as other site missions end
Long-term Stewardship Trust Fund(s)/Escrow Accounts/Investment Fund		
• Funds provided in single-year or multi-year contributions (public or private) • Once appropriated, the monies are typically managed in some type of trust fund • Long-term stewardship activities funded through an earnings stream	• Already familiar (more than 150 of such funds are currently in existence) • Transaction costs would be likely lower than annual appropriations • Annual budgets more predictable • Allows multi-year planning and budgeting • Ability to respond to unexpected costs or programmatic risks will depend on terms of the trust and the size of the trust's earnings stream	• Requires new statutory authority for initial appropriation and Congressional legislation to allow DOE or site steward to manage fund and use earnings • Difficult to estimate the "correct" funding level accurately to account for uncertainty and cost inflation (see Section 3.1.1); need to ensure funding levels could be adjusted in later years • Even if the "correct" amount of money is initially funded, invested funds could be managed too conservatively or too aggressively • Money in trust funds can be held back (not spent) in order to balance the federal budget

Exhibit 8-3 (continued)

Description	Advantages	Disadvantages
Fees from DOE Commercial Activity/Sales of Assets		
• DOE or other site stewards use fees generated from commercial activities (e.g., waste treatment or disposal) to fund long-term stewardship • Fee-based approach is more likely to occur under a public-private partnership approach. • DOE or other site stewards allowed to sell property or other site assets (e.g., mineral resources) to pay for long-term stewardship • Profits and fees are maintained in the DOE-wide long-term stewardship program	• Mechanisms to direct the sale of federal assets to specific spending exist and are understood • Sales would raise non-federal funds (i.e., private capital) to pay for long-term stewardship • Sales at one site could fund activities at multiple sites	• Congressional action required for a federal agency to conduct commercial activities or to retain asset sale proceeds • Asset sale is a one-time event, whereas long-term stewardship activities occur over a long time; sale proceeds could be insufficient • DOE would need to monitor the site to ensure private-party operations are in compliance with long-term stewardship needs • May be large transaction costs associated with asset sales and site monitoring after sales • Difficult to address unexpected costs or programmatic risks because of fixed levels of fees or saleable assets • Undetermined liability associated with waste management activities on DOE or post-DOE lands • Unfair advantage in competition with private enterprises
Public-private partnerships		
• Private entities would be allowed to lease or otherwise use site assets at below-market rates (perhaps with additional subsidies) in return for funding long-term stewardship activities	• Many of the same benefits as asset sales, with more control over assets that are leased vs. sold • Public-private partnerships already exist, have been successful, and would allow re-development of long-term stewardship sites • Deed or lease restrictions can require private, and not federal, funds to pay for long-term stewardship activities	• Congressional action required • DOE would need to monitor the site to ensure private parties are in compliance with long-term stewardship needs • Allowing development too close to residual hazards is still possible but less likely with an active partnership • Responding to unexpected costs or programmatic risks would be difficult, because it would need re-negotiation of public-private lease or contracts unless all potential contingencies are provided for in advance • Private entities can fail and go bankrupt, leaving increased federal liability

national, state, or site level. However, a larger number of funds could need larger and more expensive DOE oversight of fund management. The source of the initial funding for the trust fund or escrow account could be derived through a number of mechanisms, including Congressional appropriations and fees or asset sales (see below).

3. *Fees from DOE Commercial Activities/Sales of Assets.* DOE would generate revenue by selling property or other site assets (e.g., mineral resources) or by providing services such as waste storage, treatment, and disposal. The receipts from asset sales or fees for services could be collected in a fund that would support long-term stewardship activities on a site-specific or Department-wide basis. However, sales receipts would normally go to the general Treasury unless DOE received new legislative authority to retain the receipts.

4. *Public-Private Partnerships.* Private entities would be allowed to lease or otherwise use site assets at below-market rates (perhaps with additional subsidies) in return for funding long-term stewardship activities. These types of partnerships would need to identify sites with appropriate infrastructure and then carefully established leasing rates attractive to a private-sector entity. Leasing rates would need to take into account both the cost of conducting long-term stewardship activities as well as the risk associated with maintaining residually-contaminated areas in or around leased facilities. DOE would need new legislative authority to establish public-private partnerships.

Because alternatives 2, 3, and 4 would require specific Congressional action in the form of legislation or specialized appropriations, the viability of these alternatives is dependent upon Congress concluding that the annual budget process is inadequate for this purpose. Congress has provided DOE and other federal agencies with the authority to use alternative funding mechanisms for environmental activities:

- DOE currently contributes to two non-stewardship trust funds supporting future environmental cleanup activities: (1) the Nuclear Waste Fund to support the construction, operation, decommissioning, and final closure of a geologic repository for High-Level Waste and Spent Nuclear Fuel; and (2) the Uranium Enrichment Decontamination and Decommissioning (D&D) Fund to support the final cleanup of DOE uranium enrichment facilities. Note, however, that any DOE expenditures on the repository and the D&D Fund must be appropriated through the annual budget process. Both funds are supported by Congressional appropriations and by fees levied on utilities. The Uranium Enrichment D&D Fund also is the source of Title X Uranium/Thorium Program reimbursement funds. The Title X sites are a subset of the Title II UMTRCA sites, which will revert to DOE for long-term stewardship unless the host state assumes financial responsibility.

Long-term Stewardship Fees

Owners of sites subject to UMTRCA Title II must pay a one-time fee to the U.S. Treasury for long-term stewardship. The amount was established by NRC and is adjusted annually for inflation – it now is approximately $600,000. DOE does not receive these payments directly but instead submits a budget request to Congress to pay for long-term stewardship at these sites. Although these payments are potential sources for contributing to a trust fund for long-term stewardship, there is no legal mechanism to do so.

- The environmental restoration challenge grants program with the National Fish and Wildlife Foundation (NFWF) is one of the many tools used by the Bureau of Reclamation (BOR) to promote natural resource stewardship on BOR lands.[101] BOR uses challenge grants, where recipients match funds to encourage partnerships among federal agencies, Tribal governments, state and local governments, and other organizations, to help leverage funds from many sources. In 1999 the NFWF and BOR awarded 36 grants. Recipients matched funds with an average of 3.5 non-federal dollars for every federal dollar. Non-federal funds come from a variety of sources, including private firms, nonprofit organizations, Tribes, civic groups, and private land owners. All projects receiving these funds must be connected to the resources. BOR administers the funds.

- BLM is working in partnership with the EPA, state agencies, Tribal governments, private parties, and other interested groups to accelerate the rate of cleanup of watersheds affected by abandoned hard rock mines, using the approach outlined in the Interdepartmental Abandoned Mine Lands Watershed Initiative. Based on sources and availability of funding, BLM must first focus cleanup efforts on watersheds damaged by abandoned mines rather than on physical hazards associated with these sites. BLM works in collaboration with other government and private landowners in those watersheds to leverage their funds to clean up all mining sites affecting the watershed.[102]

8.3 Managing Available Funds

The procedures for managing long-term stewardship funds are likely to vary depending on the sources of funding, financial instruments, and contracting strategies. If Congress continues to provide funds through annual appropriations, it is likely there will be little change in current procedures for funding DOE cleanup and long-term stewardship activities. Funds will continue to be authorized, appropriated, and expended using procurement and grant-issuing procedures. However, different procedures will be needed if DOE utilizes alternative funding sources and instruments such as trust funds, commercial activity fees, or public-private partnerships. In addition, DOE and site stewards must consider appropriate contracting strategies for conducting long-term stewardship activities.

Several types of financial instruments could be used to manage funds for long-term stewardship. One type of fund with substantial precedent is Federal Trust Funds (Exhibit 8-4). Federal Trust Funds generally are accounting entities whose assets are not held separate from other federal funds or reserved exclusively for the designated purpose. This means Congress can use the funds to pay for other social needs or borrow against their assets. The majority of Federal Trust Funds are seeded with public funding generated through taxes or other user fees. It is unclear whether an analogous tax or user fee system could be established to support long-term stewardship activities. Congress generally requires the tax or user fee to be related to the problem addressed by the trust. The procedures for funding annual expenditures and reinvesting income are specific to each Federal Trust Fund and are established in their enacting legislative language.

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[101] *Resource Stewardship 2000*, U.S. Department of Interior, Bureau of Reclamation, *http://www.usbr.gov/stewardship*; *Sowing the Seeds of Success*, National Fish and Wildlife Foundation, 1999.

[102] U.S. Department of Interior, Bureau of Land Management, Abandoned Mine Lands Program, Frequently Asked Questions, *http://www.blm.gov/aml*.

Exhibit 8-4. Examples of Federal Trust Funds

- Nuclear Waste Fund (42 U.S.C. § 10222)
- Federal Old Age and Survivors Insurance Trust Fund (42 USC § 401(a))
- Federal Disability Insurance Trust Fund (42 U.S.C. § 401(b))
- Black Lung Disability Trust Fund (26 USC § 9501)
- Aquatic Resources Trust Fund (26 USC § 9504)
- Harbor Maintenance Trust Fund (26 USC § 9505)
- Inland Waterways Trust Fund (26 USC § 9506)
- Airport and Airways Trust Fund (26 USC § 9502)
- Highway Trust Fund (26 USC § 9503)
- Vaccine Injury Compensation Trust Fund (26 USC § 9510)
- Leaking Underground Storage Tank Trust Fund (26 USC § 9508)
- Hazardous Substance Superfund (26 USC § 9507); uses of fund (42 USC § 9611)
- Oil Spill Liability Trust Fund (26 USC § 9509)

A second type of fund is a trust fund held by a regulated financial institution for the benefit of a federal agency. In general, these trusts are established by private sector entities and therefore may be applicable only to a subset of long-term stewardship sites depending upon the final site long-term stewardship entity.[103] This type of fund is well-precedented. Trusts of this kind are used in a number of financial assurance programs, particularly for the post-closure care of hazardous waste disposal facilities under RCRA or sites licensed by NRC. They typically are created by a licensee or permittee at the beginning of the licensed activities. The amount of money placed into the fund equals the estimated funds necessary to close the facility or to provide long-term care for the closed facility. This estimate can be adjusted during the life of the trust, thereby requiring further contributions to or releases from the fund. If the licensee or permittee fails to pay the costs of closure or long-term care, the fund trustee is instructed to do so using funds in the trust. Both the principal and income of the fund are available to support expenditures for closure or post-closure long-term care.

Trust funds or "perpetual care investment funds" (Exhibit 8-5) could be established on a nationwide basis, or site-specific basis, provided legislative authority is established to do so. A single national fund would need a huge amount of up-front capital. Although a single fund would generally incur lower transaction costs than many separate funds, a national fund may be more costly to administer because of its larger size and multi-site responsibilities. The allocation of a national fund to multiple sites may be complicated by uncertainty in the types and costs of needed long-term stewardship activities and the highly contentious issue of equity. It would be difficult to establish a mechanism for determining each site's "share" of such a fund under any circumstances. Unexpected costs or an unexpectedly high rate of spending at a single site might lead to additional concerns about equitable distributions from a single fund. However, improving estimates over time would make it less likely that one or more sites could obtain more than their "share" of a single fund. Improved estimates could include needed contingency funding to cover potentially high costs associated with cleanup remedy failure.

[103]Federal regulations at 40 CFR Parts 264.140(c) and 265.140(c) stipulate that states and the federal government are exempt from the RCRA financial assurance requirements.

Exhibit 8-5. State of Tennessee Perpetual Care Investment Fund

The Tennessee Perpetual Care Trust Fund is an example of a "perpetual care pooled investment fund." The Fund was established pursuant to Tennessee State law (T.C.A. §9-4-603) and is administered by the Tennessee Department of Conservation (TDEC). DOE signed a Consent Order with the State of Tennessee and agreed to deposit $14 million (in $1 million annual installments) into the Fund. Other states may not have the legislative authority to implement such a fund.

The requirements for managing the Fund are established in a Fund Implementation Plan included in the Consent Order. The Plan requires that income from the Fund be used to conduct surveillance and maintenance of the Oak Ridge Reservation Environmental Management Waste Management Facility or other DOE-Oak Ridge Operations Office related activities. The Plan also requires that the principal of the Fund not be used in any circumstances.

The Fund will terminate upon written agreement that surveillance and maintenance for the facility is no longer needed. Upon termination, the balance of the fund will be returned to DOE. At this time, DOE and the State disagree on the State's ability to compel DOE contributions to the Fund if Congress does not appropriate sufficient annual funding.

There are two unique features of this agreement:

- After payment of the final installment, interest from the Fund will be used to pay for surveillance and maintenance for the Oak Ridge Reservation Environmental Management Waste Management Facility. This fund is intended as the primary source of long-term stewardship funding, not a "backstop" to DOE funding.
- The State, not DOE, will conduct the surveillance and maintenance using the interest proceeds from the fund.

Regardless of the chosen financial instrument for funding stewardship, DOE and site stewards also must choose effective contracting strategies for conducting long-term stewardship activities. This needs an understanding of both the nature of long-term stewardship activities and the contracting lessons learned by DOE during the 1990s (See Exhibit 8-6). DOE's efforts at contract reform and privatization have demonstrated that the choice of more appropriate contract instruments (e.g. fixed-price contracts, incentive fees) can reduce costs and improve productivity. In general, long-term stewardship activities fall into four types of work:

- Routine, repetitive services (e.g., groundwater monitoring, site security).
- Short-term capital construction projects (e.g., re-constructing a cap, re-installing a groundwater flow barrier).
- Special studies or analyses (e.g., health surveys, groundwater modeling).
- Long-term institutional knowledge maintenance tasks.

Exhibit 8-6. Lessons Learned on Contracting

During the Manhattan Project and throughout the Cold War, DOE and its predecessor agencies secured nuclear weapons research, production, and testing services through broadly-written, cost-reimbursable contracts that relieved contractors of most of the financial risk associated with their work. This approach was seen as necessary given the risks involved in conducting "first-of-a-kind" research and production efforts. However, as the Cold War ended, DOE's missions began to broaden and necessitated new approaches to contracting services. DOE's EM program is an example of a mission focused on the completion of discrete cleanup projects rather than maintenance of large-scale industrial manufacturing capability. The change in missions combined with an increasingly competitive funding environment prompted DOE to undertake several contracting reform initiatives during the 1990s. As a result, DOE's current best practices for contracting include increased competition, more fixed-price contracts, clearer work scope definitions, multiple contract awards, and performance-based incentives.

Routine, repetitive services and short-term capital projects are amenable to fixed-price contracting to the extent the service or project is well-defined. In contrast, where the number and type of long-term stewardship activities are uncertain, a fixed-price approach is inappropriate. It is more difficult to apply performance-based incentives to activities for which there may be no foreseeable completion date. As long-term stewardship activities become more defined, DOE and site stewards can utilize lessons from recent contract reform to reduce the costs of long-term stewardship.

Chapter 9: Natural Resources, Cultural Resources, Socioeconomic Impacts, and Environmental Justice

Long-term stewardship is a complex, multi-faceted process that cannot be successfully performed in isolation. Protection of natural resources, protection of cultural resources, and a variety of other environmental, social, economic, and engineering issues are integral to long-term stewardship. This chapter discusses four major environmental, social, and economic issues that will affect long-term stewardship and the importance of continued partnerships between DOE and affected parties in addressing these issues. Exhibit 9-1 illustrates some of the complex ways in which concerns about natural resources, cultural resources, socioeconomic impacts, and environmental justice affect long-term stewardship. As a result, the Department should:

APPLICABLE SCOPING COMMENTS
(see Exhibit 2 in Appendix B)

- Where cleanup cannot fully restore natural resources, stewardship should be used to address natural resource damage at DOE sites by improving comparable resources (3)
- The *Study* should address impacts to Tribal nations with respect to long-term stewardship (3
- Any acceptable long-term stewardship program must ensure long-term protection of human health, the environment, and cultural resources (STGWG)

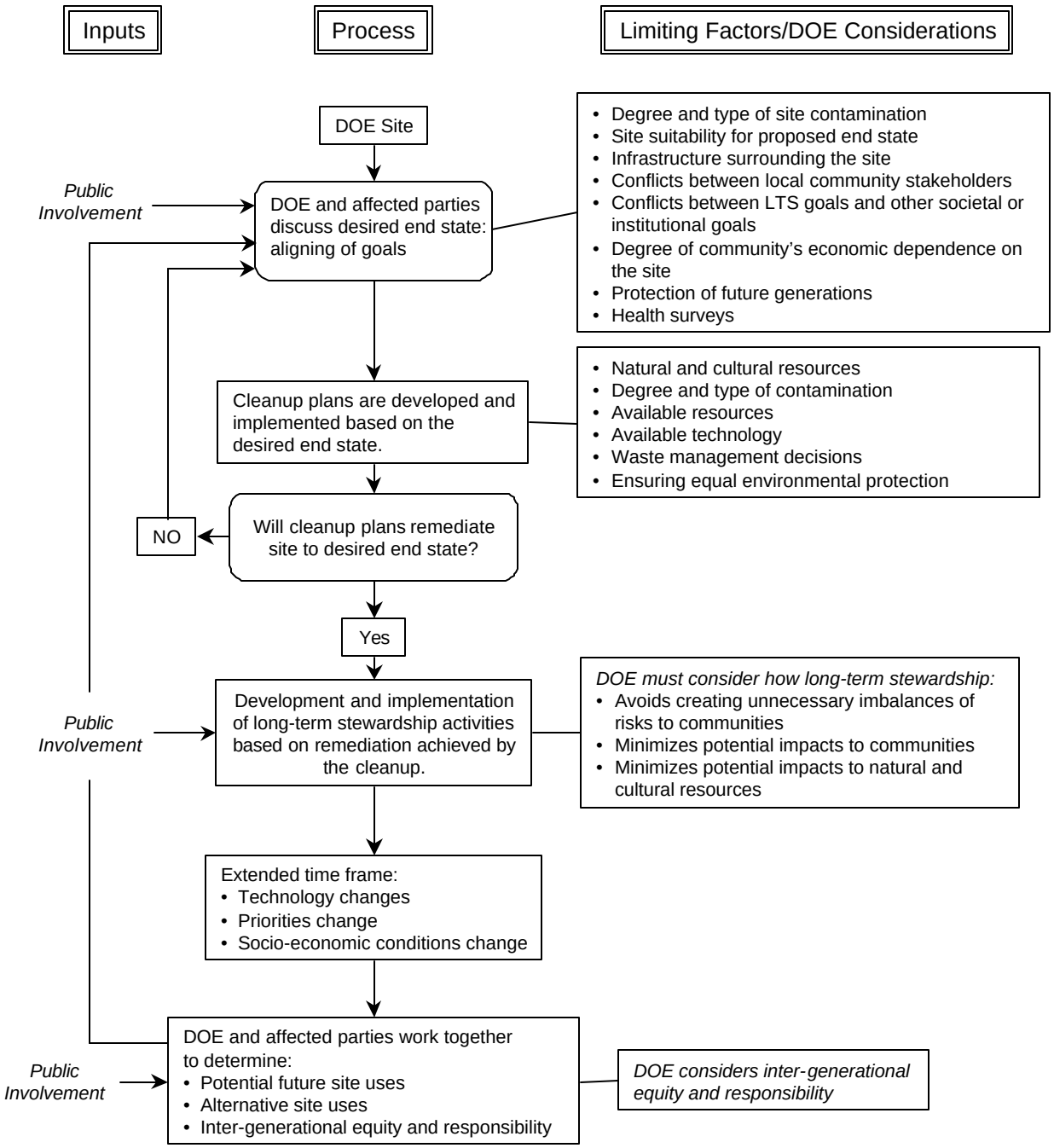
APPLICABLE ISSUES
(see Exhibit 3 in Appendix B)

11. Land Use/Natural Resources
16. Sociological/Political Issues
17. Environmental Justice
19. Public Involvement
27. Social/Citizen Control

- Identify and avoid adverse impacts to natural resources and cultural resources, where possible.
- Balance the socioeconomic needs of affected parties with DOE's stewardship goals.
- Ensure that federal Indian Trust Responsibilities and federal treaty obligations consistent with the unique legal and political status of Tribes are met.[104]
- Ensure that long-term stewardship activities do not create or exacerbate disproportionate environmental burdens on low-income and minority populations.

[104]There are currently 558 federally recognized Tribes in the United States. A federally recognized Tribe is a Tribe and/or Tribal group that has a federally acknowledged legal and political relationship with the federal government. This relationship is referred to as a government-to-government relationship. Several DOE sites have both federally recognized and non-federally recognized tribes. Federally recognized Tribes must be incorporated into DOE decision processes as a governmental entity in accordance with DOE Order 1230.2 and Council of Environmental Quality Memorandum, *Designation of Non-Federal Agencies to be Cooperating Agencies in Implementing the Procedural Requirements of NEPA*, July 28, 1999. Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments* (63 FR 67249) and the *U.S. Department of Energy American Indian & Alaska Native Tribal Government Policy*, U.S. Department of Energy, Office of Congressional and Intergovernmental Affairs, October 2000 are also relevant.

Exhibit 9-1. Environmental and Economic Issues will Affect the Process of Developing and Implementing Long-term Stewardship



Importance of Public Participation in Long-term Stewardship

Successful implementation of long-term stewardship at DOE sites will need a strong partnership between DOE and affected parties. Members of the host community may serve as one of the most effective overseers of the stewardship process, given their vested interest in ensuring that stewardship activities continue to be conducted and are appropriate to remaining site risks. A local community that has the opportunity to help develop cleanup strategies and long-term stewardship measures is more likely to support the continued implementation of those measures. As time passes, new generations will need to continuously engage in long-term stewardship planning and implementation to ensure that community involvement remains strong.

Effective public involvement in environmental decision-making involves two-way communication between the public and the agency charged with making the decision. A meaningful public involvement effort needs activities that disseminate information to, gather information from, and exchange information with all stakeholders.

Information distribution activities provide technical information about the issues under consideration (e.g., cleanup remedies, future site uses, desired end state, proposed land use options, and risk management) to all stakeholders. To enable stakeholders to participate in stewardship decisions in a meaningful way, DOE must provide accurate and timely information.

Sources: *Site-Specific Advisory Board Stewardship Workshop Report;* Oak Ridge, TN, October 1999; *Resource Conservation and Recovery Act Public Participation Manual;* U.S. Environmental Protection Agency, 1996.

9.1 Natural Resources

DOE sites are home to diverse and important natural resources,[105] such as biological resources (including fish and wildlife and threatened and endangered species) and wetlands that could be affected by long-term stewardship in numerous ways. Congress has enacted legislation to protect natural resources (Exhibit 9-2). DOE sites implement the requirements included in this legislation by first identifying these resources on the site through various mechanisms such

Public Comments Concerning Natural Resources (see Exhibit 2 in Appendix C)

- DOE should avoid additional natural resource damages in selecting stewardship activities (4)
- In addition to enhancing natural resources, actions by DOE have degraded or destroyed natural resources (29)
- Our generation should set forth principles to assure natural resources will be preserved and should establish a balanced culture-based risk assessment and management process (44)

[105] *Survey of Ecological Resources at Selected U.S. Department of Energy Sites;* Pacific Northwest National Laboratory. September 1996.

as biological resource management plans,[106] surveys, and

[106]Some DOE sites have biological resource management plans in place, which establish site-wide policies regarding management of wetlands, habitats of endangered and threatened species, systematic bio-monitoring, wildlife disease, big game, trespass livestock, forest, and wildfire. These plans can be used to identify locations of habitats of endangered and threatened species, environments of migratory birds, Wild and Scenic Rivers Act designated areas, and other environmentally sensitive natural resources. The Hanford site uses Natural Resources Management Plans (e.g., the draft Hanford Biological Resources Management Action Plan) to protect its resources. These plans are incorporated into the Hanford Comprehensive Land Use Plan, which is a NEPA Record of Decision applicable to DOE. If property is transferred to another federal agency, the new agency will not be legally obligated to follow the conditions of the plan unless that Agency commits to the plan in its own Record of Decision. Also, a non-federal entity would not be bound by the plans unless there are other binding legal commitments (e.g., deed restrictions).

Exhibit 9-2. Statutes, Regulations, and Executive Orders Concerning Natural Resources

- Bald and Golden Eagle Protection Act, 16 USC 668-668d et seq.
- Clean Water Act, 33 USC 1251 et seq.
- Coastal Zone Management Act, 16 USC 1451 et seq.
- Endangered Species Act, 16 USC 1531 et seq.
- Executive Order 11990, Wetlands Protection
- Executive Order 11988, Floodplains Protection
- Fish and Wildlife Conservation Act, 16 USC 2901 et seq.
- Marine Mammal Protection Act, 16 USC 1361 et seq.
- Migratory Bird Treaty Act, 16 USC 703 et seq.
- National Environmental Policy Act, 42 USC 4231 et seq.
- Safe Drinking Water Act, 42 USC 300f et seq.
- Wild and Scenic Rivers Act, 16 USC 1271 et seq.

special studies.[107] In its current site planning process, DOE considers the potential impacts of proposed activities on these resources and typically documents its analyses in environmental impact statements and environmental assessments prepared pursuant to NEPA. In some cases, actions taken by DOE and other federal agencies over the past 50 years have enhanced natural resources at DOE sites.[108]

Role of Tribal Governments in Long-term Stewardship

Tribal governments have a primary role in the enforcement of Tribal laws and regulations that affect long-term stewardship (e.g., Tribal land use and hazardous waste regulations) and in the maintenance of institutional controls such as zoning approvals. Tribal governments also have responsibilities as a trustee of natural resources pursuant to Subpart G of the CERCLA National Contingency Plan (40 CFR Part 300) and as a trustee of cultural resources pursuant to several statutes and Executive Orders (see Exhibit 9-3). Additionally, Tribal governments have a special and unique legal and political relationship with the federal government (e.g., treaty rights, the Federal Indian Trust Responsibility) that provides Tribes with a unique role in the management and protection of Tribal lands, assets, resources, and treaty rights. For example, Tribal governments potentially affected by DOE decisions are consulted on a "government-to-government" basis concerning such decisions. Where parcels of land are transferred to Tribal governments (e.g., at Los Alamos National Laboratory), Tribal governments may assume additional responsibilities such as ensuring that future uses of these lands are consistent with restrictions necessary to protect human health and the environment. Tribal governments also may assume a more prominent role in managing long-term stewardship information and in promoting education and training to ensure the continuity of long-term stewardship across multiple generations. The unique status of Tribal nations does not imply, however, that all Tribal nations are the same or have a uniform view of long-term stewardship issues and concerns. Nothing in this *Study* should be used to make such an inference.

While planning and implementing long-term stewardship activities, DOE needs to avoid additional impacts to natural resources that could result in liability for natural resource damage assessments under

[107] *Cross-Cut Guidance on Environmental Requirements for DOE Real Property Transfers*, U.S. Department of Energy, Office of Environmental Policy and Assistance. DOE/EH-413/97/2, October 1997.

[108] *The DOE Presence at the Hanford Site: Benefits to Natural Resources*, Pacific Northwest National Laboratory, November 1996.

CERCLA.[109] Long-term stewardship activities may impact natural resources in a positive or negative way. For example, wildlife (including threatened or endangered species) and their habitat might be protected by the maintenance of a buffer zone around a site or by restricting human access to site segments, thereby creating *de facto* wildlife preserves. On the other hand, wildlife could be adversely affected by fences or other barriers that are erected as a long-term stewardship measure but disrupt foraging or migration patterns.

Many DOE sites have been removed from the public sector for over 50 years, and at large sites often less than 10 percent of the land area is developed. Due to this situation, large parcels of DOE sites have provided unusual havens for many biota. Decisions to transfer or re-use DOE property could also affect natural resources, depending on the allowable future use of the property. For example, sensitive ecosystems and species may be protected further by creating special reserves within lands owned or controlled by DOE or by transferring those areas to agencies better equipped to manage those resources. The presence of an endangered species within a DOE site could encourage DOE to retain ownership of that land or to transfer the land to another entity that has the mission and means to better preserve such species (e.g., the Department of the Interior, a state wildlife management agency, or even a private land trust organization). As previously discussed, DOE has developed management agreements for this purpose as several sites (see Section 4.2.1).

Public Comments Concerning Tribes
(see Exhibit 2 in Appendix C)

- DOE should consider Tribal issues as a priority (1)
- The *Study's* emphasis on DOE's obligations to Native Americans and Tribal Treaties is inconsistently applied to emphasize the "host community" while neglecting the broader regional concerns (1)
- DOE needs to achieve inclusivity regarding Tribal nations and local governments; in these communications, DOE needs to acknowledge the special government-to-government nature of interactions with sovereign Tribes (1, 28, 44)
- The *Study* should emphasize that Tribes have "tribe-specific" goals so as not to infer that all Tribal nations are the same (44)
- DOE must exercise its "trust responsibility" by providing full disclosure of activities that will directly affect tribes and their treaty rights (44)
- DOE should analyze specific issues at DOE sites relative to implementation plans for engineered controls with respect to Tribal interests (44)
- The *Study* should include a fifth Principle of Intergenerational Equity – The Trust Principle; the Trustee Principle focuses on our duty to our descendants and the Trust Principle extends this to the federal government's obligation and duties towards the Tribes' descendants (1)

Partnerships among DOE, other federal agencies, Tribes, and local governments generally have been successful. However, in some cases Indian tribes and local governments have expressed concern about the need for more effective government-to-government interaction before land use decisions are finalized. The Department has recognized these concerns and is committed to more effective coordination with Indian Tribes and local governments.

DOE needs to continually monitor the extent to which long-term stewardship activities affect natural resources. Over time, new resources may be discovered and existing resources may change or be transferred, particularly over the long time periods potentially needed for long-term stewardship. For example, species not currently included on the threatened or endangered species list may be added, or

[109] 43 CFR Part 11 Natural Resource Damage Assessments.

species currently on the list may migrate to the site, may recover and be removed from the list, or may become extinct. DOE needs to consider potential impacts to natural resources and consult with affected parties, including Tribes,[110] in any periodic assessment it makes of ongoing long-term stewardship activities. Coordinated management of natural resources on adjacent federal and non-federal lands may be appropriate at some sites.

Integration of Natural Resources Concerns Into Response Actions

DOE has responsibilities under Executive Order 12580 and Subpart G of the CERCLA National Contingency Plan (40 CFR Part 300) as both a natural resource trustee and lead agency for response actions at sites under the Department's jurisdiction, custody, and control. In fulfilling these responsibilities, the heads of EM program field organizations and program and project managers are required to:

- Evaluate potential risks to natural resources or the services they provide when planning response action investigations and studies.
- Establish appropriate mechanisms for early and ongoing consultation with natural resource trustees, including establishing a natural resource trustee council or including trustee representatives on Site Specific Advisory Boards.
- Coordinate and maintain an ongoing dialogue with the trustees on potential natural resource injuries throughout the remedy selection process.
- Give strong consideration to the selection of response actions that minimize or mitigate adverse impacts to natural resources.
- Seek to obtain, where possible, covenants not to sue for natural resource damages from trustees that may file claims against DOE.
- Specifically identify any injuries to natural resources that may result from implementing the selected response actions, including any irreversible and irretrievable commitments of natural resources, in CERCLA Records of Decision or applicable licenses and permits.
- Use the Department's Natural Resource Trustee Steering Committee as a resource for implementing this policy.

Existing mechanisms for implementing this policy, such as the natural resource trustee councils established at several sites, may not be the way that this policy is implemented during long-term stewardship.

Source: *Policy on Integration of Natural Resources concerns into Response Actions*, Memorandum from Alvin Alm, Assistant Secretary for Environmental Management, U.S. Department of Energy, September 8, 1997.

9.2 Cultural Resources

DOE sites are home to diverse and historically and culturally significant resources, including:

- Artifacts and sites dating to the prehistoric, historic, and ethnohistoric periods that are currently located on the ground or buried beneath it.

- Standing structures that are over 50 years of age or are important because they represent a major historical theme or era.

[110]For example, the *U.S. Department of Energy American Indian & Alaska Native Tribal Government Policy*, U.S. Department of Energy, Office of Congressional and Intergovernmental Affairs, October 2000.

- Cultural and natural places, select natural resources, and sacred objects that have importance for Native Americans and other ethnic groups.

- American folklife traditions and arts.[111]

Many of these resources are protected by federal laws, regulations, and Executive Orders (Exhibit 9-3). DOE has long recognized its responsibilities for complying with applicable requirements and for managing cultural resources on DOE land and other lands that are impacted by DOE programs.[112] DOE policy and guidance documents provide a framework for implementing these responsibilities. DOE sites can implement applicable federal cultural resources management needs through mechanisms such as a cultural resource management plans, *Technical Site Information* documents (described in Chapter 6), NEPA documents, surveys, and studies.[113]

Exhibit 9-3. Statutes, Regulations, and Executive Orders Concerning Cultural Resources

- American Antiquities Preservation Act, 16 USC 431 et seq.
- American Indian Religious Freedom Act, 42 USC 1996 et seq.
- Archeological Resources Protection Act, 16 USC 470aa
- Curation of Federally Owned and Administered Archeological Collections, 36 CFR Part 79
- Determinations of Eligibility for Inclusion in the National Register of Historic Places, 36 CFR Part 65
- Executive Order 11593, Protection and Enhancement of the Cultural Environment
- Executive Order 13007, Indian Sacred Sites
- Historic Sites, Buildings, and Antiquities Act, 16 USC 1461 et seq.
- National Historic Preservation Act, 16 USC 470 et seq.
- Native American Graves Protection and Repatriation Act, 25 USC 3001
- National Register of Historic Places, 36 CFR Part 60
- National Historic Landmarks Program, 36 CFR Part 65
- Protection of Historic and Cultural Properties, 36 CFR Part 800

In its current site planning process, DOE analyzes the potential impacts of proposed activities on these cultural resources and typically documents the analyses in environmental impact statements and environmental assessments prepared pursuant to NEPA and in other studies conducted pursuant to other regulatory frameworks. In some instances, National Historic Preservation Act requirements can be combined with the NEPA process. For example, the potential environmental effects of property transfers at the Nevada Test Site and Los Alamos National Laboratory were assessed in NEPA documentation. The respective State Historic Preservation Officers and Tribal Historic Preservation

[111]This definition was developed in 1989 by DOE's Office of Environment, Safety, and Health in cooperation with staff from the U.S. Department of the Interior, the Advisory Council on Historic Preservation, the National Congress of American Indians, and the Native American Rights Fund.

[112]DOE has issued a wide variety of guidance documents and information briefs over the past decade to raise awareness of cultural resource management needs (e.g., *Management of Cultural Resources at Department of Energy Facilities*, U.S. Department of Energy Guidance Memorandum, February 23, 1990; *Environmental Guidelines for Development of Cultural Resource Management Plans*, U.S. Department of Energy, Final Report, DOE/EH-501, August 1995; DOE P141.1 *Department of Energy Management of Cultural Resources*, May 2001.)

[113]*Cross-Cut Guidance on Environmental Requirements for DOE Real Property Transfers*, U.S. Department of Energy, Office of Environmental Policy and Assistance. DOE/EH-413/97/2, October 1997.

Officers generally review all federal actions subject to NEPA, as well as information provided by DOE, to determine if any properties have historical significance.

DOE is required by law to consider the effects of its actions, such as implementation of long-term stewardship, on cultural resources. Continued involvement of the Department's Federal Preservation Officer, the State Historic Preservation Officers, Tribal Historic Preservation Officers, local organizations, and Tribal governments will be needed to assure that the value of historic properties and other cultural resources is considered during the planning and decision-making processes. To the extent feasible, DOE should implement long-term stewardship in a manner that continues to protect and provide appropriate access to cultural resources, including historical properties. It may be necessary for DOE to evaluate many competing or conflicting factors related to cultural resources management responsibilities and long-term stewardship activities. For example, cultural and historic resources might be protected by limiting human access to traditional sacred areas[114] and/or areas where Tribes have treaty rights to hunt, gather plants, or graze livestock. The presence of culturally significant resources could also affect plans to implement some long-term stewardship activities. The transfer, lease, or sale of property out of federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance would be viewed as an adverse effect on the property. In some cases, DOE may reconsider or modify proposals to re-use or transfer ownership of an area in which a historic or cultural site is located.[115] In other cases, DOE may decide to transfer an historic or cultural site or to substantially alter or demolish an historic property.[116] Ultimately, DOE's responsibility will be to balance the needs of the agency mission, the public interest in protecting historic properties, the costs of preservation, and other relevant factors.

As a federal agency, DOE must ensure that federal Indian Trust Responsibilities and federal treaty obligations consistent with the unique legal and political status of Tribes are met.[117] Traditional cultural properties, archeological sites, or structures may become eligible for historic preservation or inclusion on the National Register of Historic Places. Access to information regarding the location of many cultural resources may be appropriately restricted in accordance with legal requirements (e.g., the Archeological Resources Protection Act, the National Historic Preservation Act) or specific agreements with Tribal nations. Thus, long-term stewardship plans may provide for the protection of resources without specifically disclosing protected information. Requirements to protect cultural resources also may change over time. Furthermore, treaty reserved rights could be exercised, increasing the amount of land subject to Tribal use.

9.3 Socioeconomic Impacts

[114]Conference call with Los Alamos operations office, November 2, 1999.

[115]For example, the Hanford B Reactor is on the National Register of Historic Places as a nationally significant property. *Source:* National Register of Historic Places, National Park Service.

[116]DOE has this authority as long as the desired action can be justified in support of DOE's mission. However, there are a number of additional statutory and regulatory requirements that would apply. For example, if DOE decides to significantly alter or demolish an historic property, timely steps must be taken to make appropriate records and deposit the records in the Library of Congress or with another appropriate agency designated by the Secretary of the Interior for future use and reference.

[117]DOE Order 1230.2, *American Indian Tribal Government Policy*, outlines the principles to be followed by DOE in its interactions with federally recognized Tribes.

The transition from cleanup to long-term stewardship may socially and economically impact affected parties by changing workforce levels and composition, local government resources, access to community services (e.g., police, fire, schools, libraries), and housing availability. A decision to close a site and maintain it as a wildlife preserve could adversely affect the number and type of jobs available in the community or could affect treaty reserved rights. On the other hand, such a decision could also increase recreation or tourism opportunities and associated economic benefits. Similarly, a decision to transfer property for industrial or commercial re-use could maintain or enhance the socioeconomic status quo or cause job growth and increased pressures on social services and housing. The extent to which DOE decisions affect socioeconomic conditions in a community generally reflects the community's economic dependence on the DOE site. The more diverse a community's economy, the more resilient and adaptable it will be to changing circumstances resulting from DOE decisions.[118]

Directive for DOE to Consider Socioeconomic Impacts

Section 3161 of the National Defense Authorization Act of 1993 directs DOE to implement measures designed to minimize social and economic impacts associated with reconfiguration of the DOE weapons complex, and develop Workforce Restructuring Plans for Reconfigured DOE facilities.

One of the more significant results of the transition from cleanup to long-term stewardship will be changes in workforce levels and composition. As site missions change, many sites will significantly decrease the demand for highly skilled employees, which could create significant economic disruption in communities that are economically dependent on these jobs. DOE may be able to offset this decrease by transitioning some employees into long-term stewardship activities. However, it is likely that the scale and scope of long-term stewardship activities will be significantly smaller than cleanup activities. DOE also may be able to offset this disruption by attracting private industry to sites, as the Department did at Mound, Pinellas, and the former K-25 site in Oak Ridge (now the East Tennessee Technology Park).[119]

As stated earlier, successful implementation of long-term stewardship activities will need significant participation and support from affected parties. If the affected parties receive socioeconomic benefits from long-term stewardship activities, then there is likely to be a greater degree of cooperation in implementing and enforcing institutional controls. Thus, to the extent feasible, DOE should align long-term stewardship goals with the cultural and economic priorities of Tribes, local governments, and other affected parties. This will enhance the durability and effectiveness of long-term stewardship.[120]

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[118]Frisch, M., et al. 1998. Regional Economic Benefits of Environmental Management at the U.S. Department of Energy's Major Nuclear Weapons Sites. *Journal of Environmental Management* 54: 23-37; Greenberg, M., et al. 1999. Questioning Conventional Wisdom: the Regional Impacts of Major U.S. Nuclear Weapons Sites, 1970-94. *Socioeconomic Planning Sciences* 33: 183-204.

[119]For example, in 1993 DOE made a decision to close the Pinellas plant in Florida. In 1995, DOE sold the plant to the Pinellas County Industry Council, a non-profit organization created to promote industrial growth. The Council is actively seeking tenants to occupy the facility, and 80 percent of the available space is currently leased. *Source:* www.osti.gov/privatization/report/case12.htm

[120]Such an alignment does not imply DOE is responsible for providing long-term socioeconomic support to the host community. The alignment could be achieved, for example, if long-term stewardship needs are compatible with the host community's wish for lands owned or controlled by DOE to remain as open space and serve as an aesthetic

Re-Use of Pinellas Site

In 1995 the Pinellas Site was sold to the State-chartered Pinellas County Industry Council for industrial redevelopment while site remediation was ongoing. Groundwater remediation is being conducted using a "pump and treat" system, and DOE anticipates that operation of the system will continue until 2014, after which no further remedial action will be needed. On-site groundwater monitoring may be needed after completion of remediation activities. The sales contract between DOE and Pinellas County includes provisions for a "lifetime easement" for DOE to conduct environmental remediation and monitoring and a similar easement for regulatory agencies to conduct activities on the site. The sales contract sets terms and conditions for potential demolition of buildings and set specifications for decontamination to levels appropriate for an industrial park. The sales contract also requires that the State of Florida acknowledge and concur with the effectiveness of the remediation.

However, the question of identifying the responsible party for remediating contamination that may potentially be discovered on site after the time of sale was not addressed in the sale documents. As of FY 2000, most of the industrial space in the former Pinellas Plant is fully occupied with industrial operations, and there may be situations where site contamination is discovered in the future that cannot be clearly attributed either to DOE's past operations or to current industrial operations.

Sources: Quit-Claim Deed. Pinellas County, Florida, 1995. Pinellas County Office of Records Book 8939, pp. 1357-1358, March 17, 1995; *Sale and Purchase Contract for the Pinellas Plant*. U.S. Department of Energy and Board of County Commissioners, Pinellas County, Florida, 1995. DE-RP04-95A187442, March 17, 1995.

9.4 Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs federal agencies to make environmental justice part of their mission by identifying and addressing disproportionately high and adverse human health or environmental effects of federal programs, policies, and activities on minority populations and low-income populations in the United States.[121]

Findings from an initial analysis of the demographic and economic composition of communities surrounding DOE's 19 major sites and 75 smaller sites show that many counties within a 10-mile radius of DOE sites have a higher percentage of minority populations and/or low-income populations than the national average.[122] For example, the study concluded that the 16-county region bordering the Savannah River Site was 41 percent African-American in 1990. This is a higher percentage than typically found in South Carolina, Georgia, or the United States. The study also found that there was a higher percentage of residents living below the poverty line in this region than in the country or surrounding states. In addition, the counties surrounding the Hanford Site have a lower socioeconomic status than in either the host State of Washington or nearby Oregon.

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resource within the community.

[121] Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations.* February 11, 1994.

[122] Greenberg, M. and Simon, D. *Demographic Characteristics of Counties Adjacent to the Savannah River, Hanford, and Other Major U.S. Department of Energy Sites*; Consortium for Risk Evaluation with Stakeholder Participation Report No. 1, March 1996; Greenberg, M. and Simon, D. *Demographic and Economic Characteristics of Areas Surrounding Small DOE Site;* Consortium for Risk Evaluation with Stakeholder Participation Report No. 17, December, 1998.

Environmental justice issues can take many forms, but often focus on the geography of risk or burden stemming from environmental hazards, such as the impact of long-term stewardship activities on the host communities and communities that could be exposed to residual site hazards. In developing and implementing long-term stewardship strategies, DOE is directed by Executive Order 12898 to consider the extent to which minority or low-income populations might face disproportionately high and adverse human health or environmental consequences. Disproportionately high and adverse consequences can be caused by a population's geographical location, lifestyle, culture, economic condition, or other elements that increase their vulnerability and susceptibility to environmental burdens. Examples include:

General Methodology for Evaluating Potential Environmental Justice Concerns

1. Identify potential impacts from the proposed action to determine adverse environmental and health impacts on the general population.
2. Using available information, identify potentially impacted minority and low-income communities.
3. Using available information, determine whether there are any unique exposure pathways or cultural practices by which minority or low-income populations could receive a disproportionally high and adverse impact.

- Lands transferred for industrial development could be located near an existing minority or low-income neighborhood.

- Minority or low-income workers might tend to live in off-site areas that are relatively close to residual site hazards, where property values are lower.

- Minority or low-income populations might receive higher-than-average doses from the consumption of relatively large amounts of freshwater fish from contaminated waters and may also suffer disproportionate impacts because they lack access to adequate medical care or are not provided useable information about risks.[123]

To effectively address stakeholders' environmental justice concerns and ensure that no valid environmental justice concerns remain unaddressed, DOE needs to find ways to promote opportunities for members of minority and low-income populations to participate in the long-term stewardship planning process. Such opportunities may include providing translation services during public meetings, publication of notices in different media (e.g., newspapers, television, radio, or distribution of flyers to community centers or door-to-door) and in different languages, and holding meetings at convenient locations (e.g., accessible by public transportation). With effective public involvement, DOE can have more certainty that cleanup decisions and long-term stewardship activities consider any environmental justice concerns.

[123]Lazarus, R.J. and Tai, S. Integrating Environmental Justice into EPA Permitting Authority. *Ecology Law Quarterly* 26, 1999; West, P.C. Invitation to Poison? Detroit Minorities and Toxic Fish Consumption from the Detroit River. *In:* Bryant, B. and Mohai, P. (eds). *Race and the Incidence of Environmental Hazards.* Boulder, CO: Westview Press, 1992.

Chapter 10: Sustainability of Long-term Stewardship

Developing and implementing long-term stewardship activities at the national scale and over an extended period of time is an unprecedented task with many uncertainties. No existing institution has yet acquired experience in protecting public health and the environment for the extremely long time frames that may be involved in long-term stewardship. Although existing statutory and regulatory requirements provide some guidelines for long-term stewardship activities, it is not clear that the requirements anticipate all of the long-term stewardship measures that may be needed in the future, nor ensure the development of effective implementation strategies.

APPLICABLE SCOPING COMMENTS
(see Exhibit 2 in Appendix B)

- Long-term stewardship plans should be flexible and take into account future advances in technology and science and future changes in cultural values and politics; these plans should undergo revisions via a democratic process (4)
- DOE should periodically re-evaluate long-term stewardship plans and implementation programs at both the site and headquarters level to reflect changing conditions (STGWG)

APPLICABLE ISSUES
(see Exhibit 3 in Appendix B)

7. Science and Technology Development
13. Intergenerational Transfer
15. If the Department of Energy Goes Away
20. Roles and Responsibilities
22. Long-term vs. Short-term

It is important to be cognizant of the issues associated with the sustainability of long-term stewardship over many decades and perhaps centuries. DOE recognizes that efforts to define and evaluate these issues are speculative in nature, and the discussion in this chapter is not intended to either direct or impede public debate or to attempt to resolve these issues, especially as they pertain to specific sites. Nonetheless, the Department believes it is important to note the challenges facing long-term stewardship as it moves into the future.

The technology and institutions exist to allow the present generation to pass to the next generation sites in long-term stewardship that can be maintained in a safe, environmentally protective condition, and to pass along the information which will allow the next generation to make informed decisions. Nonetheless, it should be possible to develop improved technologies and to refine institutional controls to provide more cost-effective and durable protection. That would reduce the burden on future generations. This chapter discusses several types of issues that may affect the sustainability of long-term stewardship over long periods of time.

Seventh Generation Planning

The Constitution of the Iroquois Nation was drafted as early as 1390 and possibly between 1450 and 1500. It notes the following planning horizon:

> *In every deliberation, we must consider the impact of our decisions on the next seven generations ... Look and listen for the welfare of the whole people and have always in view not only the present but also the coming generations.*

Source: *http://www.axess.com/mohawk/constitution.htm*

10.1 What is Needed for Sustainability?

If long-term stewardship is not designed and managed to be enduring, human health and the environment may be endangered through a variety of means. For example:

- Society's commitment to long-term stewardship may gradually fade away or be eliminated, causing necessary monitoring and maintenance to lapse.

- Opportunities for improving the cleanup end state and the monitoring and mitigation strategies may be missed at sites where residual hazards become neglected.

- The public as well as government decision-makers may come to believe that site hazards have been eliminated.

- When residual hazards are rediscovered, the ability to address the problems may have declined and the cost needed to do so may increase.

Civilization has had only limited success in planning for and avoiding the consequences of natural disasters like floods, hurricanes, earthquakes, and volcanoes. In some situations, governments have acted to ensure that activities and developments in areas prone to these events take into account the hazards (e.g., through compliance with stringent building standards or zoning restrictions). Often, however, lessons learned about the hazards are ignored, downplayed, or lost. In many cases, known hazards are accepted or ignored (e.g., people readily move back into homes in floodplains periodically subjected to floods). Approaches to ensure that long-term stewardship remains robust and adaptable must recognize that future decisions about end states and monitoring and mitigation strategies will reflect not only new scientific and technical information and options, but also the changing values of future generations.

To design long-term stewardship strategies that can be passed on to future generations and adapt to changes, DOE must address two primary questions:

- How can implementation be structured to ensure that robust and adaptable long-term stewardship endures?

- How can DOE ensure that implementation remains reliable over time?

There are no simple approaches for addressing these issues. However, four principles of intergenerational equity proposed by the National Academy of Public Administration may provide a foundation for ensuring that long-term stewardship endures (Exhibit 10-1).

Exhibit 10-1. The Four Principles of Intergenerational Equity

1. *Trustee Principle* – Every generation has obligations as trustee to protect the interests of future generations.

2. *Sustainability Principle* – No generation should deprive future generations of the opportunity for a quality of life comparable to its own.

3. *Chain of Obligation Principle* – Each generation's primary obligation is to provide for the needs of the living and succeeding generations. Near-term concrete hazards have priority over long-term hypothetical hazards.

4. *Precautionary Principle* – Actions that pose a realistic threat of irreversible harm or catastrophic consequences should not be pursued unless there is some compelling countervailing need to benefit either current or future generations.

Sources: *Deciding for the Future: Balancing Risks, Costs, and Benefits Fairly Across Generations*, National Academy of Public Administration, June 1997; *Our Common Future*, The World Commission on Environment and Development (the Brundtland Commission) Oxford: Oxford University Press, 1987, page 43.

10.1.1 Ensuring Survival

Long-term stewardship will face a variety of long-term survival challenges. Future generations may suspend long-term stewardship activities in order to deal with more immediate needs.

The long-term survivability of long-term stewardship can be bolstered by local involvement in decision-making, active involvement of a wide range of affected parties, and frequent communication across parties at each site. The affected parties located near sites have the greatest stake in the success and survival of long-term stewardship. They also will have the best access to certain types of information that should influence evolving site strategies, such as information on changes in land use patterns, property values, and social values. For these and other reasons, long-term stewardship should rely considerably on local involvement in decision-making.

A centralized institution such as DOE, however, may have the best access to other types of relevant information, such as advances in science and technology, and a greater ability to capture economies of scale in developing and disseminating such knowledge.

A certain degree of redundancy could also be beneficial. A wide range of parties have an interest in long-term stewardship, including local residents and businesses; various state, local, Tribal, and federal agencies; site owners and contractors; technology vendors; and advocacy groups. When these parties are directly involved in long-term stewardship, communicate frequently, and understand the importance, goals, and responsibilities associated with long-term stewardship, they can help counteract threats. For example, if a local government agency that has played a key role in long-term stewardship is abolished, the remaining interested parties at the site that have been conducting similar activities can ensure that the functions performed by that agency are transferred or assumed by others.

Characteristics of an Effective Stewardship Program

According to a National Research Council report, "the overarching requirement for an effective stewardship program is that it be reliable. A reliable program has a reasonable likelihood of achieving its objectives over the period it must remain in effect." The report identified several characteristics that enhance the reliability and effectiveness of a stewardship program.:

- *Layering and redundancy*. Layering means using several measures to carry out roughly the same function; redundancy means creating a situation in which several entities are responsible for or have a vested interest in the effectiveness of the measures.
- *Ease of implementation*. A stewardship activity must be capable of being put into effect, and it also should be reasonably easy to keep in effect.
- *Monitoring commensurate with risks.* Monitoring methods and schedules need to be commensurate with the harm that could be caused in the case of release of contaminants or failure of a monitoring system.
- *Oversight and enforcement commensurate with risks.* One key stewardship activity is to have a "watchdog" over other stewards and stewardship activities. For the watchdog to be effective, however, it must have teeth.
- *Appropriate incentive structures*. Attention needs to be devoted to assuring that site stewardship managers will be appropriately motivated for carrying out the needed tasks over time.
- *Adequate funding*. Implementing, monitoring, and appropriately modifying stewardship activities will require adequate and reliable financial resources throughout the activities' required lifetimes.
- *Durability and replaceability*. A stewardship activity should endure either for as long as the site's residual contaminants remain hazardous, until the activity can be refreshed or replaced by an equally reliable substitute activity.

Source: Long-term Institutional Management of U.S. Department of Energy Legacy Waste Sites. National Academy of Sciences, National Research Council, August 2000.

Frequent communication among stakeholders at a site also can help ensure that new information is widely distributed and its implications are understood and incorporated into future decisions. Likewise, fostering a community of interest groups across sites may help bring necessary expertise and resources to bear if the survival of long-term stewardship is threatened at one site. This benefit may be particularly valuable at sites located in sparsely populated areas or in communities with few resources.

Maintaining trust and credibility will be a key challenge. Public confidence in the institution(s) charged with long-term stewardship will depend on the ability of the institution(s) to demonstrate a commitment to the mission and carry out its (their) responsibilities openly and fairly.[124]

10.1.2 Maintaining Focus

Site stewards need to avoid the perception that risk levels at the sites are less than they are. Stewardship organizations also should avoid merely ensuring regulatory compliance and implementation of existing monitoring and mitigation strategies. Instead, the organizations should continually seek better solutions and incorporate new developments in science, technology, land use patterns, and societal values. The organizations also should continually learn and reinvent themselves, adapting to changing

[124] *Long-term Stewardship of Contaminated Sites, Trust Funds as Mechanisms for Financing and Oversight*. Carl Bauer and Katherine Probst, Resources for the Future Discussion Paper 00-54, December 2000, page 380; *Long-term Institutional Management of U.S. Department of Energy Legacy Waste Sites*. National Academy of Sciences, National Research Council, August 2000, page 86.

circumstances, or they will risk becoming ineffective and lose support. At least two approaches may be used to ensure that the organizations responsible for long-term stewardship remain active and focused on their responsibilities:

- Separate the responsibilities for ensuring regulatory compliance from the responsibilities for sponsoring improvements in science and technology. This division would help to ensure that the former goal does not exclude the latter. This approach may increase the difficulty of learning lessons from existing strategies, but establishing appropriate communication paths could mitigate the problem.

- Separate the responsibilities for implementing long-term stewardship from responsibilities for educating the public about the residual hazards at sites and the rationale for long-term stewardship. Educational organizations that focus on transferring institutional knowledge from generation to generation, targeted at communities surrounding DOE sites, could reduce the possibility that remaining site hazards are forgotten.

10.2 The "Rolling Stewardship" Strategy

One of the challenges facing DOE, regulators, and stakeholders is to set in place a long-term hazard management framework that ensures protection of human health and the environment for future generations. Through this hazard management framework, DOE must address possibilities such as: (1) the remedies established during cleanup will fail (e.g., engineered controls stop working as designed, institutional controls are not enforced); (2) changing circumstances at and around the site will need corresponding changes in long-term stewardship strategies; and (3) future generations will want to change the use(s) of the lands and resources involved in long-term stewardship. Pursuant to the "chain of obligation principle" (Exhibit 10-1), the current generation should always provide the next generation with the skills, resources, and opportunities to cope with any problems that may result from cleanup and long-term stewardship decisions (i.e., a "rolling stewardship" strategy).[125]

Education and Training

Education and training will be a critical part of long-term stewardship, particularly among affected parties, and will serve to continually reinforce concepts and keep the concepts familiar and pertinent. Enhancing the awareness of: (1) why long-term stewardship is necessary; (2) how to conduct long-term stewardship activities; (3) how to evaluate and interpret change; and (4) how to modify activities in response to changing circumstances will enhance the ability of long-term stewardship to survive and adapt to the changing cultural and natural environment.

Education of the public, particularly affected parties, can enhance the effectiveness of institutional controls and the protectiveness of long-term stewardship. Communities that are well educated and trained with respect to long-term stewardship issues are less likely to challenge institutional controls and more likely to prevent unaware parties (e.g., children, visitors) from putting themselves at risk. Education and training efforts also would help to promote trust between affected parties and site stewards.

[125] *Deciding for the Future: Balancing Risks, Costs, and Benefits Fairly Across Generations*, National Academy of Public Administration, June 1997

Public Comments on "Rolling Stewardship"
(see Exhibit 2 in Appendix C)

- Cleanup is the goal, not "managing the problem," which should be used only when source removal options are exhausted and only under the most stringent of justifications (13)
- I was really pleased to see the reference to managing the problem and managing the hazards, but DOE might consider 20 years (a generation) as the appropriate time frame for stewardship (48)
- It is important to assure that the principles of intergenerational equity are implemented according to its intent, spirit, and letter (44)
- Chapter 10 generally is critical to evolution of good policy and implementation for long-term stewardship, but the separations suggested in this subsection need thorough discussion with a wide range of parties, stakeholders, and disciplines, and there must also be vigorous discussion about the extent to which DOE takes responsibility for any one of these functions (4)
- DOE (or subsequent federal managers) should implement a systematic process for re-evaluating and if needed, modifying existing long-term stewardship activities to ensure that developments in science, technology, and performance are incorporated; the community should be involved in these re-evaluations (6, 11, 32, 34, 45, 50)
- Periodic re-evaluation of the remedy should include (20, 24, 43):
  - Changes in health/environmental standards
  - Changes in technology
  - Performance of the remedy in place
  - Site conditions
  - The physical integrity of permanent markers
  - Investigation and remediation of contamination in place not previously considered to be a threat

The following three principles provide guidance for making decisions that incorporate the "rolling stewardship" strategy:

- **Focus on managing the problem rather than trying to solve the problem**. Given the limitations of present-day technologies and the uncertainties in what we know about residual hazards, the durability of engineered and institutional controls, and what will happen in the future, we cannot expect at the present time to find permanent solutions to all of the problems associated with existing hazards at DOE sites. More permanent solutions may be developed in the future as a result of technological advances.

- **Focus on managing hazards for the near future (e.g., 30-50 years) rather than trying to manage hazards for centuries or millennia**. Given the uncertainties in site conditions and new science and technology, long-term strategies implemented today will need to be re-evaluated and likely changed at regular intervals in the future. Depending on the site characteristics, it may be more productive to develop strategies using a "near-future" time horizon (e.g., 30-50 years or some other appropriate time frame such as a generation) than to attempt to develop strategies using a longer time horizon. In other cases (e.g., UMTRCA sites, WIPP), regulations require consideration of longer time frames in designing the facility. However, these regulations acknowledge and address uncertainties associated with these longer time frames.

- **Avoid foreclosing future options**. Given the need to re-evaluate and perhaps modify long-term stewardship strategies over time, future generations should have as many options available as

possible. Decisions should seek solutions that address near-term needs and concerns but preserve long-term flexibility to the greatest extent possible.

Two key elements of the "rolling stewardship" strategy, future evaluations of today's decisions and incorporating new science and technology, are discussed below.

10.2.1 Future Evaluations of Today's Decisions

As noted in Chapter 3, decisions made today (and over the next 40 years or more) will have ramifications for the future generations who will be responsible for managing residual hazards. In effect, the present generation is making cost-benefit tradeoffs and committing future generations to managing residual hazards, but future generations are not participating in the decision-making process. The present generation also is committing land and other resources that may be needed or desired for other purposes in the future. Future generations may need to commit additional resources to remediate or otherwise reverse the consequences of decisions.

Although the end state conditions resulting from the completion of EM projects will dictate the specific long-term stewardship needs, issues that may need changes in these needs include:

- After very long periods of time, residual levels of radionuclides and hazardous organic chemicals will eventually decay/degrade over time to levels that are safe for unrestricted use.

- Applicable laws, regulations, and standards may change over time.

- Demographic and political changes around sites may change exposure pathways or levels of concern. Over the past 50 years, urban development around some sites has dramatically increased, and ecological conditions at others have changed significantly (Exhibit 10-2). Long-term stewardship strategies that are effective today may no longer be effective in the future. For example, the needs for buffer zones and other restricted use areas at sites are likely to change over time as population patterns in the vicinities of the sites evolve.

- Climate change and other geological events may be an issue given that long-term stewardship may be needed for hundreds or thousands of years.

Exhibit 10-2. Changing Conditions at and near DOE Sites

Rocky Flats Environmental Technology Site – The population within a 50-mile radius of the site increased from approximately 600,000 in 1950 to more than 2 million today, and this population is expected to increase by an additional 30 percent in the next 20 years. (*Source*: *From Cleanup to Stewardship*, October 1999)

Savannah River Site – When the federal government purchased the site in 1951, 80-90 percent of the land area was farmland in degraded condition, and wildlife populations had been depleted by nearly 200 years of over-hunting and exploitation. By 1968, more than 100 million trees had been planted on the site. Today, wildlife populations have recovered, and seven percent of the site has been set aside for ecological research. (*Source*: *Savannah River Site Future Use Plan*, March 1998)

- Future advances in science and technology could reduce long-term stewardship needs and/or make it possible to clean up existing residual contamination to less restrictive levels. Advances in robotics, for example, might enable future generations to excavate areas that currently pose unacceptable risks to remediation workers.
- Advances in science and medicine may identify new hazards or mitigate existing hazards. A century ago, the effects of ionizing radiation were largely unknown and unsuspected; therefore, a long-term stewardship strategy developed then would not have considered the hazards associated with such radiation. A century from now, medical science may develop treatments that mitigate or reverse the effects of ionizing radiation.

- Cultural and economic values may change over time. Today, the presence of residual contamination generally reduces property values. In the future, limited land availability or concerns over urban sprawl could increase the relative value of property with low levels of residual contamination.

- Changes in on-site plant and animal communities may affect the protectiveness of existing long-term stewardship strategies (e.g., resident species may be listed as endangered or threatened and thus may be subject to special protection).

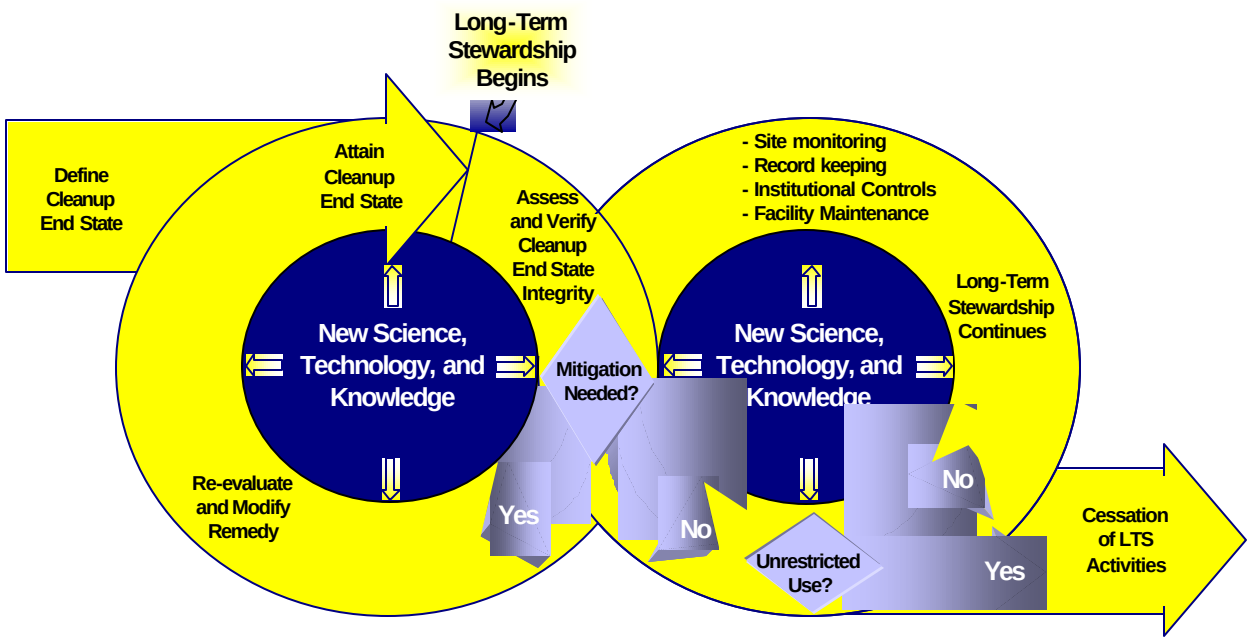
- The physical integrity or effectiveness of markers or other physical controls may change.

10.2.2 Incorporating Science and Technology Changes into Long-term Stewardship Strategies

Site stewards may benefit by using advances in science and technology to reduce costs and risks associated with long-term stewardship activities and to identify more effective ways of managing residual hazards (Exhibit 10-3). Research will be useful for a variety of technical issues (see Section 4.2.4) as well as in the social sciences (e.g., for the organizational and human performance aspects of long-term stewardship).[126] The potential benefits from advances in science and technology are available only if they are recognized and incorporated into long-term stewardship. The results of research applied to other areas may be applicable to long-term stewardship, but without a mechanism to identify and prioritize technology needs, potential improvements in the ability to meet long-term stewardship needs may be overlooked.

[126] *Long-term Institutional Management of U.S. Department of Energy Legacy Waste Sites*. National Academy of Sciences, National Research Council, August 2000, page 99.

Exhibit 10-3. The Dynamic Nature of Long-term Stewardship



Changing knowledge and technology will affect cleanup goals and strategies and long-term stewardship activities. Site stewards will benefit from re-evaluating existing end states and monitoring/mitigation strategies in response to changing knowledge and technology.

DOE has begun planning to identify new science and technology needs, initiate efforts to meet these needs, and develop the capability to react to scientific advances (see Chapter 4). The directive for DOE to develop a performance assessment (PA) and composite analysis (CA) for low-level waste disposal facilities (see Chapter 5)[127] may provide a starting point for developing a process and strategy for incorporating science and technology changes into long-term stewardship. Limited by imperfect knowledge and understanding of controlling phenomena, as well as the inability to foresee future events, the PA and CA results may be very uncertain. Therefore, the PA/CA process includes a sensitivity analysis that identifies the parameters contributing most to the long-term risk posed by the facility. These results can be used to focus research and development (R&D) efforts on those areas that would result in the greatest reduction of risk and/or uncertainty. DOE also is directed to continually update the PA and CA as new information becomes available. This provides a means for incorporating R&D results into the PA and CA and for identifying new R&D needs.

The PA/CA model approach could be applied to long-term stewardship. Site stewards will be limited by imperfect knowledge and understanding of the long-term risks associated with a site and the phenomena controlling these risks. PAs incorporating sensitivity/uncertainty analysis could identify the uncertainties that have the greatest potential for prolonging the duration of the risk or masking the true risk associated with a residual hazard. Given those characteristics, it would be possible to establish priorities for R&D to address long-term stewardship needs. Continually updating the basis for the site

[127] Pursuant to DOE Order 435.1 *Radioactive Waste Management*.

long-term stewardship strategy as new information becomes available would provide a means for incorporating new R&D results into long-term stewardship.

List of Acronyms

AEA: Atomic Energy Act

BLM: Bureau of Land Management

BOR: Bureau of Reclamation

BRAC: Base Realignment and Closure

CERCLA: Comprehensive Environmental Response Compensation and Liability Act

CFR: Code of Federal Regulations

CSM: Conceptual Site Model

D&D: Decontamination and Decommissioning

DOE: Department of Energy

ECES: Environmental Cost Element Structure

EH: Environment, Safety and Health

EM: Environmental Management

EPA: Environmental Protection Agency

FOSL: Finding of Suitability of Lease

FOST: Finding of Suitability of Transfer

GJO: Grand Junction Office

GSA: General Services Administration

INEEL: Idaho National Engineering and Environmental Laboratory

LCAM: Life Cycle Asset Management

NDAA: National Defense Authorization Act

NARA: National Archives and Records Administration

NEPA: National Environmental Policy Act

NFWF: National Fish and Wildlife Foundation

NNSA: National Nuclear Security Agency

NPL: National Priorities List

NRC: Nuclear Regulatory Commission

NWPA: Nuclear Waste Policy Act

OMB: Office of Management and Budget

PBS: Project Baseline Summary

PSO: Principal Secretarial Office

RCRA: Resource Conservation and Recovery Act

UMTRCA: Uranium Mill Tailings Radiation Control Act

WIPP: Waste Isolation Pilot Plant

WM PEIS: Waste Management Programmatic Environmental Impact Statement

Glossary

Atomic Energy Act of 1954, as amended (AEA), 42 U.S.C. 2011 et seq.: The federal statute that is the primary source of NRC and DOE regulatory authority.

Baseline: A quantitative expression of planned costs, schedule, and technical needs for a defined project. Baselines should include criteria to serve as a standard for measuring the status of resources and the progress of a project.

Cleanup: The process of addressing contaminated land, facilities, and materials in accordance with applicable requirements. Cleanup does not imply that all hazards will be removed from the site. This function encompasses a wide range of activities, such as stabilizing contaminated soil; treating groundwater; decommissioning process buildings, nuclear reactors, chemical separations plants, and many other facilities; and exhuming sludge and buried drums of waste. The term "remediation" is often used synonymously with cleanup.

Code of Federal Regulations (CFR): A document containing the regulations of federal departments and agencies.

Composite Analysis (CA): An analysis that accounts for not only the radioactivity in the disposal facility, but all other sources of radioactivity at the site that could contribute to an overall exposure should a failure occur.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 96-510,
42 U.S.C. 9601 et seq.: A federal law (also known as Superfund), enacted in 1980 and reauthorized in 1986, that provides the legal authority for emergency response and cleanup of hazardous substances released into the environment and for the cleanup of inactive waste sites.

Conceptual Site Model (CSM): A set of qualitative assumptions used to describe a system or subsystem for a given purpose. CSMs are used during cleanup actions to depict the relationship between existing hazards, environmental transport mechanisms, exposure pathways, and ultimate human and ecological receptors. CSMs can also be used to distinguish between known and unknown site conditions (e.g., the existence of fractured bedrock or preferential pathways for groundwater flow).

Contingency Plan: Preparations for unexpected or unwanted circumstances (e.g., engineered control failures, environmental change).

Cultural Resources: Include artifacts and sites dating to the prehistoric, historic, and ethnohistoric periods that are currently located on the ground or buried beneath it; standing structures that are over 50 years of age or are important because they represent a major historical theme or era; cultural and natural places, select natural resources, and sacred objects that have importance for Native Americans and other ethnic groups; and American folklife traditions and arts. Many cultural resources are protected by federal laws and regulations, including the American Antiquities Preservation Act, 16 USC 431 et seq.; the Archeological Resources Protection Act, 16 USC 470a.; Executive Order 11593, Protection and Enhancement of the Cultural Environment; Executive Order 13007, Indian Sacred Sites; the National Historic Preservation Act, 16 USC 470 et seq.; and the National Historic Landmarks Program, 36 CFR Part 65.

Decommissioning: The process of removing a facility from operation followed by

decontamination, entombment, dismantlement, or conversion to another use.

Disposition: Reuse, recycling, sale, transfer, storage, treatment, or disposal.

DOE Orders: Internal directives of the DOE that establish policy and procedures, including those for compliance with applicable laws. DOE Orders are established by DOE under the authority of the AEA and are not enforceable by external parties (e.g., regulators).

End State: The physical state of a site after agreed upon remediation activities have been completed.

Engineered Control: Includes radioactive, hazardous, and sanitary landfills; vaults; repositories; in-situ stabilization; caps on residual contamination; or other man-made controls designed to isolate or contain waste or materials.

Environmental Contamination: The release into the environment of radioactive, hazardous, or toxic materials.

Environmental Justice, Executive Order 12898: The fair treatment of people of all races, cultures, incomes, and educational levels with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment implies that no population of people should be subject to disproportionate negative environmental impacts of pollution or environmental hazards. The methodology for addressing environmental justice is described in Section 9.4.

Environmental Management (EM): An Office of DOE that was created in 1989 to oversee the Department's waste management and environmental cleanup efforts. Originally called the Office of Environmental Restoration and Waste Management, it was renamed in 1993.

Exposure Pathway: The course a chemical or physical agent takes from the source to the exposed organism; describes a unique mechanism by which an individual or population can become exposed to chemical or physical agents at or originating from a release site. Each exposure pathway includes a source or a release from a source, an exposure point, and an exposure route.

Half-life: The time it takes for one-half of any given number of unstable atoms to decay to another nuclear form. Each isotope has its own characteristic half-life. Half-lives range from millionths of a second to billions of years.

Hazards: Materials or conditions that have the potential to cause adverse effects to health, safety, or the environment.

Hazardous Waste: A category of waste regulated under the Resource Conservation and Recovery Act (RCRA, 42 U.S.C. 6901 et seq.). To be considered hazardous, a waste must be solid waste under RCRA and must exhibit at least one of four characteristics described in 40 CFR Part 261.20 through 40 CFR Part 261.24 (i.e., ignitability, corrosivity, reactivity, or toxicity) or be specifically listed by the Environmental Protection Agency in 40 CFR Part 261.31 through 40 CFR Part 261.33. Source, special nuclear, or by-product materials as defined by the Atomic Energy Act are not hazardous waste because they are not defined as solid waste under RCRA.

High-Level Waste (HLW): Highly radioactive waste material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid materials derived from such liquid waste that contains fission products in sufficient concentrations; and other highly radioactive material that is determined, consistent with existing law, to need permanent isolation.

In-situ: In its natural position or place.

Institutional Controls: Non-engineering measures - usually, but not always, legal controls - intended to affect human activities in such a way as to prevent or reduce exposure to hazardous substances. Examples of institutional controls are presented in Section 5.1.

Ionizing Radiation: Any radiation capable of displacing electrons from an atom or molecule, thereby producing ions.

Isotopes: Any of two or more variations of an element in which the nuclei have the same number of protons (i.e., the same atomic number) but different number of neutrons so that their atomic masses differ. Isotopes of a single element possess almost identical chemical properties, but often different physical properties (e.g., carbon-12 and carbon-13 are stable, carbon-14 is radioactive).

Intergenerational Equity: A concept that emphasizes the importance of considering future impacts and consequences when making decisions; likewise, future generations should not be unnecessarily or disproportionately burdened by current-day decisions.

Land Use Control Assurance Plans (LUCAP): A written installation-wide plan that sets out the procedure to assure land use controls remain effective over the long-term for all areas at the particular installation where they are needed.

Life-Cycle Cost Estimate: All the anticipated costs associated with the project or program alternative through its life. This includes costs from pre-operations through operations and post-operations stewardship.

Long-term Stewardship: The physical controls, institutions, information and other mechanisms needed to ensure protection of people and the environment at sites where DOE has completed or plans to complete "cleanup" (e.g., landfill closures, remedial actions, removal actions, and facility stabilization). This concept includes, *inter alia*, land-use controls, monitoring, maintenance, and information management

Low-Level Waste: Radioactive waste that is not spent fuel, high-level waste, transuranic waste, byproduct material (as defined in section 11e.(2) of the Atomic Energy Act of 1954), or naturally occurring radioactive material.

Metadata: Refers to the content, quality, condition, and other characteristics of data, particularly for electronic formats. Metadata (and indexing) also provide important contextual information, such as where and when data were collected, quality assurance protocols, and uncertainties in the data, which is necessary for interpreting and using information.

National Environmental Policy Act (NEPA), 42 U.S.C. 4321 et seq: A federal law, enacted in 1970, that requires the federal government to consider the environmental impacts of, and alternatives to, major proposed actions that may significantly affect the quality of the human environment in the government's decision-making processes.

Natural Attenuation: A process that reduces the risk of hazards through three possible mechanisms: 1) transform contaminants to a less toxic form through destructive processes (e.g., biodegradation, radioactive decay); 2) reduce potential exposure levels by lowering concentration levels (e.g., dilution, dispersion); or 3) reduce contaminant mobility and bio-availability by sorption to the soil or rock matrix.

Natural Resources: Include, but are not limited to, biological resources (fish and wildlife), threatened and endangered species, groundwater, water rights, mineral rights, timber, and wetlands. Natural resources are protected by Congressional legislation, including the Clean Water Act, 33 U.S.C. 1251 et seq.; Endangered Species Act, 16 U.S.C. 1531 et seq.; Executive Order 11990, Wetlands Protection; the Fish and Wildlife Conservation Act, 16 U.S.C. 2901 et seq.; the National Environmental Policy Act, 42 U.S.C. 4231; and the Safe Drinking Water Act, 42 U.S.C. 300f et seq.

Performance Assessment (PA): An analysis that predicts the behavior of a system or system component under a given set of conditions.

Programmatic Environmental Impact Statement (PEIS): An environmental impact statement associated with a programmatic decision (e.g., regional vs. local waste disposal facilities) rather than a site-specific decision. The PEIS referred to in the *Long-term Stewardship Study* is the DOE is the Final Waste Management Programmatic Environmental Impact Statement (DOE/EIS-200, May 1997).

Project Baseline Summary (PBS): A management tool used for planning, budgeting, and evaluation that summarizes information on scope, schedule, cost, risk, technical approach, end state, regulatory drivers, safety and health, and performance metrics for each EM program project.

Principal Secretarial Office: A program reporting to the Secretary of Energy. Includes over 25 offices, including the Office of Environmental Management, Office of Defense Programs, Office of Environment, Safety, and Health, and Office of Science.

Radioactivity: The spontaneous transformation of unstable atomic nuclei, usually accompanied by the emission of ionizing radiation (decay).

Radionuclide or Radiosotope: An unstable isotope that undergoes spontaneous transformation, emitting radiation.

Real Property: Includes land and structures on the land such as buildings, mission-related infrastructure, waste disposal facilities, and other waste management units. For the purpose of long-term stewardship, real property also includes groundwater, surface water, natural resources, and cultural resources; however, rights to water and mineral resources may be managed differently than surface property rights.

Receptor: Any human or other living organism that could be exposed to and/or threatened by hazardous or toxic contaminants.

Record of Decision (ROD): A public document that records the final decision(s) concerning a proposed agency action. RODs may be prepared in accordance with requirements of the Council on Environmental Quality NEPA regulations (40 CFR Part 1505.2) or pursuant to CERCLA and the National Contingency Plan. A NEPA ROD identifies the environmentally preferable alternative(s), factors balanced by the agency in making the decision, whether all practicable means to avoid or minimize environmental harm have been adopted, and, if not, why they were not. A CERCLA ROD is a public document that records a final decision in a remedial action process (e.g., selection of a remedial action).

Remedy Monitoring Plan (RMP): A plan that is used to identify the objectives, schedules, information, procedures, technologies, necessary personnel, etc., to ensure the continued effectiveness of a remedy. RMPs can include evaluation of the compliance of the remedy with applicable standards; continued performance of the design, operation, and maintenance of the remedy; and continued maintenance of the land use upon which the remedy selection was based. RMPs are established as part of remedy decision documents.

Resource Management Plan: A management strategy for the conservation of biological (e.g., fish, wildlife, plants) or cultural (e.g., historically significant buildings, sites, objects) resources. Its primary purpose is to provide DOE and its contractors with a consistent approach to protect resources and to monitor, assess, and mitigate impacts from site development, cleanup or restoration activities.

Risk: Risk requires the presence of a hazard, but adds to the hazard the probability that the potential harm of undesirable consequences will be realized upon exposure of a receptor to the hazard. Risk is expressed (qualitatively or quantitatively) in terms of the likelihood that an adverse effect will occur as a result of the existence of the hazard. The existence of a hazard does not automatically imply the existence of a risk since risk requires a pathway (to a receptor) for an exposure to occur.

Spent Nuclear Fuel: Fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been chemically separated. Spent nuclear fuel also includes uranium/neptunium target materials, blanket assemblies, pieces of fuel, and debris.

Transuranic Elements: All elements beyond uranium on the periodic table, including neptunium, plutonium, americium, and curium.

Unrestricted Use: Land use status upon which there is no restriction on the types of activities that may occur, including permanent residential use.

Uranium Mill Tailings: Tailings or waste produced by the extraction or concentration of uranium or thorium from ore for the source material content. Mill tailings are one type of byproduct material, and typically contain about 85 percent of the radioactivity present in unprocessed ore.

Uranium Mill Tailings Radiation Control Act of 1978, 42 U.S.C. 7901 et seq.: The Act that directed the Department of Energy to provide for stabilization and control of the uranium mill tailings from inactive sites in a safe and environmentally sound manner to minimize radiation health hazards to the public. It authorized the Department to undertake remedial actions at 24 designated inactive uranium processing sites and at an estimated 5,048 vicinity properties.

Appendix A: History of Long-term Stewardship and Events Leading to the *Final Study*

History of Long-term Stewardship as an Issue for DOE

DOE first acknowledged in the 1995 and 1996 Baseline Environmental Management Reports that no feasible remediation strategy was available for certain hazards at DOE sites. The Baseline Reports suggested that site cleanup strategies and remedial endpoints for some sites were closer to "brownfields" than "greenfields." The report *Paths to Closure* also acknowledged that DOE has no remediation plans for certain types of residual hazards (e.g., entombment vs. demolition of many facilities) and concluded that long-term stewardship would therefore be needed at DOE sites to manage residual hazards. The report *From Cleanup to Stewardship,* published in October 1999, began to examine national policy issues, challenges, and barriers associated with the transition from cleanup to long-term stewardship and provided a summary of the nature and extent of DOE's long-term stewardship responsibilities. Advisory groups and non-DOE entities that have also identified long-term stewardship issues and/or provided recommendations to DOE include individual state, Tribal, and local governments, Site Specific Advisory Boards, the State and Tribal Governments Working Group (STGWG), the National Association of Attorneys General, and the Environmental Management Advisory Board (EMAB).

The Waste Management Programmatic Environmental Impact Study (WM PEIS) Settlement Agreement

In 1998, the Natural Resources Defense Council and 38 other plaintiffs reached a Settlement Agreement with DOE (*Joint Stipulation: Natural Resources Defense Council et. al. v. Richardson et. al. Civ. No. 97-963 (SS) December 14, 1998*). The text of the Settlement Agreement can be found at *http://lts.apps.em.doe.gov*.

The WM PEIS Settlement Agreement contains three elements:

1. DOE was required to establish a Central Internet Database of information on waste, contaminated media (e.g., water, soil, sediment), facilities, and waste transfers. Data in the Central Internet Database is limited to available site data, and the Settlement Agreement required public participation in its development.

2. DOE was required to prepare a Study on long-term stewardship (Exhibit A-1). The Settlement Agreement requires DOE to conduct a scoping process for the *Draft Study* in accordance with Council on Environmental Quality (CEQ) regulations and to conduct the public review process for the *Final Study* in accordance with DOE NEPA regulations.

Exhibit A-1. Language from WM PEIS Settlement Agreement Pertaining to Long-term Stewardship Study

> "DOE will prepare a study on its long-term stewardship activities. By "long-term stewardship," DOE refers to the physical controls, institutions, information and other mechanisms needed to ensure protection of people and the environment at sites where DOE has completed or plans to complete "cleanup" (e.g., landfill closures, remedial actions, removal actions, and facility stabilization). This concept of long-term stewardship includes, *inter alia*, land-use controls, monitoring, maintenance, and information management. While DOE's study on long-term stewardship will not be a NEPA document or its functional equivalent, DOE will, nevertheless, follow the procedures set forth in the regulations of the President's Council on Environmental Quality (CEQ) for public scoping, 40 C.F.R. § 1501.7(a)(1)-(2), and the procedures set forth in DOE's NEPA regulations for public review, of environmental impact statements (EIS's), 10 CFR § 1021.313, except that (a) DOE will not transmit the study, in draft form, to EPA, and DOE (not EPA) will publish a Notice of Availability in the Federal Register, as set forth in 10 C.F.R. § 1021.313(a); and (b) DOE will not include any Statement of Findings as set forth in 10 C.F.R. § 1021.313(c). In the study, DOE will discuss, as appropriate, alternative approaches to long-term stewardship and the environmental consequences associated with those alternative approaches."

3. DOE was required to allocate $6.25 million in funds for citizen monitoring and technical assessment for eligible organizations to procure technical expertise to review DOE Environmental Management activities. Any nonprofit organization, non-governmental organization, or Tribal organization group is eligible for funding. RESOLVE was selected as the "Administering Organization" for the funding.

Relationship Between the Background Document, the *Final Study*, and the National Defense Authorization Act (NDAA) *Report to Congress*

The Background Document *From Cleanup to Stewardship* provides background information for the long-term stewardship study scoping process required by the WM PEIS Settlement Agreement. The Background Document provides an overall summary of the nature and extent of current and anticipated long-term stewardship needs at all DOE sites. The Background Document also summarizes available information about the number and location of sites that will likely require long-term stewardship by DOE, the type of long-term stewardship activities likely to be required, and the DOE sites at which long-term stewardship activities are currently being conducted. DOE used this information to identify sites where contaminated facilities, water, soil, and/or engineered units would likely remain after cleanup is complete, and to estimate the scope of long-term stewardship activities needed.

DOE prepared the *Final Study* pursuant to the terms of the Settlement Agreement, to meet the commitment made in the Background Document, and to respond to insights provided by the public during the public scoping process. The *Final Study* is not directly related to the other two elements of the Settlement Agreement. The funding allocated by DOE for citizen monitoring and technical assessment was not used to support preparation of the *Draft Study* or the *Final Study*. The *Final Study* also was prepared independently of the Central Internet Database, which contains site-specific information concerning DOE facilities. The *Final Study* does not analyze site-specific issues, but analyzes the national issues that DOE needs to address in planning for and conducting long-term

stewardship activities. The *Final Study* promotes exchange of long-term stewardship information between DOE and non-DOE agencies and organizations, including Tribal nations, state and local governments, and private citizens. The *Final Study* will inform future DOE site and national programmatic decision processes affected by long-term stewardship issues.

The *Report to Congress on Long-term Stewardship*, published in January 2001, is the third important building block for developing DOE's long-term stewardship program. While the *Final Study* and Background document address long-term stewardship issues on a broad, complex-wide scale, the *Report to Congress* addresses DOE's long-term stewardship requirements on a more site-specific, detailed scale. The *Report to Congress*:

- Identifies sites or portions of sites where environmental restoration, waste disposal, and facility stabilization will be completed by 2006 without unrestricted land use.

- Includes sufficient detail to undertake the necessary management and stewardship responsibilities, including cost, scope, and schedule.

Appendix B: How DOE Identified the Scope for the *Draft Study*

How DOE Selected the Scope and Issues Presented in the *Draft Study*

The scope of and issues presented in the *Draft Study* were based on the comments received through the scoping process, ongoing work on long-term stewardship being conducted by DOE and non-DOE organizations, and the requirements of the WM PEIS Settlement Agreement. DOE headquarters and field organizations worked with each other, state and federal regulatory agencies, and national and local stakeholder organizations to identify and address long-term stewardship issues. Long-term stewardship issues were identified by DOE as part of the Department's cleanup, economic re-development, and facility disposition programs. DOE identified and is addressing long-term stewardship issues and statutory requirements through the development of complex-wide and site-specific guidance, site-specific agreements, and site-specific and organization-specific programs. Examples of these documents are discussed in this Appendix and referenced throughout the *Final Study*. The long-term stewardship issues that DOE identified and is addressing in these documents provides a basis for the scope of and the specific issues presented in the *Draft Study*.

The scoping comments received from DOE stakeholder organizations and the public raised a number of broad long-term stewardship issues, including complex-wide and site-specific planning, long-term provision of engineered and institutional controls, residual hazard management, alternative long-term funding mechanisms, life-cycle cost estimation, information management, natural resources management, cultural resources management, and compliance oversight. Scoping commenters also specifically requested that DOE consider recommendations on long-term stewardship issues that have been developed by advisory groups and non-DOE organizations. DOE integrated the long-term stewardship issues identified in the scoping comments with the issues that were identified through DOE's ongoing long-term stewardship work in developing the scope of and specific issues presented in the *Draft Study*. Each chapter of the *Draft Study* focused on a single broad issue of long-term stewardship.

The Scoping Process and How Scoping Comments Were Incorporated into the *Draft Study*

DOE published a Notice of Intent (NOI) to prepare a study on long-term stewardship in the October 6, 1999 Federal Register (64 FR 54279). The NOI described the goals of the study and development process for the study. The NOI also described the study scoping process and established the formal period during which DOE would accept scoping comments. Initially, the formal scoping period for the study was October 6, 1999 to January 4, 2000. In response to public comment, DOE extended the scoping period to February 3, 2000. The notice of extension for the scoping period was published in the December 29, 1999 Federal Register (64 FR 73027). DOE developed a background document for the *Study*: *From Cleanup to Stewardship, A Companion Report to `Paths to Closure' and Background Information to Support the Scoping Process Required for the 1999 PEIS Settlement Study*. Notification of the publication of the Background Document was included in the Notice of Intent.

In accordance with the terms of the settlement agreement, DOE followed the President's Council on Environmental Quality (CEQ) procedures for public scoping, 40 CFR 1501.7(a)(1)-(2), even though the *Study* is not a NEPA document or its functional equivalent. The public scoping process provided interested parties with opportunities to learn about the goals of the *Study* and review background information related to the *Study*. The public scoping process also provided DOE with input about the topics and issues that should be included in the *Draft Study*, within the general parameters established by the Settlement Agreement.

DOE conducted a public scoping workshop October 28, 1999 in Oak Ridge, TN, to provide an opportunity for information exchange and constructive discussions between DOE and interested parties on the types of issues DOE should examine in the *Study*. The public scoping workshop was scheduled to coincide with the 1999 annual Site-Specific Advisory Board (SSAB) National Stewardship Workshop held October 25-27, 1999. A public notice for the public scoping workshop was published in the October 7, 1999 Federal Register (64 FR 54624). At the public workshop, DOE staff discussed the *Study* process and objectives, described how public input will be incorporated into the *Study*, and addressed questions. The facilitated workshop provided the means for interaction among the participants so as to promote a thorough, open discussion of long-term stewardship issues.

In addition to the public workshop, DOE pursued other opportunities to inform the public about the *Study* and scoping process throughout the scoping period. DOE distributed the Background Document and other relevant information to existing forums and entities, including the Environmental Management Advisory Board (EMAB), Site-Specific Advisory Boards (SSABs), State and Tribal Governments Working Group (STGWG), and other stakeholder organizations. DOE also conducted public presentations concerning the *Draft Study* at many locations throughout U.S. (see Exhibit B-1). DOE published the Background Document and other relevant information on the long-term stewardship Internet Web Site (*http://lts.apps.em.doe.gov/lts*). DOE solicited scoping comments through the Internet Web Site and by postal mail and fax to the DOE Study Project Manager.

DOE received scoping comments from 18 commenters (Exhibit B-2). DOE reviewed and considered all scoping comments and other suggestions. These comments and suggestions were integrated with ongoing DOE work to determine the scope of and issues that were presented in the *Draft Study*. DOE made a concerted effort to address every substantive comment received. The *Draft Study* did not address site-specific issues except as examples in the context of presenting national issues. Therefore, site-specific scoping comments were incorporated into the *Draft Study* scope only to the extent feasible in the context of national long-term stewardship issues. Comments that were received by DOE after the closing date of the formal scoping process (February 3, 2000) were considered in the *Draft Study* to the extent practicable considering schedule constraints. Exhibit B-2 provides a summary of each scoping comment and where the comment was addressed in the *Study* (or whether DOE considered the comment to be out of scope for the *Study*). The *Study* also identifies the scoping comments addressed in each chapter.

Exhibit B-1. Presentations by the Office of Long Term Stewardship

Date	Organization	Location
November 16, 1999	National Association of Attorneys General	Oak Ridge, TN
November 17, 1999	Idaho National Engineering and Environmental Laboratory Citizens Advisory Board	Idaho Falls, ID
December 8, 1999	Environmental Management Advisory Board	Washington, DC
December 14, 1999	Environmental Management Advisory Board	Washington, DC
January 4, 2000	Nevada Test Site Citizens Advisory Board	Las Vegas, NV
January 5, 2000	Community Advisory Board for Nevada Test Site – Site Programs	Las Vegas, NV
January 15, 2000	Fernald Citizens Advisory Board	Harrison, OH
January 19, 2000	LLRW Decisionmakers' Forum & Technical Symposium	Amelia Island, FL
January 25, 2000	Savannah River Site Citizens Advisory Board	Aiken, SC
February 2, 2000	Office of Science and Technology Focus Area Meeting	Germantown, MD
February 28, 2000	Long-term Stewardship Workshop Waste Management 2000 Symposium	Tucson, AZ
March 9, 2000	Energy Communities Alliance	Washington, DC
April 7, 2000	Interstate Technology Regulatory Coordination Group	Arlington, VA
April 18, 2000	Applied Research, Development & Deployment Cleanup Technology Colloquium	Scottsdale, AZ
May 24, 2000	Environmental Quality Portfolio Analysis	Televideo Conference

Exhibit B-2. Scoping Comments

Commenter, Date Received, Summary of Scoping Comments, Where Addressed in *Study*
1. State Attorney General Office, January 4, 2000 • Suggests that DOE evaluate the failure of institutional controls and then recommend methods to prevent/minimize such failures in the future. (Chapter 5) • Asks DOE how it intends to provide long-term protection for UMTRCA "vicinity properties" in cases where owners did not allow property cleanup. (out of scope – site specific issue) • Proposes that DOE dedicate part of each former DOE facility as a historic site or museum for long-term information management. (Chapter 7) • Requests that DOE respond to the STGWG recommendations in "Closure for the Seventh Generation." (STGWG comments included in boxes entitled "Applicable Scoping Comments and Issues" in Chapters 2-10) • Asks DOE to describe funding approaches available for long-term assurance of adequate oversight without relying on Congressional appropriations. (Chapter 2, Chapter 8) • Recommends that DOE evaluate the pros and cons of different federal agencies performing long-term stewardship responsibilities, esp. at sites with significant natural resources/historic preservation values. (Chapter 4) • Suggests that DOE consider the issue of cost of stewardship activities when taking a remedial action that may have long-term stewardship implications and provide for redundant/overlapping oversight mechanisms to ensure that such long-term stewardship/remedial action decisions are appropriately carried out. (Chapter 3)
2. Private citizen, January 4, 2000 • Suggests that each major site have its own detailed long-term stewardship plan that must be approved/reviewed by EPA and the State. (Chapter 4) • Recommends that the *Study* include discussion on the approaches to long-term stewardship and land use control used by other federal agencies and other nations. (Chapter 4, Chapter 6) • The *Study* should assess the relative roles of active vs. passive controls with guidance on determining the length of time for active controls. (Chapter 5) • The *Study* should discuss approaches for preserving information about a site and its past activities and contamination history. (Chapter 2, Chapter 7)
3. Private citizen, January 4, 2000 • Provides alternative definitions of long-term stewardship. (Chapter 1) • Asks DOE to assess several natural resources damage and cleanup issues/decisions. (Chapter 9) • Recommends that the Study be conducted by those not previously involved with DOE, DOD, and National Labs because of possible bias, and asks that stakeholders and Tribes be involved fully in the *Study*. (out of scope – requirements for public involvement were specified in the Settlement Agreement) • Wants DOE to focus more on protecting the future and actual cleanup of sites rather than assessing the need for cleanup. (Chapter 2) • Asks that stewardship involve leaving a site in a better natural condition than when DOE started using the site. (out of scope – cleanup decision)

Exhibit B-2 (continued)

Commenter, Date Received, Summary of Scoping Comments, Where Addressed in *Study*
4. Private citizen, January 4, 2000 • Wants DOE to create a single headquarters office with cross-cutting authority to oversee long-term stewardship activities and develop rules and approve individual site plans. (Chapter 4) • Recommends that long-term stewardship decisions be transparent by involving the public and that public involvement be a key element in the planning and implementation of stewardship programs. (Chapter 2, Chapter 9) • Suggests that DOE use life-cycle accounting to assess the complete costs, present and future, associated with cleanup decisions. (Chapter 8) • Asks DOE to seek alternative funding for long-term stewardship in the form of trust funds or endowments, fee-generating scheme etc. since Congressional appropriations are uncertain. (Chapter 8) • Emphasizes that DOE needs to institute a reliable documentation update/revision system to ensure that crucial data on each site is preserved. (Chapter 7) • Acknowledges that DOE may not remain the steward and asks that provisions be made for another entity to take over as steward. (Chapter 4, Chapter 10) • Believes that DOE should evaluate the reliability of institutional controls; DOE should adopt redundant/overlapping functions to ensure efficacy of control measures; and every long-term stewardship plan should have an emergency response component to address failure of such controls. (Chapter 5) • Long-term stewardship plans should be flexible and take into account future advances in technology, science, changes in cultural values and politics etc. and undergo revision via a democratic process. (Chapter 10) • Proposes that DOE continue R&D activities to minimize residual contamination and reduce future long-term stewardship costs. (Chapter 4)
5. Citizen group, January 4, 2000 No relevant suggestions for national study. Requested EM briefing at Spokane Indian Reservation and/or Spokane. Requested copy of *Background Document*
6. State regulatory agency, December 15, 1999 • Wants DOE to explain why residual contamination will remain at some sites. (out of scope – cleanup decision) • Suggests that the *Study* examine alternative internal organizational/program strategies and financial mechanisms that will be needed to maintain long-term stewardship programs. (Chapter 8, Chapter 10) • Would like the *Study* to examine DOE's existing legislative authorities for maintaining long-term institutional control over contaminated sites and the alternatives for sharing regulatory responsibilities with other federal agencies. (Chapter 3, Chapter 4)
7. State regulatory agency, January 4, 2000 • Requests a more uniform definition of long-term surveillance and maintenance. (Chapter 5) • Recommends that the Study address the need for consistent policy and guidance at the Secretary of Energy level for long-term stewardship across all departmental programs. (Chapter 4) • Asks that the *Study* discuss contingency/emergency plans being included in long-term stewardship plans. (Chapter 5) • The state expects to work with DOE on the NDAA Report and wants the *Study* to be consistent with the NDAA Report to Congress. (Chapter 1) • Emphasizes that the *Study* must identify milestones for activities leading to a final action or decision by DOE on its plan for long-term stewardship. (Chapter 4)

Exhibit B-2 (continued)

Commenter, Date Received, Summary of Scoping Comments, Where Addressed in *Study*
8. DOE Advisory Group, January 4, 2000 • Addresses DOE's responses (5-24-99) to earlier recommendations. (out of scope – not relevant to study specifics) • Emphasizes that DOE retains liability in perpetuity for all contamination at its sites. (Chapter 6) • Expresses concern over DOE's reliance/dependency on the use of institutional controls for extended periods. (Chapter 5) • Asks DOE how it intends to assess comprehensively all elements in determining cleanup levels and future land uses. (Chapter 3)
9. Citizen group, January 6, 2000 No scoping comments provided. General comments are provided urging DOE to completely decommission facilities that are no longer needed. Supports projects like the AMWTF at INEEL.
10. State regulatory agency, January 10, 2000 • Wants DOE to establish consistent policy and guidance for stewardship across all DOE programs. (Chapter 4) • Also wants DOE to ensure programmatic effectiveness of long-term institutional controls and mechanisms for restricting future land use. (Chapter 5, Chapter 6)
11. Environmental group, January 12, 2000 No scoping comments provided. Requests DOE to extend the scoping period for 30 days, or until February 3, 2000.
12. Citizen Advisory Group, January 12, 2000 • Requests DOE to address the issues raised in the two-volume document, "The Oak Ridge Reservation Stakeholder Report on Stewardship."
13. State regulatory agency, January 26, 2000 • States that the state is directly affected by decisions concerning the cleanup of the Hanford site. (out of scope – cleanup decision) • Is disappointed at the lack of public involvement in developing the *Study* – only two public meetings, both of which were held on the eastern half of U.S. (Chapter 1, Appendix B) • Concerned that stewardship will substitute actual cleanup – does not agree that leaving contamination in place under long-term stewardship is a primary cleanup strategy. Long-term stewardship should be instituted only *after* the necessary cleanup action to remove maximum amount of contamination has been undertaken. (Chapter 3) • Skeptical of the viability of long-term institutional controls citing the historical evidence of transient nature of institutions and commitments. (Chapter 5)

Exhibit B-2 (continued)

Commenter, Date Received, Summary of Scoping Comments, Where Addressed in *Study*
14. Environmental group, January 31, 2000 • Concerned that long-term stewardship will be used an excuse to avoid cleanup of sites. (Chapter 3, Chapter 10) • Wants more emphasis on groundwater monitoring. (Chapter 5) • Suggests conducting health studies alongside monitoring of waste and caps etc. (Chapter 4) • Questions who will be overseeing, especially in multi-program site cases – does not trust Defense Programs to conduct long-term stewardship effectively. (Chapter 4, Chapter 6)
15. Private company, February 2, 2000 • Advises that DOE-EM's long-term stewardship obligations be fully addressed in conjunction with all new DOE projects and missions. (Chapter 6) • States that DOE should consider the use of commercial facilities to manage its waste instead of using on-site DOE facilities. Further adds that DOE should have addressed this option in its WMPEIS. (out of scope – cleanup decision) • Emphasizes that an institutional bias at DOE favors the development of new "on-site" DOE projects by traditional DOE contractors since this allows DOE to maintain and/or increase its current scope of work/mission. (out of scope – site-specific issue) • Believes that on-site waste treatment and disposal facilities increase DOE's long-term stewardship obligations. Believes that DOE's use of "off-site" commercial options for waste treatment and disposal as opposed to DOE's development of new "on-site" treatment and disposal facilities can reduce DOE's long-term stewardship obligations. (out of scope – cleanup decision)
16. Citizen Advisory Board, February 27, 2000 • Acknowledges that comments were submitted late but would still like them to be included/addressed in the *Study*. • Considers the scoping process to be limited since scoping meeting was held in Oak Ridge, TN and not conducted on a regional basis to allow residents near sites to participate. (Chapter 1, Appendix B) • Recommends that the *Study* carefully review, document, and provide recommendations on the transfer of liability for monitoring, surveillance, and cleanup for properties that are sold into the private sector or to other governmental entities. (Chapter 6) • Also suggests that the *Study* explicitly show how liability will be assigned in the event of the failure of a subsequent landholder to perform adequately (e.g., bankruptcy) so that public is guaranteed that a responsible steward is always identifiable. (Chapter 6) • Emphasizes that the *Study* should identify process(es) whereby owners and neighbors are made aware of, in perpetuity, the nature and extent of contamination and use restrictions and maintain corporate memory so that any attrition of personnel and changes in filing and computer systems do not result in loss of corporate memory. (Chapter 7) • Suggests that the *Study* provide that stewardship activities of DOE contractors be mandated by law. (Chapter 4) • The *Study* should explore the option of setting up funding for stewardship separately from other operational and programmatic funding for DOE contractors and supported by a source not subject to the annual appropriations process. (Chapter 8)

Exhibit B-2 (continued)

Commenter, Date Received, Summary of Scoping Comments, Where Addressed in *Study*
17. State regulatory agency, March 24, 2000 • Discusses an underground nuclear test area (UGTA) as an unique DOE former nuclear test site in the continental U.S. because of the uncontrolled pathways allowing radionuclides from the underground tests to enter the accessible marine environment. (out of scope – site-specific issue) • Comments focus on approaches that should prove helpful to DOE in carrying out its long-term stewardship responsibilities at such a site. (out of scope – site-specific issue) • Scope of contamination at DOE's UGTA sites should discuss the contaminated subsurface areas and marine waters around the site as media of special concern. (out of scope – site-specific issue) • Questions how DOE and its affiliates in the nuclear testing program will meet their joint long-term stewardship responsibility at the site and which federal entity will be assigned long-term stewardship responsibility -- DOD, DOE, USFWS? (general issues addressed, specific issues are site-specific) • States that past monitoring efforts for the region have been poor and deficient and suggests several types of monitoring plans that need to be included in a long-term stewardship plan. States that this is critical for building stakeholder trust and confidence from the native population in the region that depends on subsistence survival from the natural environment, e.g., fishing. (Chapter 9) • Suggests forming a joint long-term stewardship assessment group involving State, Tribal Governments, and other stakeholders to independently conduct long-term monitoring under a "trust" funding mechanism. (Chapter 8)
18. State regulatory agency, October 28, 1999 • DOE needs to provide adequate information to the public. (Chapter 7) • States that the boundaries of most sites include very contaminated areas and some clean areas; which should be accounted for separately. (Chapter 6) • States that DOE needs to recognize what areas need to be cleaned up, what has been cleaned up and is now in a long-term stewardship state. (Chapter 6) • States that DOE needs to identify what is expected to be cleaned up to pristine standards for unrestricted use and what can never be cleaned up completely with available technologies; identifying sites in this way will help DOE build a reliable program, identify research needs, and budget appropriately. (Chapter 3) • Suggests that long-term stewardship will inevitably fail; it's only a matter of when and where it will fail. Suggests that efforts can delay it or stretch it out, but not prevent failure. Recommends that DOE assume that long-term stewardship will fail, and the *Study* should consider this possibility. (Chapter 5) • Suggests that currently, long-term stewardship relies on several things going perfectly: perpetual funding, perpetual record-keeping, perfect monitoring and modeling, and effective containment. DOE should consider the consequences if these don't remain perfect, specifically with regard to health impacts, ecological impacts, economic disruption, and disproportionate effects of future exposures on certain segments of the population (manual laborers, low-income communities, etc.). (Chapter 5) • When starting new projects, DOE should be required to provide a technical plan and adequate funding to fully clean up any waste or contamination that would result from the project. (Chapter 6)

Exhibit B-2 (continued)

Commenter, Date Received, Summary of Scoping Comments, Where Addressed in *Study*
State and Tribal Working Group (STGWG), *Closure for the Seventh Generation*, February 1999 *Commenter number 1 requested that DOE respond to recommendations in the report "Closure for the Seventh Generation." The STGWG recommendations from that report are summarized here.* Goals of Long-term Stewardship • Any accepted long-term institutional control or stewardship program must ensure long-term protection of human health, the environment, and cultural resources. (Chapter 9) Long-term Stewardship Planning • The specifics concerning the goals of institutional controls, the types of controls required, the manner in which the controls will be implemented, and how the controls will be maintained should be evaluated for each alternative being considered in a feasibility study. (Chapter 3) • DOE should more fully explain and quantify the required long-term cost and funding commitment required for long-term institutional controls; should develop plans to ensure the availability of adequate funding for these controls; and should not consider decisions requiring these controls to be final until DOE can implement an acceptable stewardship program that includes an acceptable funding mechanism. (Chapter 8) • DOE should develop methods for accurately reflecting long-term institutional controls, monitoring, or maintenance commitments in decision documents or should identify any uncertainties related to these commitments. (Chapter 3) • DOE should establish mechanisms for the collection, retrieval, and storage of information needed for long-term stewardship and site historic preservation programs. (Chapter 7) • DOE should continue to work with regulators and stakeholders to develop an acceptable stewardship program. Each site should develop a stewardship plan that defines constraints, costs, and implementation mechanisms. (Chapter 4) • Stewardship planning and implementation should be an iterative process. DOE sites and headquarters should re-evaluate and revise stewardship plans and implementation on a routine basis to reflect decisions made and changing conditions. (Chapter 10) Long-term Stewardship Implementation • DOE should create a specific program office, not limited to the EM program, to manage stewardship responsibilities. (Chapter 4) • DOE should retain ownership and control of lands for which institutional controls are necessary unless adequate legal mechanisms and institutions exist to enforce such controls against future landowners. (Chapter 6) • Experience shows that implementing legislation facilitates maintaining long-term commitment of resources. DOE should continue to work with the states, tribes, and other stakeholders to explore the parameters of statutory long-term stewardship. (Chapter 4) • For new construction and new facilities, the closure and long-term commitments associated with the facility should be addressed in the initial approval decision. Provisions should be made for closure and post-closure funding for the facility. (Chapter 6). Public Education and Awareness • DOE needs to complete the final report, *Moving from Cleanup to Stewardship*, and distribute it for public comment as soon as possible. (out of scope – not related to *Study*)

At the public workshop, DOE presented a number of issues regarding long-term stewardship that had been raised during the past few years. The workshop participants identified a number of additional issues pertaining to long-term stewardship. The combined list of 27 issues was included in subsequent briefings used at the public presentations noted above. Exhibit B-3 lists these 27 issues and where they are addressed in the *Study* (including those considered out of scope).

Other Factors That Led to the Identification of Issues Presented in the *Draft Study*

DOE considered the ongoing work on long-term stewardship that is being conducted within DOE organizations to help determine the issues presented in the *Draft Study*. The Grand Junction Office, Oak Ridge Operations Office, Richland Operations Office, and other DOE organizations are already conducting long-term stewardship activities at sites or portions of sites for which cleanup has been completed, both in response to statutory requirements and to the conditions of negotiated site-specific agreements. The *FY 2000-2001 Idaho National Engineering and Environmental Laboratory Institutional Plan* prepared by the Idaho Operations Office describes INEEL's role as the lead laboratory for DOE's efforts to incorporate new science and technology into long-term stewardship. Long-term stewardship activities are also addressed in site-specific DOE documents, including the *1999 Long-Term Surveillance and Maintenance Report* prepared by the Grand Junction Office and the *WIPP Compliance Certification Application* prepared by the DOE National Transuranic Waste Program Office.

DOE Headquarters and Field Offices have also developed complex-wide and site-specific guidance documents and reports that address long-term stewardship issues. These include the *Cross-Cut Guidance on Environmental Requirements for DOE Real Property Transfers*, the DOE RCRA/CERCLA Information Bulletin *Planning and Implementing RCRA/CERCLA Closure and Post-Closure Care when Wastes Remain Onsite*, and *Facility Disposition Lessons Learned from the Mound Site Monograph*, prepared by the DOE Office of Environmental Policy and Assistance. DOE also reviewed other Environmental and Property Management Information Bulletins, DOE Site Profiles, Guidance Documents, and information developed by the DOE Stewardship Working Group to identify the specific issues to be included in the *Draft Study*.

DOE considered recommendations related to long-term stewardship developed by advisory groups, stakeholder organizations, and non-DOE entities, including EMAB, STGWG, the Oak Ridge Stewardship Working Group, the Environmental Law Institute, the Energy Communities Alliance, and Resources for the Future. These include the recommendations in the STGWG report *Closure for the Seventh Generation,* the EMAB *Report and Recommendations on Long-Term Stewardship*, and the *Oak Ridge Reservation Stakeholder Report on Stewardship*. Scoping comments specifically requested that DOE consider the recommendations in these stakeholder reports in developing the scope of the *Draft Study*.

DOE obtained site-specific and program-wide information from other federal agencies with long-term stewardship responsibilities. These include the Department of Defense Base Realignment and Closure (BRAC) program, the Bureau of Land Management, and the Bureau of Reclamation. DOE also

reviewed EPA guidance documents concerning long-term stewardship, including guidance on the use of institutional controls as part of CERCLA remedies.

Exhibit B-3. The 27 Issues Noted During the Scoping Process

Issue	Where Addressed in *Study*
1. *Relationship of "Cleanup" Decision Process to Long-term Stewardship Needs* – how to better integrate consideration of long-term stewardship needs and requirements in waste management, facility decommissioning, and remedial action decision-making processes?	Chapter 3
2. *Development of Site-specific Long-term Stewardship Plans* – when are they needed; what should they include; how to coordinate development among sites; how to revise and update them?	Chapter 5
3. *Funding Mechanisms* – how much funding will be required; financial obligations of federal, state, and local governments; what will and will not be paid for; when are payments made and funds obligated; adequacy of the annual appropriation model for long-term stewardship?	Chapter 8
4. *Regulatory Drivers, Negotiated Agreements, and Legislative Barriers* – to what extent do existing regulatory requirements address long-term stewardship needs and requirements (are additional regulations needed?); how to better integrate consideration of long-term stewardship issues in planning processes (e.g., NEPA documents)?	Chapter 4
5. *Information Management* – what information will be required; how will it be preserved and made accessible; how should information be provided to federal, state, and local officials and to the general public; what entities will be responsible for information management?	Chapter 7
6. *Relationship of Facility Development Planning to Long-term Stewardship Needs* – how to better integrate consideration of long-term stewardship needs and implications in decisions to site, build, and operate a new facility?	Chapter 6
7. *Science and Technology Development* – how to ensure periodic re-examination of existing end states and long-term stewardship activities to apply new science and technology; how to focus science and technology development on long-term stewardship needs?	Chapter 4
8. *Institutional Controls* – appropriate entities (organizations, individuals) to ensure that long-term stewardship occurs; role of state and local governments at federal sites; long-term viability of existing institutional control mechanisms; variability among state and local laws and authorities?	Chapter 5
9. *Purpose of Long-term Stewardship* – maintaining status quo or reassess site condition and remedy?	Chapter 10
10. *Property Transfer Policies and Procedures* – what obligations and restrictions will convey to future site owners and tenants; what are the mechanisms by which property transfers from federal to non-federal (public or private) entities; role of the federal government after property transfers; variability among state and local property laws; criteria for deciding which property can be transferred?	Chapter 6
11. *Land Use/Natural Resources* – how to integrate on-site and off-site land use planning; how to balance preservation of site assets (e.g., natural or cultural resources, infrastructure) with long-term stewardship needs; how to meet treaty obligations with Tribal governments during cleanup and long-term stewardship?	Chapter 9

Exhibit B-3 (continued)

Issue	Where Addressed in *Study*
12. *Risk Management* – relationship between short-term risk reduction achieved by remedial actions vs. long-term risks during stewardship; potential conflicts between economic benefits of site redevelopment and risks to onsite workers/visitors; how to evaluate and manage risks over multiple generations?	Chapter 5
13. *Intergenerational Transfer* – what mechanisms and institutions are appropriate means to ensure transfer of long-term stewardship information and responsibility to future generations?	Chapter 10
14. *Stewardship Responsibilities at Non-EM Facilities with Continuing Operations and Multi-Purpose Sites* – what are the options for long-term stewardship responsibilities and funding at non-EM facilities and multi-purpose sites; how do we do long-term stewardship for these sites/facilities; how do you tie long-term stewardship into on-going production sites/facilities?	Chapter 4
15. *If the Department of Energy Goes Away* – what about long-term stewardship if DOE does not exist; what happens; what happens when the Administration changes?	Chapter 10
16. *Sociological/Political Issues* – what is the federal obligation/compensation for impacts related to long-term stewardship; socioeconomic/local and regional impacts?	Chapter 9
17. *Environmental Justice* – the Tribes need to be engaged and involved.	Chapter 9
18. *Realistic Cleanup Standards*	out of scope (cleanup decision)
19. *Public Involvement* – during and after long-term stewardship.	Chapter 9
20. *Roles and Responsibilities* – who will be responsible in the long term; how can we maintain sustainable responsibility?	Chapter 4, Chapter 10
21. *Enforcement* – who is going to enforce long-term stewardship? Look at the NRC licensing process.	Chapter 4, Chapter 6
22. *Long-term vs. Short-term* – need to articulate what is short- vs. long-term and how long is long.	Chapter 10
23. *Tie National Policy to Stewardship Legislative Mandate* – need policy and legislative mandate now. Need these regulatory drivers to get and maintain funding.	Chapter 4
24. *Moral Responsibility to Follow the Waste* – especially when it goes offsite.	out of scope (not addressed)
25. *Minimize Risks/Hazards and Plan for Failures* – need to plan for contingency actions now.	Chapter 5
26. *Expedite* – DOE needs to act now.	Chapter 2, Chapter 4
27. *Social/Citizen Control* – Communities/citizens need to have the information, etc.	Chapter 7, Chapter 9

Appendix C: The Public Comment Process for the *Final Study*

The Public Comment Process

As specified in the Settlement Agreement, the public review process for the *Draft Study* followed:

> *"the procedures set forth in DOE's NEPA regulations for public review, of environmental impact statements, 10 C.F.R. § 1021.313, except that (a)...DOE (not EPA) will publish a Notice of Availability in the Federal Register, as set forth in 10 C.F.R. § 1021.313(a); and (b) DOE will not include any Statement of Findings as set forth in 10 C.F.R. § 1021.313(c)."*

DOE published a Notice of Availability (NOA) announcing the availability of the *Draft Study* and describing the public review process for the *Draft Study* in the October 31, 2000 Federal Register (65 FR 64934). The NOA described the public comment process and established the formal period during which DOE would accept public comments. The 45-day formal public comment period was October 31, 2000 to December 15, 2000. The NOA also announced a public hearing that was held in Washington, D.C. on November 30, 2000. In addition to the public hearing, DOE held a public workshop in San Francisco, CA on December 14, 2000, to allow for additional information exchange and constructive discussions between DOE and interested parties on the scope and content of the *Draft Study*. DOE used input from the public to complete this *Final Study*.

In addition to the public hearing and public workshop, DOE pursued other opportunities to inform the public about the availability of the *Draft Study* and the public comment process. DOE distributed the *Draft Study* to existing forums and entities, including the Environmental Management Advisory Board (EMAB), Site-Specific Advisory Boards (SSABs), the State and Tribal Governments Working Group (STGWG), and other stakeholder organizations. Prior to and during the public comment period, DOE conducted public presentations concerning the *Draft Study* at several locations throughout the U.S. (see Exhibit C-1). DOE also published the *Draft Study* on the Internet Web Site (*http://lts.apps.em.doe.gov*). DOE solicited public comments through its Internet Web Site and by postal mail, email, and fax to the DOE Study Project Manager.

How Public Comments Were Incorporated into the *Final Study*

DOE received public comments from 50 commenters, including four speakers at the public hearing (Exhibit C-2). DOE reviewed and considered all public comments and other suggestions. These comments and suggestions were integrated with ongoing DOE work to determine how to revise the *Draft Study* and its Appendices. DOE made a concerted effort to address every substantive comment received and modify or revise the *Draft Study* accordingly. The *Final Study* does not address site-specific issues except as examples in the context of presenting national issues. Therefore, site-specific comments have been incorporated into the

Exhibit C-1. Presentations on the *Draft Study* by the Office of Long Term Stewardship

Date	Organization	Location
June 13, 2000	Interagency Steering Committee on Radiation Standards	Rockville, MD
August 7, 2000	Third Annual National Workshop on Long-Term Stewardship	Denver, CO
August 30, 2000	Third Dixie Lee Ray Memorial Symposium	Washington, DC
September 20, 2000	Post Closure Stewardship Technology Needs University of Cincinnati	Cincinnati, OH
October 3, 2000	National Governors' Association, Energy Communities Alliance, and National Association of Attorneys General Roundtable	Idaho Falls, ID
October 17, 2000	Industry Partnerships for Environmental Science and Technology	Morgantown, WV
October 18, 2000	New Environmental Technologies and Market Opportunities, Fall 2000 ITRC Conference	San Antonio, TX
October 25, 2000	Argonne National Laboratory Seminar	Argonne, IL
October 25, 2000	Management & Operating Contract Attorneys, Fall Conference	Argonne, IL
October 26, 2000	EM Site Specific Advisory Board Stewardship Workshop	Denver, CO
November 14, 2000	DOE Technical Information Exchange Conference	Augusta, GA
November 15, 2000	National Conference of State Legislatures	Augusta, GA
November 30, 2000	Public Hearing on *Draft Study*	Washington, DC
December 7, 2000	Resources for the Future	Washington, DC
December 14, 2000	Land Transfer and Long Term Management of Contaminated Federal Facilities Conference	San Francisco, CA

Exhibit C-2. Public Commenters and Date Comments Received

1. Oregon State Office of Energy, December 4, 2000
2. James S. Johnson, December 7, 2000
3. Robert Peelle, November 26, 2000
4. Tom Fitzsimmons, Washington State Department of Ecology, December 6, 2000
5. Kathy Crandall, Alliance for Nuclear Accountability, November 30, 2000
6. Tri-Valley CARES and Western States Legal Foundation, December 12, 2000
7. Stanley Hobson, INEEL Citizens Advisory Board, November 22, 2000
8. Kenneth Reim, November 28, 2000
9. Sam Booher, December 10, 2000
10. Mark Plessinger, DOE Grand Junction Project Office, December 11, 2000
11. Pamela Sihvola, Committee to Minimize Toxic Waste, December 15, 2000
12. Stephen Dycus, December 18, 2000
13. Earl Leming, State of Tennessee Department of Environment and Conservation, December 12, 2000
14. Robert Johnson, Nuclear Regulatory Commission, December 13, 2000
15. Thomas Family, December 13, 2000
16. Daniel Miller, State of Colorado Office of the Attorney General, December 13, 2000
17. Carol E. Lyons, City of Arvada, December 14, 2000
18. Michael Duvall and Mary Halliday, St. Charles City Government, December 14, 2000
19. National Governors Association, December 14, 2000
20. Julie Davis, South Davis Campus Superfund Oversight Committee, December 14, 2000
21. Norman Mulvenon, Oak Ridge Reservation Local Oversight Committee, December 14, 2000
22. Luther Gibson, Oak Ridge Site Specific Advisory Board, December 13, 2000
23. Dennis Bechtel, Clark County Department of Comprehensive Planning, December 14, 2000
24. Tom Marshall, Rocky Mountain Peace and Justice Institute, December 15, 2000
25. Stephen Mahfood, Missouri Department of Natural Resources, December 15, 2000
26. M.J. Plodinec, December 15, 2000
27. Patrick Sobotta, Nez Perce Tribe, December 15, 2000
28. Steve Tarlton, State and Tribal Government Working Group, December 15, 2000
29. Steve Tarlton, Colorado Department of Public Health and Environment, December 15, 2000
30. Reinard Knutsen and Susi Snyder, Shundahai Network, December 15, 2000
31. Carl N. Anderson, December 14, 2000
32. Robert M. Gould, Physicians for Social Responsibility, December 14, 2000
33. Fred E. Humes, Economic Development Partnership, December 11, 2000
34. Vernon Brechin, December 14, 2000
35. Janis Kate-Turner, December 19, 2000
36. DOE Fernald Environmental Management Project, December 12, 2000
37. Jay Vance, Envirocare of Utah, Inc., December 15, 2000
38. Roman Kohler, December 19, 2000
39. H. Boyd Hathaway, DynCorp Tri-Cities Services, Inc., December 15, 2000
40. Victoria L. Peters, State of Colorado Office of the Attorney General, December 15, 2000
41. Tim Michael, New Mexico Environment Department, December 18, 2000
42. Bryan Taylor, Rocky Flats History Group, December 19, 2000
43. Nevada Test Site Community Advisory Board, December 20, 2000
44. Diana Yupe, Shoshone-Bannock Tribe, December 15, 2000
45. Mark Donham and Kristi Hanson, Regional Association of Concerned Environmentalists/Coalition for Nuclear Justice, December 18, 2000
46. Debra McBaugh, Washington State Department of Health, December 29, 2000

47. and 48. Public Hearing, November 30, 2000

49. Russell Jim, Yakama Nation, December 27, 2000
50. Thomas Winston and Graham Mitchell, State of Ohio Environmental Protection Agency, December 15, 2000.

Final Study only to the extent feasible in the context of national long-term stewardship issues. Comments that were received by DOE after the closing date of the formal public comment process (December 15, 2000) have been considered in the *Final Study* to the extent practicable considering schedule constraints. The public comments, and DOE's response to these comments, are included in *Volume II – Responses to Comments.*

As noted above, DOE held a public workshop on December 14, 2000 to allow additional information exchange and discussion with the public. Discussions and comments received were recorded by note-takers. Although the discussions were not included as formal public comments, these discussions were considered by DOE in developing the *Final Study*. Many speakers also submitted formal written comments at the workshop; these are included in the 50 commenters.
DOE acknowledged public comments by including text boxes throughout the *Final Study* that provide a synopsis of specific public comments and numbers in parentheses to identify the commenter(s). These numbers correspond to the numbers listed in Exhibit C-2. The full comment letters, and DOE's responses to each comment, are included in Volume II of the *Final Study*.

Other Factors That Were Incorporated into the *Final Study*

The *Final Study* was revised to incorporate policy decisions and other information pertaining to several documents that DOE issued in the period of time between the release of the *Draft Study* and completion of the *Final Study*:

- On December 15, 2000, Deputy Secretary T.J. Glauthier issued a memorandum that addressed the transition of long-term stewardship to DOE landlord organizations. The memorandum states that at sites where non-EM missions (e.g., nuclear weapons stockpile stewardship, scientific research) are expected to continue, the site landlord programs are expected to take responsibility for long-term stewardship activities after EM finishes its cleanup mission at a site.

- In January 2001, DOE issued the *Report to Congress on Long-term Stewardship*, which details the long-term stewardship requirements, scope, and cost at DOE sites where EM cleanups are expected to be completed by 2006. A summary of the cost estimates from the *Report to Congress* is included in the *Final Study*.

- In January 2001, the Assistant Secretary for Environmental Management issued a policy requiring all EM sites to develop, by 2004, site-specific long-term stewardship plans along with site-specific cost estimates, budget requests and performance metrics. The Department is currently developing guidance for these site-specific plans.

- In January 2001, the Assistant Secretary for Environmental Management issued an interim policy on the use of institutional controls during long-term stewardship. This policy is available on the long-term stewardship web-based information center, *http://lts.apps.em.doe.gov*.

- In May 2001, DOE formed the Long-term Stewardship Executive Steering Committee to provide senior management coordination, strategic planning, and policy development. The Committee includes senior managers from each DOE field office and major headquarters Program Secretarial Offices. The Executive Steering Committee is currently drafting a Strategic Plan for long-term stewardship which will be the basis for establishing specific roles and responsibilities and performance objectives for the Department. Several key issues raised in the *Final Study* were identified to the Executive Steering Committee as important near-term issues for the Department to address.

- In June 2001, the Department published a listing of major environmental statutes, regulations, and Executive Orders that may apply to long-term stewardship. A second table provides applicable DOE Orders and environmental policies. These tables are available on the long-term stewardship web-based information center, *http://lts.apps.em.doe.gov*.

The *Final Study* also was revised to incorporate information contained in recent publications by groups external to DOE:

- On December 5, 2000, Resources for the Future published a report entitled *Long-Term Stewardship of Contaminated Sites, Trust Funds as Mechanisms for Financing and Oversight*. Discussion Paper 00-54, December 2000.

- In February 2001, the Environmental Law Institute and the Energy Communities Alliance published a report entitled *The Role of Local Governments in Long-Term Stewardship at DOE Facilities* (ELI Project #972206, ELI ISBN #1-58576-015-3, Document #D10.10). Although the this report was published too late to be incorporated fully, the *Final Study* includes a text box acknowledging this report and its key recommendations.

Appendix D: Statutory, Regulatory, and Executive Order Requirements for Long-term Stewardship

DOE conducts long-term stewardship activities in accordance with various statutes, DOE Orders, policies, regulations, Executive Orders, and International and Tribal government treaties. These statutes, regulations, Orders, and treaties vary considerably in site-specificity, detail, and purpose. Statutes that broadly require DOE to conduct long-term stewardship activities include the Atomic Energy Act (AEA), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, also known as Superfund), and the Resource Conservation and Recovery Act (RCRA). The AEA requires DOE to conduct its activities in a manner that protects human health and the environment. RCRA and CERCLA broadly require DOE to ensure that contaminated sites and associated residual hazards are managed to protect human health and the environment over the long-term. Specific activities that DOE must conduct in order to manage residual hazards at DOE sites are established in RCRA and CERCLA requirements and through site-specific agreements with the regulators.

Statutes that require DOE to conduct long-term stewardship activities at specific sites include the Waste Isolation Pilot Plant Land Withdrawal Act (WIPP LWA), the Nuclear Waste Policy Act, and the Uranium Mill Tailings Radiation Control Act (UMTRCA). These statutes do not apply to the entire DOE complex, only to specific sites and facilities. The WIPP LWA is applicable to the Waste Isolation Pilot Plant; the Nuclear Waste Policy Act is applicable to high-level waste disposal facilities; and UMTRCA is applicable to former uranium and thorium milling sites. These Acts and their associated regulations require DOE to implement specific engineered and institutional controls for these sites in order to ensure effective long-term stewardship.

Other requirements for long-term stewardship activities that apply to DOE are related to DOE's status as a federal agency and the Department's role as an owner and manager of federal lands.

- The National Environmental Policy Act (NEPA) requires agencies to conduct environmental impact analyses of major federal actions that may significantly affect the quality of the human environment, including assessment of impacts to natural and cultural resources.

- DOE Order 1230.2, American Indian Tribal Government Policy, requires that obligations under the Federal Indian Trust Responsibility (Seminole Nation v. United States, 1942) and treaty obligations

be met.[1] Treaty obligations require a long-term planning process, which directly affects Tribal rights as they were defined when treaties were signed.

- Executive Order 13175, Consultation and Coordination With Indian Tribal Governments (65 FR 67249, November 6, 2000) requires DOE to adhere to specified criteria when formulating and implementing policies that have Tribal implications; to ensure meaningful and timely input by Tribal officials in the development of regulatory policies that have Tribal implications; and to the extent practicable and permitted by law, to increase opportunities for utilizing flexible policy approaches at the Indian Tribal level with respect to proposed waivers of statutory or regulatory requirements.

- Federal real property management statutes establish requirements for owners and managers of federal land, including the acquisition, transfer, management, and sale of public land.

- The Endangered Species Act, the National Historic Preservation Act, the Archeological Resources Protection Act, the Native American Graves Protection and Repatriation Act, and other statutes require federal agencies to manage natural resources and cultural resources.

- Federal agencies including DOE are subject to Executive Orders issued by the President that may include provisions for long-term stewardship activities for public lands, such as wetlands or fisheries.

In June 2001, the Department published a listing of major environmental statutes, regulations, and Executive Orders that may apply to long-term stewardship. A second table provides applicable DOE Orders and environmental policies. These tables are available on the long-term stewardship web-based information center, *http://lts.apps.em.doe.gov*.

[1]Tribal governments have a special and unique legal and political relationship with the U.S. Government, defined by history, treaties, statutes, court decisions, and the U.S. Constitution. The United States has entered into more than 600 treaties and agreements with American Indian Tribes. These treaties and agreements create a variety of legal responsibilities by the United States toward Tribes and provide the basis for a government-to-government relationship. Although the Department of the Interior, through the Bureau of Indian Affairs, has the principal responsibility for upholding obligations of the federal government to American Indians, this responsibility extends to all federal agencies, including DOE. *Source*: DOE Order 1230.2 *American Indian Tribal Government Policy*, April 8, 1992, available at *http://www.explorer.doe.gov:1776*.

Appendix E: Long-term Stewardship Activities, Guidance, Reports, and Internet Web Sites

DOE is conducting ongoing long-term stewardship activities at DOE headquarters, field offices, and sites. This Appendix highlights DOE's recent long-term stewardship efforts, reports, and activities; describes DOE's long-term stewardship Internet Web Pages; and identifies the points of contact at each DOE field office.

Program Management

- The Assistant Secretary for Environmental Management established the Office of Long Term Stewardship in 1999.

- In 1998, DOE Formed the Long-term Stewardship Working Group to identify and address stewardship issues.

- DOE sponsored three workshops and a background report by Resources for the Future on long-term stewardship and analysis of long-term funding mechanism options.

- DOE sponsored case studies and workshops conducted by the Environmental Law Institute and the Energy Communities Alliance.

- DOE supported local government and SSAB evaluations of long-term stewardship issues at DOE sites (e.g., Rocky Flats Environmental Technology Site, Oak Ridge).

- DOE sponsored contractor reports on data management for long-term stewardship and risk-based requirements for long-term stewardship.

- DOE sponsored an analysis of long-term stewardship risks in the context of other risks by the Consortium for Risk Evaluation with Stakeholder Participation.

- DOE incorporated a Project Baseline Summary (PBS) within the Integrated Planning, Accountability, and Budgeting System – Information System (IPABS-IS) and developed guidance for completing the PBS. Independent PBSs for long-term stewardship are required of all EM sites by Fiscal Year 2003.

- DOE sponsored Environmental Law Institute case studies on institutional controls at the DOE Grand Junction, Mound, and Hanford sites.

- DOE prepared two reports to Congress on land-use planning at DOE sites.

- DOE prepared studies that identified actions for improving how information is currently controlled and maintained in order to provide for long-term stewardship. Relevant studies include *Roadmap to the Year 2000* and *Responsible Openness: An Imperative for the Department of Energy*.

- The Ohio Field Office has issued guiding principles for long-term stewardship: *Guiding Principles for Long-term Stewardship*. U.S. Department of Energy, Ohio Field Office, Miamisburg, OH, March 27, 2000.

- DOE issued Order 435.1, Radioactive Waste Management. The Order requires DOE sites to develop a performance assessment (PA) and composite analysis (CA) for each low-level waste disposal facility.

- The National Energy Technology Laboratory is currently leading efforts to develop separate cost estimating techniques for long-term stewardship and incorporate these modules into the Environmental Cost Element Structure, a cross-agency framework for estimating and managing environmental management costs.

- In 1999, the Rocky Flats Environmental Technology Site developed an activity-based methodology to estimate their annual stewardship costs based on the type, cost, and duration of anticipated long-term stewardship activities.

Guidance

- *Guidance for Implementation of Long-Term Surveillance and Maintenance at DOE Sites in Long-Term Stewardship*, U.S. Department of Energy, Grand Junction Office, Grand Junction, Colorado, December 30, 1999.

- *Development of Remediation Goals under CERCLA*, U.S. Department of Energy, Office of Environmental Policy and Assistance, CERCLA Information Brief. DOE/EH-413/9711, August 1997.

- *RCRA Closure and Post-Closure Plans*, DOE, Office of Environmental Guidance, RCRA Information Brief. DOE/EH-231-009/1291, December 1991.

- *Planning and Implementing RCRA/CERCLA Closure and Post-Closure Care When Wastes Remain Onsite*, U.S. DOE, Office of Environmental Policy and Assistance, RCRA/CERCLA Information Brief. DOE/EH-413-9910, October 1999.

- *Using Remedy Monitoring Plans to Ensure Remedy Effectiveness and Appropriate Modifications*, U.S. Department of Energy, Office of Environmental Policy and Assistance, RCRA/CERCLA Information Brief. DOE/EH-413/9809, July 1998.

- *Effects of Future Land Use Assumptions on Environmental Restoration Decision Making*, U.S. Department of Energy, Office of Environmental Policy and Analysis, RCRA/CERCLA Information Brief. DOE/EH-413/9810, July 1998.

- *Cross-Cut Guidance on Environmental Requirements for DOE Real Property Transfers*, U.S. Department of Energy, Office of Environmental Policy and Assistance. DOE/EH-413/97/2, October 1997.

- *Interim Policy for the Department of Energy's Use of Institutional Controls*. February 2001.

- *CERCLA Requirements Associated with Real Property Transfers,* U.S. Department of Energy, Office of Environmental Policy and Analysis, CERCLA Information Brief. EH-413-9808, April 1998.

Reports

- *From Cleanup to Stewardship*, U.S. Department of Energy, Office of Long Term Stewardship. DOE/EM-0466 , October 1999.

- *1999 Long-Term Surveillance and Maintenance Program* Report, U.S. Department of Energy, Grand Junction Office, Grand Junction, Colorado, April 2000.

- *2000 Long-Term Surveillance and Maintenance Program* Report, U.S. Department of Energy, Grand Junction Office, Grand Junction, Colorado, February 2001.

Long-term Stewardship Internet Web Sites

http://lts.apps.em.doe.gov/

This website, maintained by the Office of Long Term Stewardship, is a tool for providing long-term stewardship information to the public. The website provides news and information concerning DOE's long-term stewardship activities, including the *Study*, the *Report to Congress on Long-term Stewardship*, other complex-wide and site-specific reports and workshops, and site-specific perspectives on long-term stewardship.

http://www.em.doe.gov/settlement/index.html

This website provides news and information about the implementation of the December 12, 1998 Waste Management Programmatic Environmental Impact Statement Settlement Agreement and provides links to the Central Internet Database, Citizen's Monitoring and Technical Assistance Fund, and Long-term Stewardship Study Internet Web Sites.

http://www.em.doe.gov/settlement/index2.html

This website provides access to the Central Internet Database (CID). The CID contains reports for radioactive waste, contaminated media, spent nuclear fuel, non-radioactive waste, toxic waste, facilities, and materials in inventory. CID also contains information on DOE's current and projected waste and spent nuclear fuel inventories, management activities, and shipping and receiving quantities. The CID has organized much of its information in a searchable manner, according to state, site, DOE programs, or year.

http://www.em.doe.gov/settlement/funding.html

The Settlement Agreement requires that DOE establish a $6.25 million citizen monitoring and technical assistance fund. This Internet Web Page provides information concerning the purpose and administration of the fund.

http://www.lastinglegacy.net/legacy3.1/loadup.htm

This interactive website explains production, waste, and long-term stewardship across the nuclear weapons complex over time.

Appendix F: Long-term Stewardship Points of Contact

This Appendix lists the current principal Working Group Members and the areas they represent. The list will be updated periodically on the long-term stewardship information center web page (***http//lts.apps.em.doe.gov***).

DOE Headquarters Offices

Office	Name	Phone, Fax, Email
Office of Long Term Stewardship	David Geiser	202-586-9280 (phone) 202-586-1241 (fax) david.geiser@em.doe.gov
	Letitia O'Conor (contact for *Final Study*)	202-586-6570 / 9280 202-586-9732 letitia.o'conor@em.doe.gov
Office of Environment, Safety, and Health	Andrew Lawrence	202-586-7870 (phone) 202-586-3915 (fax) andrew.lawrence@eh.doe.gov
Office of Science	Arnold Edelman	301-903-5145 (phone) 301-903-7047 (fax) Arnold.edelman@science.doe.gov
Office of Management Budget and Evaluation	Andrew Duran	202-586-4548 (phone) 202-586-4500 (fax) Andrew.Duran@hq.doe.gov
Office of Defense Programs	John Marchetti	301-903-5003 (phone) 301-903-1562 (fax) John.marchetti@dp.doe.gov

DOE Field Offices

Office	Name	Phone, Fax, Email
Albuquerque Operations Office	Deborah Griswold	505-845-4752 (phone) 505-845-4239 (fax) dcouchman-griswold@doeal.gov
Grand Junction Office	Art Kleinrath	970-248-6037 (phone) 970-248-6023 (fax) akleinrath@doegjpo.com
Chicago Operations Office	Susan Heston	630-252-2381 (phone) 630-252-2654 (fax) Susan.heston@ch.doe.gov

Office	Name	Phone, Fax, Email
National Energy Technology Laboratory	Celinda H. Crawford	304-285-4128 (phone) 304-285-4403 (fax) Celinda.Crawford@netl.doe.gov
Idaho Operations Office	Patty Natoni	208-526-0977 (phone) 208-526-0553 (fax) natonipm@id.doe.gov
Nevada Operations Office	Bobbie K. McClure	702-295-1862 (phone) 702-295-1113 (fax) McClure@nv.doe.gov
Oakland Operations Office	Laurence B. McEwen	510-637-1623 (phone) 510-637-1646 (fax) laurence.mcewen@oak.doe.gov
Oak Ridge Operations Office	Ralph Skinner, Jr.	865-576-7403 (phone) 865-576-5333 (fax) skinnerrm@oro.doe.gov
Ohio Field Office	Anne Wickham	937-865-3624 (phone) 937-865-4397 (fax) Anne.Wickham@ohio.doe.gov
Ohio - Miamisburg Environmental Management Project	Susan L. Smiley	937-865-3984 (phone) 937-865-4489 (fax) sue.smiley@ohio.doe.gov
Ohio - Fernald Environmental Management Project	Gary D. Stegner	513-648-3153 (phone) 513-648-3073 (fax) gary.stegner@fernald.gov
Richland Operations Office	Jim Dailey	509-376-7721 (phone) 509-372-2610 (fax) James_L_ii_Daily@rl.gov
Rocky Flats Field Office	Joe Legare	303-966-2282 (phone) 303-966-2995 (fax) joe.legare@rf.doe.gov
Savannah River Operations Office	Terry Vought	803-725-9747 (phone) 803-725-2016 (fax) terry.vought@srs.gov
Weldon Spring Site Remedial Action Project	Thomas Pauling	636-441-8978 (phone) 636-447-0739 (fax) tpauling@wssrap.com

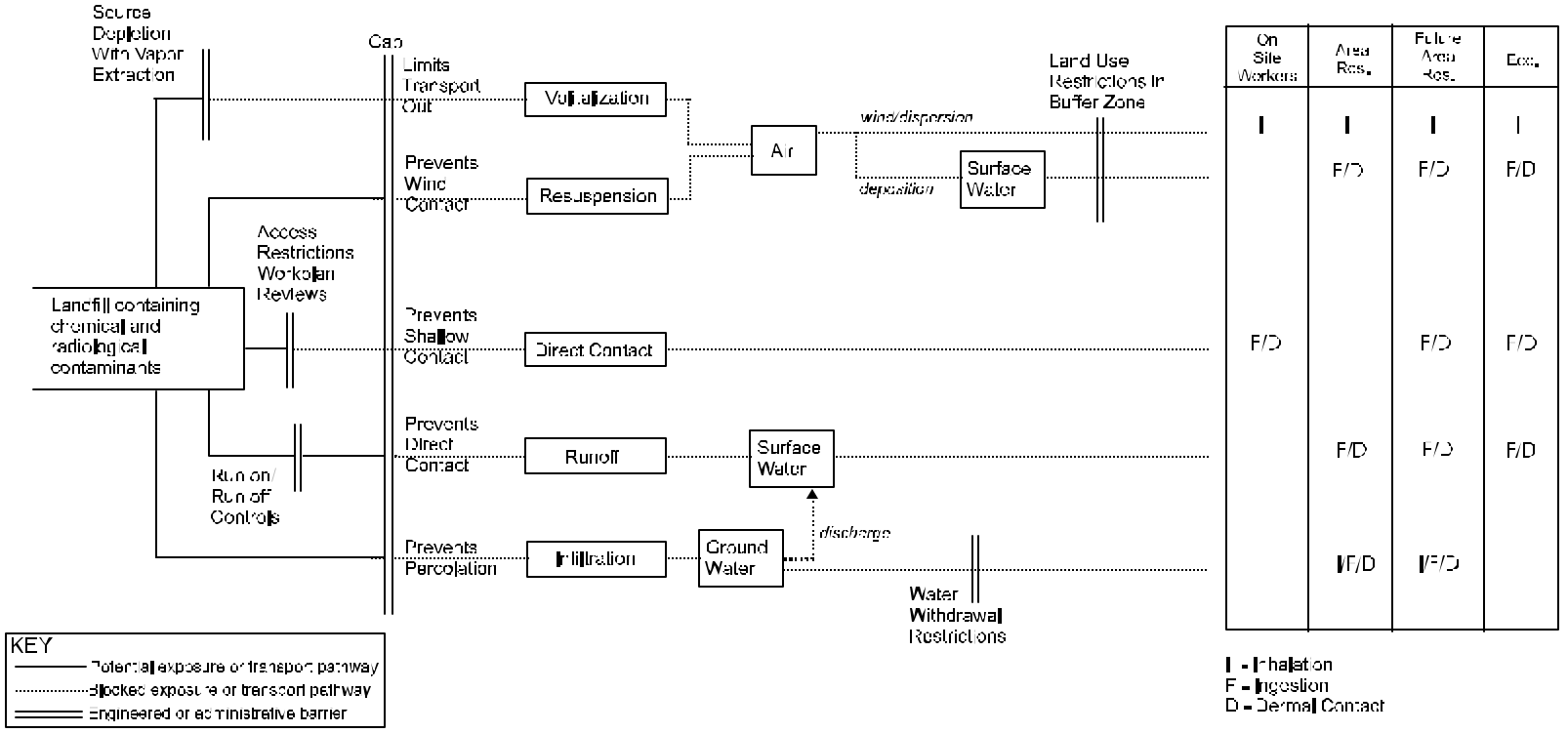
Appendix G: Using a Conceptual Site Model to Communicate End State

Conceptual Site Models (CSMs) are used during cleanup actions to depict the relationship between existing hazards, environmental transport mechanisms, exposure pathways, and ultimate human and ecological receptors. CSMs can also be used to distinguish between known and unknown site conditions (e.g., the existence of fractured bedrock or preferential pathways for groundwater flow). While CSMs have traditionally been used for individual Operable Units or Areas of Concern, it may be possible to develop a long-term stewardship CSM for broader areas of a site (e.g., encompassing multiple Operable Units or Areas of Concern). A long-term stewardship CSM, however, may be difficult to develop or impractical at large, complex sites. Functional equivalents could include management plans specific to particular biological resources or area management plans.

Long-term stewardship CSMs could be used to illustrate the characteristics of a site and its residual hazards, how hazards have been contained, how exposure pathways have been blocked, and the uncertainties that may affect the performance of engineered and institutional controls. Where significant uncertainties exist, the CSM could identify the range of scenarios that are probable or otherwise indicate the importance of the uncertainties. The resulting model could serve as the basis for evaluating the likelihood and consequences of events such as barrier failures, identifying how stewards can plan to mitigate these events, and predicting the ability of future generations to ensure protectiveness based on improved technology and increased understanding of science. The CSM also could serve as a tool for communicating with local governments and stakeholders. An example of a long-term stewardship conceptual site model is presented in Exhibit H-1.[1]

[1] *Planning and Implementing RCRA/CERCLA Closure and Post Closure Care when Wastes Remain Onsite*. U.S. Department of Energy, Office of Environmental Policy and Assistance, RCRA/CERCLA Information Bulletin, DOE/EH-413-9910, October 1999.

Exhibit G-1. Example of Post-Remediation Conceptual Site Model



Components of End State	Description
Waste Characteristics	One landfill remains on site. Contaminants include: Ra_{226}, Sr_{90}, NO, $CHCl_3$, DCE, Toluene, H_3, C_{14}, and DCA. The estimated volume of material is 420,000 y_3, a minimum of 1,000 curies was disposed in the landfill, based on historical records and knowledge of past practices.
Unit Characteristics	Landfill is approximately 50-60 feet above the upper hydrostratigraphic unit (HSU) and approximately 80 ft. above the lower HSU of the groundwater aquifer. The contaminants detected in the upper HSU include: $CHCl_3$, DCA, Cr, No_3, DCE, Toluene, H_3, and C_{14}. Contaminants detected in lower HSU include: Cr, NO, $CHCl_3$, DCE, Toluene, H_3, C_{14}, and DCA.
Barriers in Place	One single-layer cap with a design life of 30 years covers the landfill. Vapor extraction system installed and operated until concentrations drop below threshold. Land use restriction covenants in place stating that: (1) There can be no digging in the landfill area, and (2) There shall be no agriculture or residential use of groundwater, pumping groundwater from wells is prohibited.
Other Key Assumptions to Maintain Protectiveness	Land use will remain industrial. Monitored natural attenuation will demonstrate that contaminants in the groundwater are below MCLs in 20 years. Remaining contaminants in landfill will not continue to leach to the groundwater. An alternate water supply is provided to local residents.

Appendix H: Developing Uncertainty Matrices to Communicate Uncertain Conditions

One key to successful communication and implementation of long-term stewardship will be to identify and describe to future site stewards the residual hazards and any associated uncertainties that remain once cleanup is complete. It is important for local residents to understand the need to adhere to and maintain land use and access controls imposed on a site because of residual contamination/hazards. Site stewards need to understand the potential for breaks in the barriers to occur, understand the impact on human health and the environment should a failure in the remedy occur, and have prepared a contingency plan for addressing the situation before major problems occur. This information can be organized and characterized with a tool called an "uncertainty management matrix". An example is presented in Exhibit I-1.

Exhibit H-1. Example Uncertainty Matrix for Long-term Stewardship

Expected Condition	Reasonable Failure	Probability of Occurrence	Time to Respond	Impact	Monitoring Plan	Contingency Plan
Cap prevents infiltration and subsequent leachate development.	Burrowing animals or plant roots will breach cap integrity	High. Operations of other landfills indicate that over time this is a common intrusion scenario.	Short for animals. In the case of plants, it takes time to establish a deep root system.	Significant since cap integrity will be lost and leachate is likely to carry contaminants to the ground water.	Site inspection every 3 months to ensure integrity of cap.	A rock cover could be installed to deter burrowing animals. Since lead times are quite short for this pathway, it may be better to install this barrier at the onset (robust design). Plant removal upon detection should mitigate root intrusion.
Access and institutional controls will prevent excavation through cap.	Humans will dig in the area of the landfill, breaching integrity of the cap.	Low. Additional controls (i.e., land use restrictions and a fence) are in place to prevent human intrusion.	Short for direct contact of humans, longer for loss of cap effectiveness with respect to infiltration.	Same as above. In addition, intrusion into the soil would likely result in dermal contact with radioactive contaminants, posing an unacceptable risk to human health.	Site inspection will include surveillance of cap condition, evaluation of fence integrity and maintenance of land use controls.	Reevaluation of remedy will be conducted if humans breach the integrity of the cap and land use controls are not functional. Options may include more sophisticated fence designs, site security, and armoring.
Contaminants in the groundwater will naturally attenuate to levels below Maximum Concentration Limits (MCLs) within a 20-year timeframe.	Contaminants do not attenuate naturally to levels below MCLs within the required timeframe.	Low. Based on modeling of site conditions, contaminant characteristics, and the general trend established by existing monitoring data, MCLs will be attained within a 20-year timeframe.	Long. Monitoring data will indicate if the current trend in contaminant reduction changes. Based on these data, the site manager will have advance warning if end objectives will not be met in 20 years.	1. High. If groundwater remediation goals cannot be reached in the 20-year period, unit regulators will require a different remediation approach, which would be quite costly. 2. Low. No risk to human health would result from additional contamination of the groundwater because land use restrictions and an alternate drinking supply prevent ingestion.	Wells within the plume will be sampled every 3 months to ensure that natural attenuation is reducing the concentration of contaminants in the groundwater. Sentinel wells will be monitored quarterly to detect any escapement near receptor wells.	If data indicate significant negative deviation from predicted trends in plume concentrations, an extraction type of remedy will be installed.

Appendix I: DOE Property Transfer Requirements

This Appendix summarizes federal real property transfer requirements, including requirements applicable to federal agencies in general, requirements specific to DOE, and CERCLA property transfer requirements. As background, the Appendix describes the roles of the various agencies potentially having jurisdiction over federal real property owned or controlled by DOE as well as the legal authority and implementing regulations that control property transfers. This is followed by a description of the various procedures that DOE may employ to transfer real property. The Appendix closes with a description of CERCLA requirements related to disclosure of hazardous substances and the transfer of contaminated property.

Agency Roles, Legal Authority, and Implementing Regulations for Property Transfers

To understand property transfer requirements, it is important to know that other federal agencies and their associated statutes and regulations often have a role in the transfer of property owned or controlled by DOE. Depending on the type of property that DOE is transferring, the Department of Interior's (DOI) Bureau of Land Management (BLM) and the General Services Administration (GSA) may play a role. DOE has authority under the Atomic Energy Act (AEA), the DOE Organization Act, and other statutes to engage directly in real property transfers without BLM or GSA involvement in some circumstances[1] (see Exhibit J-1). The type of property transfers that may occur, the required procedures, and the potential recipients of the property will depend, in part, on how DOE first acquired ownership or control of the property: by direct purchase, by withdrawal from the public domain and reservation by DOI for use by DOE, or through some other process such as a grant or gift. In addition, Congress sometimes directs DOE by legislation to transfer certain properties without the involvement of BLM or GSA.

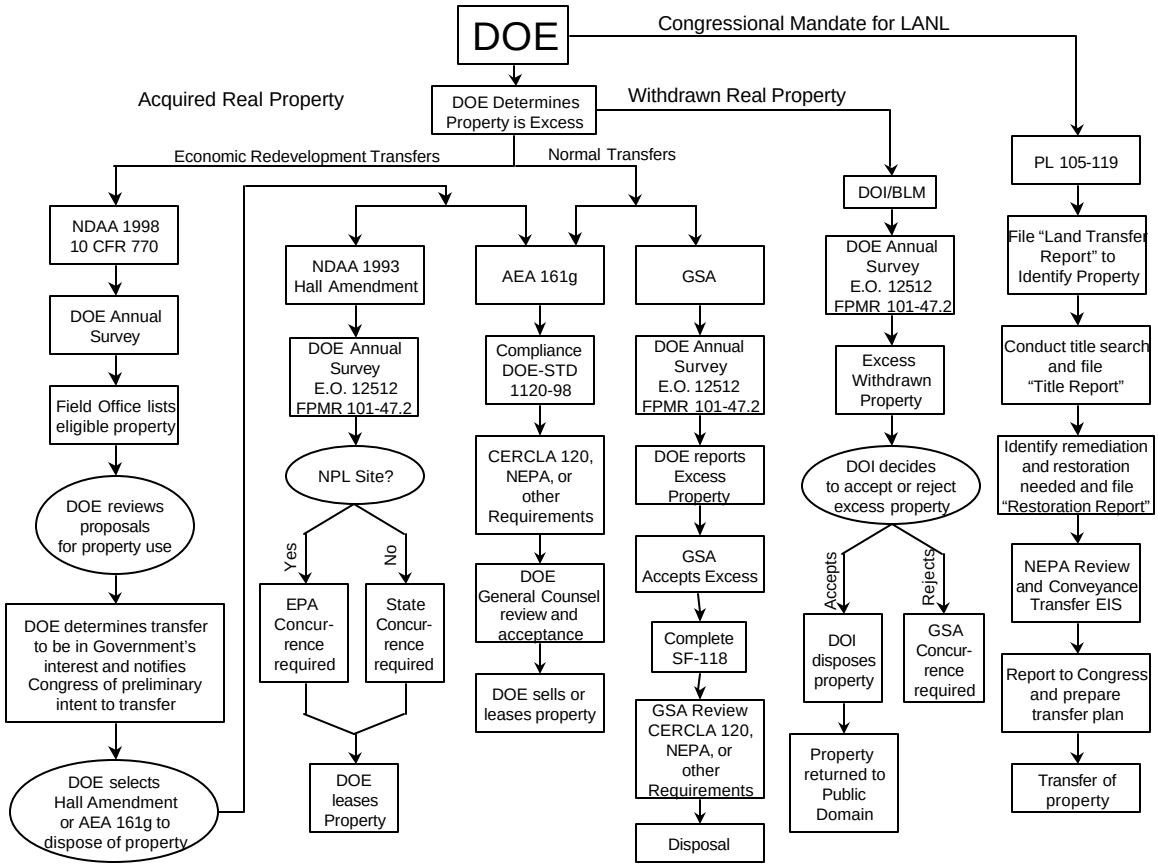
The Environmental Protection Agency (EPA) becomes involved in federal land transfers when sites proposed for transfer have hazardous waste contamination. EPA's authority in these transactions derives from the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Other federal agencies may become involved if the property transfer would impact other resources (e.g., wetlands, endangered species, archaeological or historic resources).

BLM Oversight. BLM has jurisdiction over transfers involving property that was acquired by DOE through withdrawal from the public domain. Withdrawn properties that were reserved by DOI for DOE must be relinquished to the original holder upon completion of the DOE missions for which the land was withdrawn. Withdrawn land comprises 62 percent of DOE's real property. GSA also may become involved in these property transfers. For real property transfers of withdrawn land, federal agencies are required to transfer the land in accordance with the Federal Land Policy and Management

[1] *Cross-Cut Guidance on Environmental Requirements for DOE Real Property Transfers*. U.S. Department of Energy, Office of Environmental Policy and Assistance, October 1997. DOE/EH-413/97/2, October 1997.

Act of 1976 (Public Law 94-579, as amended). The regulations on the restoration and revocation of withdrawn land that BLM developed to implement the Act are included in 43 CFR Part 2370.

Exhibit I-1. Potential Disposition Paths for Excess DOE Real Property



Withdrawn Real Property. DOE transfers all withdrawn real property under the authority of Federal Land Policy and Management Act of 1976 (Public Law 94-579 as amended), with concurrence from the Department of the Interior (DOI). Executive Order 12512 (April 29, 1985) and Federal Property Management Review (FPMR) 101-47.2 require real property utilization surveys at DOE facilities. DOI has the discretion to decide whether the property is suitable for return to the public domain. If the property is contaminated or has any "improvements" upon it, it may be rejected by DOI, and GSA concurrence is required. If DOI accepts the excess property it will return the land to the public domain, often as land under the jurisdiction of the Bureau of Land Management (BLM).

Acquired Real Property – Atomic Energy Act. DOE uses its broad authority to sell or lease acquired real property under Section 161(g) of AEA of 1954. Property disposals under the Act must comply with DOE internal orders including DOE-STD-1120-98, Integration of Environment, Safety and Health into Facility Disposition Activities. It is DOE policy to file a memorandum to the Real Property Branch and to have the Assistant General Counsel for General Law or appropriate Field Counsel review the transfer of real property.

Acquired Real Property – Hall Amendment. DOE uses its broad authority under Section 3154 of the National Defense Authorization Act of 1993 ("Hall Amendment") to lease acquired land to promote the public interest, with special emphasis on economic development. DOE conducts an annual survey to determine excess real property. The determination to lease is made by DOE Field Office Manager. If the property is on the CERCLA National Priorities List (NPL), DOE must obtain concurrence from EPA. If the property is not on the NPL, DOE must obtain concurrence from the appropriate state regulatory agency.

Acquired Real Property – GSA. DOE disposes of acquired real property through the GSA under the Federal Property and Administrative Services Act of 1949. A determination by DOE that the property is "excess" to facility needs is required before disposition may proceed. Standard Form 118, "Report of Excess Real Property" must be filed with the GSA.

Acquired Real Property – NDAA. DOE disposes of real property for economic development purposes pursuant to section 3158 of the National Defense Authorization Act of 1998 as implemented by 10 CFR Part 770. This is not a separate authority, but merely a review, notification, and approval process for transfers pursuant to the other authorities listed. Field Office managers will provide the Community Reuse Organization and other interested parties with a list of real property that may be transferred under this Act. DOE reviews property use proposals to determine the economic development impact and if the use would be in the best interest of the government.

Congressional Mandate. (example) Public Law 105-119, the Departments of Commerce, Justice, and State, the Judiciary, and Related Agencies Appropriation Act of 1998 requires DOE to convey or transfer certain Los Alamos National Laboratory (LANL) real property to the County of Los Alamos or the Secretary of the Interior, in trust for San Ildefenso Pueblo. In October 1999, DOE issued the Conveyance and Transfer Final Environmental Impact Statement, which was required under PL 105-119. In the associated March 2000 Record of Decision, DOE decided to convey or transfer 10 tracts of land, in whole or in part, subject to DOE's ability to complete needed environmental restoration or remediation.

DOE may temporarily outgrant withdrawn lands to other parties by lease with the consent of BLM. An exception is that withdrawn lands that are under the purview of the Atomic Energy Act and that are temporarily not needed may be outgranted by DOE without BLM consent (Section 161(g) of the Atomic Energy Act). In a few situations, DOE has been permitted by other federal agencies to build facilities on land withdrawn for use by those other federal agencies. In such cases, DOE may outgrant DOE facilities as long as: (1) the terms of the lease are consistent with the original withdrawal and original use permitted by BLM; and (2) the other federal agency agrees.[2]

Some of the withdrawn lands reserved for and used by DOE now contain improvements, such as buildings, structures, and other facilities, or have otherwise substantially changed in character. Such withdrawn lands are generally not suitable for return to the public domain for disposition other than leasing and are generally turned over to GSA for disposition, after both BLM and GSA concur.

GSA Oversight. GSA's role in property transfers is that it generally has oversight over all acquired land and withdrawn lands that are not suitable for return to the public domain. Acquired land, defined as real property that DOE (or its predecessors) originally purchased, comprises 27 percent of DOE's real property. Disposition of acquired land and withdrawn lands that are not suitable for return to the public domain is governed by requirements of the Federal Property and Administrative Services Act of 1949. GSA issued Federal Property Management Regulations (FPMR) under 41 CFR Parts 101-47 and 109 to implement the Act. AEA and other statutes provide DOE with limited authority to engage directly in real property transfers without GSA authorization.

The Federal Property and Administrative Services Act authorizes federal agencies to declare real property as "excess, underutilized or temporarily underutilized," and dispose of such property. GSA has disposition oversight for property transfers under the Act. In addition, Executive Order 12512, "Federal Real Property Management," and FPMR regulations under 41 CFR 101-47.202-2, require federal agencies to conduct real property utilization surveys. The FPMR requires agencies to conduct an annual survey and Executive Order 12512 requires agencies to conduct a survey every five years.

DOE Authorities. The primary statutory authorities for DOE property transfers are section 161(g) of the Atomic Energy Act and section 646(c) - (f) (known as the "Hall Amendment") and Section 649 of the Department of Energy Organization Act. Section 161(g) of the Atomic Energy Act authorizes DOE to transfer real property that was originally acquired under the authority of the Act, or will be used to further the purposes of the Act, without the involvement of the GSA. Section 649 of the Department of Energy Organization Act applies to leasing of underutilized real property. Section 646(c) - (f) of the Act applies to leasing of specific facilities that DOE will close or reconfigure. A number of other statutes have granted DOE limited authority to transfer real property without BLM or GSA authorization or involvement, or have directed DOE to transfer specific real property. These statutes have often been focused on specific DOE sites.

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[2] *Cross-Cut Guidance on Environmental Requirements for DOE Real Property Transfers*. U.S. Department of Energy, Office of Environmental Policy and Assistance, October 1997. DOE/EH-413/97/2, October 1997.

DOE property transfers are governed by DOE Order 430.1A, *Life Cycle Asset Management* (LCAM), including NEPA review, as appropriate. LCAM requirements for DOE real property include:

- Use of a DOE-certified real estate specialist to execute the transfer of real property, including land and improvements (e.g., facilities).

- A DOE decision-making process by which land and facilities that are candidates for transfer are either transferred to other DOE program offices, or are determined excess and therefore available for disposal.

- Completion of a pre-transfer review commensurate with the nature of existing hazards for transfer of any contaminated land or facilities, and participation of the DOE Office of Environment, Safety, and Health in the review process.

- Specific procedures for disposition of contaminated facilities, including characterization of hazards, surveillance and maintenance, assessment of decontamination and decommissioning alternatives, identification of a specific facility end point, and preparation of a final report.

- Compliance in all disposition of physical assets with all applicable federal, state, and local laws, regulations, negotiated agreements, and DOE integrated safety management Orders and Policies.

DOE also recently issued an interim final rule (10 CFR Part 770) to address the transfer by lease or sale of unneeded real property at DOE defense nuclear facilities for the purpose of economic development (65 FR 10685, February 29, 2000). Under the interim final rule, which was required by Section 3158 of the National Defense Authorization Act for Fiscal Year 1998, DOE identifies real property at defense nuclear facilities that is unneeded and provides this information to a local economic development organization. Interested parties may then approach DOE with a specific proposal concerning the lease or sale of an identified property for the purpose of economic development.

Under the interim final rule, DOE may indemnify an entity receiving the real property against any claim for injury that results from the release or threatened release of any contaminant as a result of DOE (or predecessor agency) activities at the defense nuclear facility. This indemnification provision is similar to provisions enacted for the Department of Defense Base Realignment and Closure (BRAC) program. The indemnification provisions in Section 3158 are intended to facilitate transfers for economic development, because the possibility of as-yet undiscovered contamination poses uncertainties even at sites that have been remediated in accordance with applicable regulatory requirements. DOE may grant indemnification when it is deemed essential for facilitating local redevelopment of DOE real property proposed for transfer.

Requirements and Procedures

Internal DOE Screening. One place to begin to illustrate the requirements and procedures for property transfers is DOE's procedures for the identification of excess property. The site manager of a DOE field element (e.g., operations offices, field offices, energy technology centers, and power marketing administrations) identifies real property that is no longer needed by a specific DOE program as directed by Executive Order 12512, Federal Real Property Management, through analysis required under DOE Order 430.1A, Life-Cycle Asset Management. The site manager determines whether the real property is temporarily or permanently not needed. The property is then screened to see if it might meet the needs of other DOE programs. If there are no DOE programs that can use the property, the site manager reports the property to the Office of Management and Administration (MA) at DOE Headquarters or the appropriate DOE Field Office. The appropriate Program Secretarial Officer or designee makes a determination that a real property is excess by preparing the following for MA or the appropriate Field Office:

- Memorandum stating that the real property is excess.

- GSA Standard Form (SF) 118, "Report of Excess Real Property," and any appropriate supplementary forms.

- Recommendation for disposal of the property from DOE accountability.

The memorandum stating that the property is excess must receive all appropriate field element concurrences. The Attachment to SF 118 must address 13 items required by the FPMR. Some of these items include a description of the real property, any restriction on the property, floodplains, wetlands, historic significance, and hazardous materials or waste. Concurrent with addressing the 13 items in SF 118, the field element must identify that portion of the real property on which no hazardous substances or petroleum products were stored for one year or more, released, or disposed in order to meet requirements of the Community Environmental Response Facilitation Act of 1992 (CERFA). The results of this identification must be submitted for concurrence by EPA if the real property is a site on the National Priorities List or by a state official if the property is not on the National Priorities List. If DOE is transferring the property under Section 161(g) of the Atomic Energy Act, DOE does not have to involve GSA in the transfer process or prepare GSA Standard Form 118. However, in practice, DOE essentially collects and discloses similar information for real property transferred under Section 161(g) in terms of identifying hazardous materials and wastes, other environmental considerations, and property future use restrictions.

MA or the appropriate Field Office screens the property identified for transfer with respect to potential needs of the other DOE field elements, program offices, and operations offices for the property. The property is declared excess to DOE if there is no permanent need for the property within DOE. Upon approving the property disposal action, the Team Leader of the DOE Real Property Team within MA or the appropriate Field Office transmits the completed GSA Standard Form 118 to the appropriate GSA regional office and a copy to the DOE field element. DOE Headquarters' approval for reporting

of excess real property is generally required for large properties or for field elements lacking a certified realty specialist. If DOE Headquarters approval is not required, the DOE field element then reports the real property to GSA for disposal and submits the required GSA Standard Form 118 and any appropriate supplementary forms. For property transferred by DOE under the Section 161(g) of the Atomic Energy Act, DOE headquarters and field elements in practice follow the internal DOE processes and procedures described above, but without the involvement of the GSA.

Steps for Withdrawn Land. If the excess real property is withdrawn land, DOE must notify the appropriate BLM office that it intends to relinquish the property for return to the public domain and prepare a Notice of Intent to Relinquish. DOE must also send a copy of the Notice to the appropriate GSA regional office. There is no specific standard format for the Notice of Intention to Relinquish; however, it must contain 13 specific items identified by regulation, including:

- The extent to which the land is contaminated and the nature of the contamination.

- The extent to which the land has been decontaminated or the measures being taken to protect the public from the contamination.

- The extent to which the land and resources have been disturbed and the measures being taken to recondition the property.

In addition, DOE must describe easements or other rights and privileges burdened on the land and a list of the terms and conditions, if any, DOE deems necessary to be incorporated in any further disposition of the land in order to protect the public interest. BLM then reviews the Notice of Intention to Relinquish to determine the suitability of returning the property to the public domain. The five conditions for BLM acceptance of withdrawn land for return to the public domain, as identified in 43 CFR 2374.2, are as follows:

1. The lands have been decontaminated and restored to suitable conditions. If decontamination and restoration are uneconomical, DOE must install and maintain protective notices and barriers.

2. DOE agrees to undertake treatment measures and measures deemed necessary by BLM to prevent deterioration of the land and resources.

3. DOE has exhausted GSA procedures for disposition of improvements to the land and certifies they are of no value.

4. DOE has resolved, through a final grant or denial, all commitments to third parties relative to rights and privileges related to the land.

5. DOE has submitted to the appropriate BLM office a copy of the easements, leases, or other encumbrances.

If the property meets all of the five conditions, BLM will notify DOE and GSA that it accepts accountability and responsibility for the excess withdrawn land. BLM then manages the land. If BLM determines that the excess withdrawn land has been so substantially changed in character that it is not suitable for return to the public domain, BLM will notify GSA and request GSA to concur in the determination. BLM tends to reject for return to public domain excess withdrawn land upon which improvements have been built.

GSA Reviews. GSA reviews the submission from DOE to ensure that the documentation is complete and that the real property has no encumbrances and has a marketable title. If GSA rejects the property that DOE has reported as excess, it becomes a candidate for transfer to DOE's Office of Environmental Management (EM). GSA generally rejects real property if it is contaminated. If GSA accepts the property, then DOE can relinquish the property to GSA for disposal. Until the property is disposed, the DOE field element has environmental, safety, and health responsibility for the property for five fiscal quarters from GSA's acceptance of the report of excess property, or until the excess property is disposed, whichever is earlier.

CERCLA Requirements. CERCLA requires DOE to disclose whether any hazardous substances, certain hazardous wastes, or petroleum products have been stored, released, or disposed of on the property, in accordance with CERCLA Section 120(h)(1) and (3) and EPA regulations at 40 CFR Part 373. Conversely, CERCLA Section 120(h)(4) requires DOE to identify uncontaminated parcels of land that are proposed for transfer. EPA or the state agency must approve DOE's identification of uncontaminated parcels. CERCLA Section 120(h)(5) requires notification of the leasing of DOE real property which has been contaminated and where government operations will cease.

CERCLA Section 120(h)(3)(A) requires that a federal agency transferring real property to a nonfederal entity include a covenant in the deed of transfer warranting that all remedial action necessary to protect human health and the environment has been taken prior to the date of transfer with respect to any hazardous substances remaining on the property. In addition, CERCLA Section 120(h)(B) requires, under certain circumstances, that a federal agency demonstrate to EPA that the cleanup remedy implemented on the property is "operating properly and successfully" before the federal agency can provide the "all remedial action has been taken" covenant to the non-federal entity to which the land will be transferred. Under CERCLA Section 120(h)(C), the covenant can be deferred so that property may be transferred before all necessary remedial actions have been taken if regulators agree that the property is suitable for the intended use and the intended use is consistent with protection of human health and the environment. EPA has issued Interim Final Guidance on Institutional Controls and Transfer of Real Property pursuant to CERCLA Section 120(h)(3)(A), (B) or (C). Depending upon whether the property is or is not listed on the NPL, either EPA or the state must approve transfer of property under CERCLA.

For the purpose of spurring economic development in communities where federal facilities are closing, Congress has enacted several statutes to facilitate the transfer of contaminated properties from the federal government. These statutes are aimed at avoiding delays in clean-up and indemnifying new owners from having to clean-up hazardous substances attributable to federal activities. The statutes

include CERFA, which amended CERCLA in 1992, and specific to DOE, the National Defense Authorization Act for Fiscal Year 1998.

NEPA Requirements. DOE's procedures (10 CFR Part 1021) for complying with NEPA and with the Council on Environmental Quality NEPA implementing regulations (40 CFR Parts 1500 to 1508) require a determination of whether any DOE proposal requires preparation of an Environmental Impact Statement (EIS), or an Environmental Assessment (EA), or is categorically excluded from the preparation of either an EIS or and EA. DOE's procedures allow categorical exclusions for the transfer, lease, disposition, or acquisition of interests in real property if certain conditions are met:

- Property use is to remain unchanged (i.e., the type and magnitude of environmental impacts would remain essentially the same (10 CFR Part 1021, subpart D, Appendix A, subsection A.7).

- For the transfer of uncontaminated structures for residential, commercial, or industrial use, if environmental impacts after the transfer would generally be similar to those before the transfer (10 CFR Part 1021, subpart D, Appendix B, subsection B.24).

- For the transfer, lease, disposition, or acquisition of interest in uncontaminated land for habitat preservation or wildlife management (10 CFR Part 1021, subpart D, Appendix B, subsection B.25).