A Report to the Secretary of Energy

Initial Joint Review of Wildland Fire Safety at DOE Sites

December 2000

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Abbreviations Used in This Report

BNA	Baseline Needs Assessment
CFR	Code of Federal Regulations
CY	Calendar Year
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
EA	Environmental Assessment
EH	DOE Office of Environment, Safety and Health
EIS	Environmental Impact Statement
EOC	Emergency Operations Center
EPHA	Emergency Planning Hazards Assessment
ERO	Emergency Response Organization
FHA	Fire Hazards Analysis
INEEL	Idaho National Engineering and Environmental Laboratory
LANL	Los Alamos National Laboratory
LBNL	Lawrence Berkeley National Laboratory
LLNL	Lawrence Livermore National Laboratory
NFPA	National Fire Protection Association
NWCG	National Wildfire Coordinating Group
OA	DOE Office of Independent Oversight and Performance Assurance
ORNL	Oak Ridge National Laboratory
RFETS	Rocky Flats Environmental Technology Site
SO	DOE Office of Security and Emergency Operations
SRS	Savannah River Site
USFS	U.S. Forest Service

OVERSIGHT

Executive Summary

Introduction

In October 2000, the Secretary of Energy directed three actions aimed at improving capabilities within the Department of Energy (DOE) to prevent and respond to wildland fires. The first was to direct an immediate complex-wide initial joint review of the adequacy of fire safety programs and related emergency management capabilities. This was to be followed by a more comprehensive review of facility fire safety. The second was to appoint a commission of nationally recognized experts and charter it to provide an independent perspective on the adequacy of DOE's fire safety programs and of its capabilities to manage a fire-induced emergency. The third action was the development and execution of a memorandum of understanding with the Departments of Agriculture and Interior to initiate and formalize cooperative efforts in the areas of wildland fire planning, preparation, prevention, and response.

The initial joint review was conducted between October 15 and December 15, 2000, by the Offices of Independent Oversight and Performance Assurance (OA), Security and Emergency Operations (SO), and Environment, Safety and Health (EH). The purpose of the initial joint review was to assess the abilities of DOE sites to prevent and respond to wildland fires and provide recommendations for pertinent site-specific and DOE-wide improvements. In addition, the review was to provide recommendations regarding the scope and conduct of the comprehensive follow-on fire safety review. The initial joint review included an examination of DOE and national-level policies applicable to wildland fire management, onsite reviews of lessons learned at the three DOE sites that experienced major wildland fires in calendar year (CY) 2000, and visits to four other major DOE sites to collect information on their wildland fire management programs. This report documents the results and recommendations from the initial joint review.

Results

All sites had a variety of plans, procedures, and both personnel and equipment resources in place for preventing and responding to wildland fires. Some sites have implemented exemplary practices in various aspects of wildland fire prevention and response. For example, some sites have implemented highly successful land management plans to reduce the threat from wildland fires and to maintain and promote native ecosystems at the site. Additionally, some sites pre-stage firefighting resources, including heavy equipment (e.g., bulldozers loaded on trailers), during periods of high fire danger.

DOE has a successful record in protecting facilities from wildland fires. Even in the particularly severe fires that involved portions of the Los Alamos National Laboratory, the Hanford Site, and the Idaho National Engineering and Environmental Laboratory during CY 2000, losses to facilities and infrastructure were minimal. This record reflects solid basic capabilities of fire protection programs across the DOE complex.

While the Department has been successful over the years in protecting its facilities from wildland fires, the efforts to combat the major fires of CY 2000 revealed potential concerns and vulnerabilities in some of the Department's programs. There are several areas in need of additional management attention to strengthen the Department's capabilities in preventing and responding to wildland fires.

DOE orders and policy guidance do not clearly establish or convey expectations for establishing wildland fire management programs. Fire safety and emergency response orders focus primarily on facility safety (e.g., prevention and response to structure fires) and do not provide specific requirements or guidance concerning wildland fire prevention or response. For example, although work is in progress, at this time there is no DOE policy on the use of prescribed (controlled) burns as a wildland fuels

management and fire prevention practice. Additionally, DOE's budget process does not specifically address wildland fire prevention and response needs. Lack of specific guidance at the Departmental level is reflected in policy and program deficiencies at local (DOE field office and contractor) levels. Consequently, while sites have established certain elements of effective wildland fire prevention and response programs, most site programs do not include all necessary elements of a comprehensive program. For example, such elements as formal requirements identification (e.g., National Fire Protection Association codes and standards), hazards assessment and control, and formal feedback and improvement processes have not been applied in the area of wildland fire management programs at all sites.

Site hazards assessments do not adequately address wildland fires. While the Department has adequate processes and analytical tools available to assess hazards and identify mitigation measures, those processes and tools are not typically applied to wildland fires. Programs are generally based on informal, undocumented assessments rather than on formal, documented evaluations that are typically used to assess other site hazards. Consequently, hazards associated with wildland fires may not be completely characterized, and actions needed to mitigate hazards may not be implemented. Examples of types of hazards that are generally not being addressed include smoke intrusion (from wildland fires) into facilities and the consequences of fires occurring on (chemically or radiologically) contaminated property.

Some of the needs associated with effectively managing the response to severe wildland fires have not been adequately addressed. Severe wildland fires may pose threats to sites that are longer in duration (e.g., days rather than hours) and broader in scope (e.g., affecting an entire site and surrounding area, rather than a single building or facility) than those typically addressed by fire and emergency response organizations. Fire and emergency response organizations may face a requirement for prolonged, intense, around-the-clock operations that they may not currently be prepared to staff or sustain. Information demands, if not properly coordinated through appropriate Headquarters personnel, can overburden site, operations office, and Headquarters emergency managers and adversely affect emergency operations. Additional emergency management challenges may result from a need to totally abandon a site, the loss of normal evacuation routes, and other unusual conditions caused by a major wildland fire.

Interfaces with offsite agencies need improvement. While sites generally have mutual aid and other agreements with offsite agencies that may respond to or be affected by a wildland fire on site, many of those agreements and accompanying procedures may not adequately address the needs of a serious wildland fire that involves more land and more offsite agencies. Some specific problems that have been identified in dealing with offsite response agencies include the incompatibility of emergency (radio) communications equipment, procedures and responsibilities for monitoring extremely low-level radioactive releases, and the lack of a process to inform responders of, or prepare them to deal with, site-specific hazards such as those that might result from fires affecting radiologically or chemically contaminated areas.

Formal feedback and improvement processes have not been applied to wildland fire prevention and response programs. The recent major wildland fires experienced by DOE sites have resulted in a greater awareness across the Department of the hazards associated with such events, and specific corrective actions have been implemented or planned as a result of those fires. However, routine oversight activities at all levels within the Department have generally omitted assessments of capabilities for preventing and responding to wildland fires. For example, they have not formally evaluated the adequacy of hazard reduction activities, such as fuel reduction in wildland areas or maintenance of defensible areas (e.g., fuel-free buffers around facilities); the adequacy of firefighter training or equipment in relation to wildland firefighting needs; and the adequacy of interfaces with offsite agencies whose assistance will be needed in the event of a major wildland fire.

Conclusions

The Department has, over time, demonstrated a sustained capability to protect its sites from severe damage from wildland fires. Even the several unusually severe wildland fires that were experienced during CY 2000 were combated and suppressed without major facility damage, although not without

significant interruption of operations. This record, as well as the results of this review, indicates that wildland fire prevention and response programs throughout the Department possess the basic capabilities necessary to protect facilities. However, the experiences of dealing with the major CY 2000 fires and the examinations that occurred in their aftermath revealed that those programs are neither comprehensive nor robust in certain areas. The programs lack essential elements of formality that are necessary to ensure that they provide the most effective, efficient, and sustainable levels of protection consistent with the assets that may be at risk. Consequently, increased management attention at all levels is needed to achieve program improvements, particularly in the areas of policy, interagency coordination, hazard assessment, and oversight.

Opportunities for Improvement

The following actions are recommended to improve the Department's capabilities for wildland fire prevention and response. Actions that are appropriate at the Departmental level include:

- Revise existing fire protection and emergency response orders and guidance to clearly convey Departmental expectations for wildland fire prevention and response programs.

- Issue a DOE-wide policy on prescribed (controlled) burning to ensure that sites can plan and implement such precautions before the beginning of the 2001 fire season. In the meantime, expedite requests for waivers from the prescribed burn moratorium when necessary.

- Institutionalize the process for interacting with national wildland fire organizations, such as the National Wildfire Coordinating Group and the National Interagency Fire Center, to ensure that DOE fire protection and land management programs are consistent with national standards and to ensure effective coordination between DOE and regional and national fire fighting resources during major wildland fire events.

- Revise the budget process to identify and allocate financial resources for wildland fire prevention and response programs.

- Reinforce the roles, responsibilities, and authorities within and between the Headquarters, operations office, and site tiers of DOE's emergency response organization, including communications protocols for channeling all information requests through the Headquarters emergency operations center. An understanding of these roles and responsibilities must be supported by training (including senior managers from Headquarters and field organizations) and participation in drills and exercises.

- Establish an agreement immediately with the U.S. Environmental Protection Agency for conducting independent environmental monitoring during wildland fire events that may impact hazardous materials.

Actions that are appropriate at the site level include:

- Evaluate and document the hazard from, and potential consequences of, wildland fires in order to establish the technical basis for prevention and response programs (e.g., fuel management, mitigation of smoke intrusion into facilities, and response to fires on contaminated property).

- Expand the fire protection baseline needs assessment to address wildland fire response needs (personnel, equipment, training and qualifications) and commitments.

- Ensure that fire protection program implementing procedures adequately address wildland fire prevention and mitigation (ignition controls, activity restrictions, and defensible areas).

- Ensure that fire and emergency response plans and procedures adequately address wildland fire response.

- Conduct drills and exercises on wildland fire scenarios with fire and emergency response organizations that would be involved in responding to a major wildland fire at the site.

- Implement or expand fire safety and emergency management self-assessments to include an assessment of wildland fire prevention and response, including appropriate actions to address applicable lessons learned from the CY 2000 wildland fires (compiled in Appendix B).

Recommendations for the Comprehensive Fire Safety Review

The following recommendations for the scope and conduct of the follow-on fire safety review are provided for consideration by EH and the Secretary's Fire Safety and Preparedness Commission. The scope of the review should focus on the elements of a comprehensive fire safety program including, but not limited to:

- Fire protection and emergency services program documentation
- Management of site fire protection and emergency services programs
- Identification and evaluation of fire and related safety hazards at a site or within a facility
- The spectrum of fire safety features installed to mitigate fire risk
- Qualification and training of personnel responsible for fire safety and workers at risk from fire
- Site emergency services capability.

EH should lead the fire safety review with assistance from other Headquarters support and oversight organizations, expert consultants, and experts from DOE line organizations as appropriate. OA should provide support in the review of emergency management aspects of DOE's fire safety program.

1.0 Introduction

In October 2000, the Secretary of Energy directed several actions to better prepare the Department of Energy (DOE) to prevent and respond to wildland fires. The first was to direct an immediate complex-wide initial joint review of the adequacy of fire safety programs and related emergency management capabilities. This was to be followed by a more comprehensive review of facility fire safety. The second was to appoint a commission of nationally recognized experts and charter it to provide an independent perspective on the adequacy of DOE's fire safety programs and of its capabilities to manage a fire-induced emergency. The third action was the development and execution of a memorandum of understanding with the Departments of Agriculture and Interior to initiate and formalize cooperative efforts in the areas of wildland fire planning, preparation, prevention, and response.

In response to the Secretary's direction, this report documents the results of the complex-wide initial joint review that was conducted by the Office of Independent Oversight and Performance Assurance (OA), the Office of Security and Emergency Operations (SO), and the Office of Environment, Safety and Health (EH) from October 15 to December 15, 2000.

Cerro Grande Wildland Fire

Background

Every year, wildland fires burn about 3.6 million acres of land in the United States. In calendar year (CY) 2000, several large wildland fires threatened the safety of DOE personnel, facilities, and equipment at Los Alamos National Laboratory (LANL), the Hanford Site, and Idaho National Engineering and Environmental Laboratory (INEEL). These wildland fires provided a difficult test of DOE capabilities for preventing damage from wildland fires and an extreme challenge to DOE emergency response organizations.

Each site affected by a major wildland fire assessed its own performance and collected lessons learned to improve their wildland fire programs. In addition, DOE Headquarters took action to review its policies on wildland fire. In particular, DOE took near-term action to impose a moratorium on prescribed burns (i.e., deliberate, planned burning of wildland areas to reduce the risk from wildland fires) due to concerns about controlling such burns. Secondly, DOE formed a working group to assess DOE's policy on prescribed burns and to evaluate whether DOE should adopt the National Wildland Fire Management Policy. As part of this ongoing effort, EH-1 issued a survey to each DOE site to gain data on fire management programs.

This report presents the results of an initial review of wildland fire safety mandated by the Secretary of Energy.

This initial joint review initiated by the Secretary expands upon the lessons learned by the individual sites and the wildland fire management policy review by DOE Headquarters to provide an overview of wildland fire safety programs across the DOE complex.

Scope

The initial joint review included three components that collectively provide an overview of wildland fire safety programs across the DOE complex:

- An examination of DOE and national-level policies applicable to wildland fire management
- A lessons-learned review effort focusing on site fire and emergency response performance during the wildland fires at LANL, Hanford, and INEEL
- A site data collection review effort focusing on site programs for preventing and responding to wildland fires at Savannah River Site (SRS), Rocky Flats Environmental Technology Site (RFETS), Oak Ridge National Laboratory (ORNL), and Lawrence Livermore National Laboratory (LLNL).

The sites selected for the data collection effort are all susceptible to wildland fires to various degrees and represent a diversity of site-specific conditions (e.g., vegetation, topography, natural and cultural resources, and proximity to populated areas) that impact the nature of their wildland fire prevention and response programs.

The initial joint review included briefings by DOE and contractor managers and staff, document reviews, interviews, and a validation process to ensure that data collected by the review team was factually accurate. The review focused on five key topical areas related to wildland fires: policies, fire/emergency hazards assessments, prevention and response, offsite interfaces and agreements, and feedback and continuous improvement. The data collected during the initial joint review will be used to support planning efforts for the comprehensive follow-on review.

Organization of the Report

This report provides results, conclusions, and opportunities for improvement for DOE Headquarters and sites regarding wildland fire policy and programs. Recommendations for the follow-on comprehensive fire safety review are also provided.

Wildland Fire Lessons-Learned Sites

Los Alamos National Laboratory

This site, located on the eastern slopes of the Jemez Mountains in New Mexico, consists of approximately 71,600 acres (112 square miles). Juniper savannas and ponderosa pine forest make up the site vegetation. The "Cerro Grande" wildland fire occurred from May 4 to 17, 2000, and burned more than 47,000 acres, 7,500 of which were DOE property. The fire destroyed 45 structures (but no permanent buildings that were in current use for operations) and damaged 67 others. The site was evacuated for 11 days.

Hanford Site

Located on the Columbia River in southeastern Washington State, this 358,400 acre (560 square mile) site is characterized by steppe, sand, and sagebrush. The "24 Command" wildland fire occurred June 27 to July 1, 2000, and burned approximately 40 percent of the site's land area. On site, the fire destroyed a trailer and a metal storage shed, neither of which housed hazardous materials. Portions of the site were evacuated for three days.

Idaho National Engineering and Environmental Laboratory

The 569,00 acre (888 square mile) site is located in southeastern Idaho. The main ground fuels of this semi-arid prairie are sagebrush, wheat grass, and rabbit brush. Three significant wildland fires impacted INEEL in 2000, burning a total of approximately 62,000 acres. These fires occurred in July, August, and September 2000. No damage to facilities or structures or injury to personnel resulted from any of these fires. Two of the fires caused facilities to be evacuated.

Section 2 summarizes results of the reviews of wildland fire prevention and response capabilities at the four sites visited, as well as lessons learned from the three sites that experienced major wildland fires in CY 2000. This section is organized in accordance with the five key topical areas.

Section 3 presents the overall conclusions of the initial joint review team. Section 4 identifies opportunities for improvement both at the Departmental and the site level. Finally, Section 5 provides recommendations to support planning efforts for a comprehensive follow-on review of facility fire safety.

Appendix A presents information about the conduct of the lessons-learned and site-specific data collection reviews and the composition of the initial joint review team that conducted the reviews. Appendix B presents a complilation of the lessons learned from the visits to the three sites that experienced major wildland fires in CY 2000. Appendix C provides the highlights of site-specific prevention and response capabilities from the four data collection site visits.

Sites Selected for Onsite Review*

Savannah River Site

This site consists of 198,000 acres, approximately 90 percent of which is forested. The forests are about 31 percent hardwood or mixed pine hardwood, and 69 percent pine. The topography is flat to rolling. Over the past ten years, the site averaged ten wildland fires per year; the largest burned 230 acres.

Rocky Flats Environmental Technology Site

This site consists of a 385-acre industrial area surrounded by nearly 6,000 acres of controlled open space that serves as a buffer. The ground cover is a meadow-type habitat with areas of marsh and/or stream bank vegetation. Topography consists of a gentle slope, but the northeast and southeast edges of the site drop relatively sharply. Two wildland fires occurred in CY 2000, burning approximately12 acres.

Oak Ridge National Laboratory

ORNL is part of the Oak Ridge Reservation, which consists of 35,000 acres, 75 percent of which is forest or grassland. Long parallel ridges separated by narrow valleys characterize the Reservation. Four wildland fires occurred in CY 2000, all affecting less than an acre; however, between 19,000 and 20,000 acres have burned in neighboring counties since October 15, 2000. The largest wildland fire on the Reservation burned approximately 50 acres in 1977.

Lawrence Livermore National Laboratory

The LLNL main site encompasses approximately 800 acres in a relatively flat, suburban-like setting, surrounded by housing and light industrial areas. Site 300, located about 15 miles southeast of the LLNL main site, occupies approximately 7,000 acres of grassland covering steep, rolling hills and low, rugged mountains. Two relatively minor wildland fires occurred in CY 2000, affecting a total of less than seven acres. The largest wildland fire associated with Site 300 burned approximately 4,700 acres in 1984.

* In addition, E.O. Lawrence Berkeley National Laboratory (LBNL) provided the initial joint review team with data on their fuels management program and a tour of the site environs (to demonstrate the effects of their program).

2.0 Summary of Review Results

These results are arranged by the five key topical areas outlined in Section 1 and include data on the general processes in place across the DOE complex, potential vulnerabilities that should be addressed, lessons learned from the three major wildland fire event sites, and good practices that can be shared.

2.1 Wildland Fire Management Policy

A clear and comprehensive set of requirements and expectations is the necessary foundation of effective safety and emergency management programs. Departmental expectations are expressed through directives such as policy, orders, standards, and guidance, as well as contract clauses. Departmental requirements and expectations should then form the basis for establishing site-specific policy, requirements, plans, and procedures.

Guidance for Comprehensive Programs

Departmental policy does not fully define expectations for wildland fire management programs.

DOE fire protection and emergency services program requirements are governed by the applicable provisions of 29 CFR 1910 and 1926, as well as DOE Orders 420.1, *Facility Safety*, and 151.1, *Comprehensive Emergency Management System*, and their implementation guides, among other directives. However, these orders and guidance focus on facility-specific hazards rather than on sitewide hazards. They do not provide clear expectations and guidance for establishing the following elements of a comprehensive wildland fire program: (1) requirements identification, (2) hazards assessment and control, and (3) feedback and continuous improvement. The lack of clear expectations and guidance contributes directly to weaknesses in site wildland fire management programs noted throughout this review.

None of the sites involved in the data collection component of this review has identified or established an explicit requirements basis for developing and implementing a comprehensive wildland fire prevention and response program. In particular, roles and responsibilities for wildland fire program development and oversight have not been clearly established. Further, standards for developing these programs have not been evaluated for applicability and implemented as appropriate. For example, DOE and contractor requirements identification and management programs, such as DOE Work Smart Standards, have not been rigorously applied to National Fire Protection Association (NFPA) standards related to wildland fire prevention and control, such as NFPA Standard 299, "Protection of Life and Property from Wildfire," NFPA Standard 295, "Wildfire Control," and NFPA Standard 1051, "Wildland Fire Fighter Professional Qualifications," such that these standards have been evaluated for applicability and implemented as appropriate.

In addition, most of the sites have not adequately assessed the hazard from wildland fires in order to establish a basis for controlling the hazards. Programs have generally been based upon informal, undocumented assessments rather than a formal, documented evaluation of the hazard. This is discussed further in Section 2.2. An outcome of a comprehensive hazards assessment is the identification of resource needs (personnel, equipment, and financial). However, there is currently an absence of a specific mechanism for allocating financial resources to support wildland fire activities.

Finally, while DOE directives and contractor fire protection program documents address the need for self-assessments of facility fire safety programs, these documents do not explicitly require that such assessments include a review of wildland fire prevention and response program elements. As a result, site wildland fire programs lack an effective feedback and continuous improvement process. This is discussed further in Section 2.5.

Sites have developed plans and procedures to address wildland fires.

Notwithstanding these concerns, all of the sites involved in this review recognize the potential for wildland fires and have developed plans and procedures to address them. In particular, sites have developed land management plans to reduce the hazard from wildland fires and established firefighting resources (personnel, equipment, and procedures) for responding to wildland fires. Some of these plans and preparedness activities are exemplary. This is particularly noteworthy considering the lack of clear direction on this issue from DOE Headquarters and the absence of specific mechanisms for allocating financial resources to support these activities.

Prescribed Burn Policy

There is no Department-wide policy concerning the use of prescribed burns.

Individual sites have implemented land management plans, some of which include the use of prescribed burns to minimize the buildup of wildland fuels. However, there is no DOE-wide policy concerning the use of prescribed burns. In developing policy in this area, DOE is considering adopting the Federal Wildland Fire Management Policy. DOE is part of the working group that is reviewing the 1995 Federal Wildland Fire Management Policy to determine whether it should be revised as a result of the lessons learned from the severe 2000 wildland fire season that included fires at LANL, the Hanford Site, and INEEL. This policy addresses the management of wildland fuels and wildland fire response capabilities, and advocates the use of prescribed burning as an essential ecological process. The Federal policy will require DOE sites to develop fire management plans, which would address fuels management and response capabilities.

However, at the present time, DOE sites are under a prescribed-burn moratorium that was imposed in May 2000 by the Deputy Secretary of Energy. This moratorium was issued due to concerns that arose from this year's major wildland fire at LANL, which began as a prescribed burn at a nearby national park and later became an uncontrolled wildland fire that caused substantial damage to both wildland and residential areas. For large wildland areas, prescribed burns are effective in reducing fuel loading and, as a result, minimizing the effects of a wildland fire. Although there is an inherent risk in intentionally setting fires, allowing the fuel load to accumulate may pose a greater risk over the long term. DOE Headquarters needs to resolve in the near term the conditions under which the prescribed burn moratorium can be lifted or amended so that DOE sites can plan and implement appropriate and accepted wildland fuel control practices before the next wildland fire season.

In summary, although DOE has established requirements and expectations for fire protection and response, these directives and guidance do not sufficiently define expectations for managing wildland fire hazards at DOE sites. Specific areas where policy, guidance, and expectations are lacking relate to the systematic identification of site-specific requirements; assessment of wildland fire hazards and implementation of controls to minimize the hazards; and application of feedback and improvement mechanisms. In particular, policy is currently lacking concerning the use of prescribed burns as a method for minimizing the risk of wildland fires.

2.2 Fire/Emergency Hazards Assessments

Most sites have not fully assessed the hazards from wildland fires.

Within the Department's integrated safety management program, one of the fundamental principles for ensuring safe site and facility operations is analyzing the hazards associated with work activities so that necessary facility process controls or protective equipment can be identified and utilized. Wildland fires, regardless of the cause of ignition, present certain hazards to facility processes, site workers, fire response personnel, and the public. These hazards should be analyzed so that their impacts are fully understood and appropriately addressed.

Although all of the DOE sites in this review perform various activities related to wildland fire management, most sites have not fully assessed the hazard from wildland fires as a basis for those activities. Rather, their activities are generally based on historical precedent, general assumptions about each site's fire history, and general knowledge of the site's vegetation characteristics. This reliance on undocumented, qualitative analyses does not provide assurance that all of the potential impacts from a wildland fire have been evaluated and

that all appropriate prevention and mitigation options have been considered and addressed.

DOE has established requirements and methodologies for conducting hazards analyses to support development of programs for preventing and responding to fires. These include fire hazards analyses (FHAs), emergency planning hazards assessments (EPHAs), and environmental assessments (EAs) and/or environmental impact statements (EISs).[1] None of the sites visited as part of the data collection component of this review has systematically evaluated the hazard from wildland fires and then used the results of that evaluation to establish specific program elements to minimize that hazard.

FHAs (or other fire-phenomena analyses) could be used as a mechanism to evaluate the hazards from wildland fires, particularly as an initiating event or indirect threat to facilities, and to establish facility-based and sitewide wildland fuels management programs (to minimize the hazard from wildland fires). In addition, FHAs provide information that is useful in performing a baseline needs assessment to determine response resource needs, as discussed in Section 2.3. FHAs could also provide data useful for evaluating the impact of smoke from a wildland fire on safety system operability. None of the sites visited had evaluated the impact of smoke intrusion on facility safety systems, such as diesel generator air intakes and ventilation systems. The concern is that smoke and suspended ash could restrict flow through air filters, rendering systems inoperable. SRS is exploring a methodology to assess these risks.

Smoke Impact on LANL

[1] In addition, other governmental organizations (e.g., National Wildfire Coordinating Group) have established analysis methods for evaluating the risk of wildland fires and benefit of preventive measures such as fuels reduction.

EPHAs can provide data on potential consequences (e.g., radioactive material releases) of wildland fires and information for developing emergency response tools, such as maps, emergency action levels, and protective actions. For example, an EPHA (or similar analysis) can be used to provide data on the potential consequences from wildland fires on contaminated areas. Wildland fires on contaminated areas are a concern for DOE sites, since such fires could provide a mechanism for transport and deposition of radiological and chemical contaminants. This information will be useful in developing plans for responding to fires in these areas. These plans should address the need for personnel monitoring (e.g., dosimetry badges) for firefighters potentially impacted by fires in contaminated areas. The CY 2000 fires at LANL (Cerro Grande) and Hanford (24 Command) affected such areas, and legacy surface contamination in wildland areas is common to many DOE sites.

EAs and EISs can provide data on the impact of wildland fires and wildland fire prevention activities (e.g., prescribed burns) on the environment. LANL developed a sitewide EIS that included an assessment of wildland fires. The results of this assessment closely mirrored the impact from the Cerro Grande fire. During the response to the fire, this assessment proved to be very useful in understanding the maximum consequences that could result. However, few other DOE sites have evaluated wildland fire impacts as part of their EAs or EISs.

Sites have identified contaminated and special-interest areas.

Even though sites had not systematically evaluated the hazards from wildland fires, all of the DOE sites in this review performed various qualitative and, in some cases, quantitative analyses to support aspects of their wildland prevention and response plans. All of the DOE sites visited during this review have developed extensive information on land surface areas that are known to be radiologically and/or chemically contaminated, as well as areas of special interest, such as ecological reserves and sites of archaeological interest. In the field, these areas are clearly marked to alert emergency responders to potentially hazardous or sensitive areas. In addition, this information was found to be generally well documented on site maps and readily available to emergency managers and responders, as well as to personnel who routinely work in the field.

Some sites have performed analyses to guide their wildland fuel management efforts, while other sites use

their existing fuel management practices to justify that the risk is low. For example, Lawrence Berkeley National Laboratory (LBNL) has performed wildland fire hazard analyses to determine where mechanical thinning should occur and where fire breaks and defensible spaces should be established. This type of analysis provides a firm technical basis for the fuels management aspect of a site's wildland fire program. LLNL, on the other hand, uses the fact that they have conducted prescribed burns at Site 300 every year for more than 40 years to show, in safety analysis reports, that the risk of an uncontrolled wildland fire is low. Other sites have recently conducted risk assessments as a result of wildland fire concerns. For example, SRS recently completed a preliminary assessment of the wildland fire risk at the site, and RFETS recently completed an analysis of the consequences of a wildland fire impacting the areas of highest soil contamination on site and has incorporated the results of that analysis into their emergency management program.

In summary, DOE has processes and analytical tools in place (e.g., FHAs, EPHAs, EAs and EISs) that can and should be used to assess and characterize the hazards from wildland fires and identify actions to mitigate those hazards. However, sites do not typically address such threats as part of these processes. As a result, wildland fire hazards may not be completely characterized at all sites, and activities to mitigate the hazards may not be adequate. In particular, plans and procedures to address wildland fuel buildup, potential smoke intrusion into facilities, and fires on contaminated property may not be in place because the hazards of wildland fires have not been formally or fully evaluated.

2.3 Wildland Fire Prevention and Response

Sites have not formally evaluated their needs and capabilities.

Wildland fires cannot be completely prevented. However, the potential for and impact of a wildland fire can be reduced by implementing a variety of fire prevention measures and establishing response capabilities. The extent and type of preventive measures and response capabilities appropriate for a given site depend on the risk from and consequences of wildland fires (as discussed in Section 2.2), the size and location of the site, and the availability and proximity of non-DOE fire response support.

Wildland Fire Prevention Measures

All the sites in this review have implemented prevention measures to reduce the hazard from wildland fires. For example, SRS and LLNL have conducted very successful prescribed burn programs for many years (see text box on prescribed burning). LANL and

Use of Prescribed Burns for Fuel Management

SRS has an extensive prescribed burn program in place and annually burns about 15,000 acres. The figures below illustrate the positive effects of the prescribed burn program at SRS in reducing fuel loading. The sole use of mechanical methods of reducing fuel loads, such as clearing and thinning, may be effective and less intrusive for areas immediately surrounding facilities but is not practical for large areas.

No prescribed burns

Land managed by prescribed burn

LBNL perform mechanical thinning of forested areas and vegetation to reduce fuel loads and establish defensible areas. RFETS has a well established herbicide spraying program to maintain a fire break surrounding the site. These activities are necessarily specific to the topography, vegetation, weather conditions, size, and location of each site.

DOE sites, especially those that encompass relatively large geographic areas, generally maintain site roads and trails to facilitate emergency access and to serve as fire breaks. Some variability in the effectiveness of these maintenance programs was noted during the review. At some sites, road and trail maintenance appears to have been adversely affected by budget reductions and the lack of explicit requirements for maintaining fire breaks and access routes.

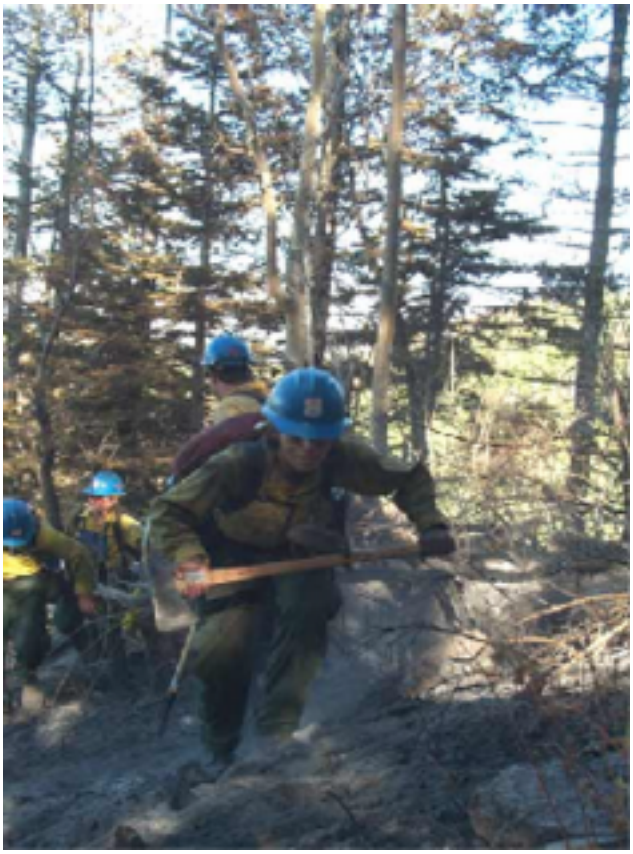
Defensible areas around facilities provide some protection to facilities from an encroaching wildland fire and facilitate emergency response efforts directed toward protecting the facilities. Some facilities have established these areas for both fire hazard mitigation and security reasons. However, the need for defensible areas has not been consistently defined or evaluated in procedures, program requirements documents, or FHAs.

Fire Department Capabilities

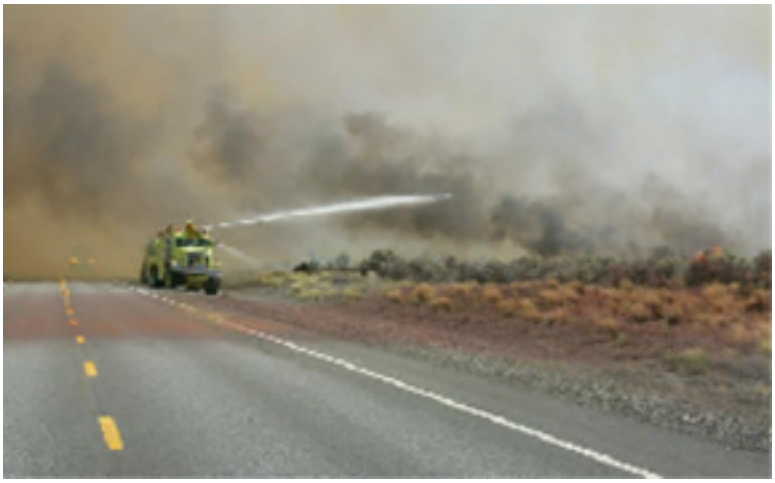
Sites have mobile apparatus for fighting non-facility fires.

DOE Order 420.1 requires that sites perform a fire protection program baseline needs assessment, which is a formal evaluation of the personnel and fire apparatus necessary for the site to meet its fire response objectives. Historically, DOE sites have not considered wildland fires in developing their baseline needs assessment; even so, all of the sites in this review have obtained mobile apparatus and equipment for use in fighting non-facility fires. For example, several sites have brush trucks equipped with 200-300 gallon water tanks to allow quick attack on small fires and access to off-road areas that larger response apparatus cannot reach. INEEL, which experiences wildland fires nearly every year, has obtained extensive equipment for fighting wildland fires, including four wildland firefighting units with compressed air foam capabilities and a 2000-gallon water tender. LLNL maintains personal protective equipment specific to wildland fire hazards for all of its firefighters stationed at Site 300. Both SRS and LLNL have established procedures that require mobile response apparatus and firefighters to be pre-staged in certain areas during periods of high fire danger, while INEEL pre-stages heavy equipment (e.g., bulldozers and graders) on transporters to provide for quicker response to wildland fires during such times. The availability and deployment of these resources constitute a very positive attribute. However, the number of wildland firefighting response vehicles and the type of equipment available at these sites are based on historic precedent and not on a formal evaluation of wildland fire hazards. Thus, sites cannot be certain whether their resources are adequate.

DOE sites have recognized the need for specialized staffing and training in wildland fire response, although some of the sites have not addressed these needs as part of their baseline needs assessment. However, LLNL recently added this information to their needs assessment. In addition, at SRS, where the U. S. Forest Service (USFS) is responsible for managing the site wildland areas and responding to wildland fires, personnel resource requirements are determined using the National Fire Management Analysis System. In addition, even though such training is not formally evaluated or consistently established as a requirement, all of the sites provide training on wildland firefighting.



Firefighters Responding to Cerro Grande Fire



Firefighting Apparatus

For example, LLNL fire department personnel are trained in accordance with NFPA 1051, "Wildland Fire Fighter Professional Qualifications," and USFS personnel stationed at SRS are trained in accordance with National Wildfire Coordinating Group (NWCG) Standard 310-1.

Emergency Response Organization Capabilities

Lessons learned from the DOE fires during CY 2000 identified a need for sites to evaluate the ability of their emergency response organizations to support a long duration, sitewide emergency. DOE emergency response organizations are typically structured to respond to facility-specific events that are of relatively short duration. Some sites are not staffed with an adequate number of trained personnel to sustain emergency response organization operations 24 hours a day over an extended period. In addition, site emergency plans and procedures typically do not address the potential impacts of sitewide evacuations on the ability to perform routine security and safety functions during a large-scale emergency. For example, during the LANL fire, the roles and responsibilities for managing a large-scale event over an extended period were not clearly identified, and the process for accessing and entering the site and facilities during the fire was not well defined. Furthermore, LANL had difficulty contacting personnel who had evacuated with the local community but were needed to support the emergency operations.

During the CY 2000 wildland fires, information requests from personnel from various DOE offices and other Federal agencies to the site emergency operations center added to the already large communications demand. The information demands can overwhelm site response personnel and adversely affect response operations. Although these organizations have legitimate information needs, protocols for channeling information flow through the Headquarters emergency operations center should be followed to minimize the impact on the site emergency operations center.

Another significant lesson learned pertaining to emergency response to wildland fires is the need for DOE sites to establish formal plans for monitoring very low levels of radioactive material that could be released from contaminated land or vegetation during a wildland fire. Additional preparations are also needed to coordinate these monitoring activities with local, state, and national organizations, such as the U.S. Environmental Protection Agency. During the recent wildland fires, the affected sites mobilized and deployed personnel to obtain air samples to identify any increase in the levels of radioactivity in the area. While no significant increase was expected, the sites were proactive in conducting this monitoring to assure the public that there was, in fact, no health hazard. Their decision was prudent; however, they had not established in advance a process for immediately collecting and analyzing samples potentially containing very low levels of radioactive material. In addition, during the CY 2000 wildland fires, the U.S. Environmental Protection Agency performed independent monitoring at LANL and the Hanford site. This monitoring was useful in assuring the public that their health and safety were not adversely affected by the wildland fires. However, protocols for initiating and coordinating this independent monitoring need improvement.

In summary, DOE sites have implemented measures for preventing wildland fires and have obtained resources and equipment for responding to fires in wildland areas of their sites. However, the sites have not formally evaluated their needs in order to ascertain whether their present capabilities and activities are adequate to minimize the risk from wildland fires, particularly in the areas of establishing defensible spaces and firefighting needs, training on wildland firefighting, and staffing for a prolonged, sitewide event.

2.4 Offsite Interfaces and Agreements

Wildland fires that encroach upon the wildland/urban interface can have a major impact on communities and challenge local, regional, and even

national firefighting resources. Wildland fires that cross the boundaries of DOE sites create some additional challenges in interfacing with offsite response units and the public.

During the data collection visits, all of the sites expressed confidence that additional support from offsite agencies could be readily obtained and would be provided promptly to aid in fighting a wildland fire on DOE property, and some sites have established formal agreements to that effect. Approaches for obtaining assistance in responding to a DOE wildland fire varied significantly among the sites visited. This variation is due in large part to differences in the organizational structure of local, regional, and state systems that have been established for mutual aid and the degree of the wildland fire threat in the particular region of the DOE site.

Various support agreements are in place.

The differences between the approaches at SRS, LLNL, and ORNL are illustrative. SRS is one of the largest DOE sites, and most of the site is covered by forest. To accomplish its natural resource stewardship and land management program responsibilities effectively, the DOE Savannah River Operations Office has established an interagency agreement with the USFS. As a result of this agreement, a cadre of USFS personnel is stationed at the site. The USFS is responsible for and equipped to respond to wildland fires at SRS and also carries out the site's extensive prescribed burn program. LLNL, in addition to its many mutual aid agreements, has established a memorandum of understanding with the California Department of Forestry and Fire Protection (CDF) under the auspices of a state program that establishes State Responsibility Areas and Mutual Threat Zones. The memorandum clearly defines the CDF roles and responsibilities for responding to an assistance request and identifies the numbers and types of personnel and equipment relative to the threat posed by the fire. ORNL has historically maintained close ties with the Tennessee Emergency Management Agency (TEMA). ORNL has a direct telephone line for contacting the Tennessee state emergency operations center, which has the authority to deploy assets of the Tennessee Division of Forestry and the Tennessee National Guard, among others. Although there is presently no formal agreement between DOE and TEMA that defines this process or specifies support commitments, TEMA has developed a draft Tennessee Multi-jurisdictional Emergency Plan for the DOE Oak Ridge Reservation that defines concepts of operation for multi-jurisdictional responses to emergencies.

LANL Emergency Operations Center During the Cerro Grande Fire

Agreements may not be sufficient to support site needs during a severe wildland fire.

However, even at sites where mutual aid agreements exist, the level of detail is not always sufficient to address foreseeable problems. The lessons-learned review identified two concerns related to coordination of response efforts with offsite agencies. First, the review noted that radio communications among the various emergency services organizations were not always effective and reliable. Problems identified at various sites included: different emergency frequencies were in use, site organizations with no emergency response role used the emergency frequency, and plans to transition to more modern capabilities were in place but not implemented. The second concern is that mutual aid agreements did not specifically address expectations for wildland fire response in contaminated areas, and information about the potential for hazardous releases from contaminated areas was not adequately communicated to firefighters or the public. This weakness contributed to heightened public concerns. Furthermore, in some cases, it can delay the response because of firefighters' concerns, as noted at LANL when firefighters did not understand hazard signs and

postings. Mutual aid agreements should be used to identify any special provisions, such as dosimetry or bioassay monitoring, that might be provided to offsite responders.

In summary, DOE sites have generally established mutual aid agreements with offsite organizations for response to wildland fires. However, although past performance indicates that additional support from offsite agencies can be readily obtained, some mutual aid agreements and emergency public information plans may not be adequate to support site needs during large wildland fires. Effective and reliable radio communications among the various emergency services organizations and expectations for response to wildland fires in contaminated areas are of particular concern.

2.5 Feedback and Continuous Improvement

Feedback and continuous improvement constitute an important element of all DOE programs, particularly as a mechanism for preventing the recurrence of or improving the response to emergencies impacting workers, the public, and DOE programs. Event critiques, identification and dissemination of lessons learned, self-assessments, and independent oversight are some of the elements that contribute to an effective feedback and continuous improvement process.

Lessons Learned from Wildland Fires

Some sites have been proactive in developing and implementing lessons learned.

Following each of the significant wildland fires at LANL, Hanford, and INEEL, one or more teams were convened to identify lessons learned in order to share knowledge and experience gained from the event, prevent recurrence of similar undesirable conditions, and improve response capabilities. These teams identified a number of lessons learned that have relevance across the DOE complex both for wildland fire safety and emergency management. A compilation of the lessons learned from the fires at these three sites is provided in Appendix B of this report.

The magnitude and severity of this year's fires have raised the general level of awareness of the potential for severe wildland fires on or around DOE sites. However, in the absence of direction from either DOE Headquarters or the operations offices, most sites that were not directly affected by this year's fires have not reevaluated their risk from wildland fires or implemented additional controls to prevent such fires. A notable exception is SRS, which has been very proactive in evaluating and taking actions in response to the wildland fire at LANL. SRS and the USFS personnel stationed there have identified, and in many cases already implemented, extensive actions to reduce risks and enhance response capabilities. These actions included completing a preliminary quantitative assessment of the risk from a wildland fire at SRS, commissioning a multi-agency team to perform an independent review of SRS wildland management practices, conducting walkdowns of the combustible loading of wildland areas near all major facilities, and performing a tabletop performance exercise using a wildland fire scenario. This exercise revealed some coordination issues that had not been previously recognized using other drill scenarios and provided an excellent opportunity to test interfaces with organizations and personnel who have not been involved routinely in other site drill and exercise activities.

In addition, RFETS took a number of significant actions as a result of a small brush fire at the site in July 2000. Although this fire burned less than 15 acres, RFETS published a formal report of their emergency response actions and documented a fire department critique of the event, identifying many lessons learned. As a result of the fire, RFETS also expedited completion of a detailed consequence analysis of the potential impact of a similar fire occurring in a contaminated area of the site.

Self-Assessments

Oversight activities have not assessed capabilities for responding to wildland fires.

Within the recent past, fire safety assessment responsibilities within DOE have been shared among several organizations, both at the field level and at Headquarters. Aside from the site management and operations and integrating contractors and DOE field

offices, fire safety assessments have been performed by some program offices, the EH Office of Oversight, and the Defense Nuclear Facilities Safety Board (DNFSB). In addition, OA performs emergency management assessments. However, no previous assessments have focused particularly on wildland fire issues.

Furthermore, although DOE Order 420.1 requires the implementation of a comprehensive fire safety self-assessment program, neither contractors nor DOE field elements have completely incorporated the evaluation of wildland fire safety issues into their assessment activities (aside from incident-driven lessons learned). For example, some contractor fire protection assessment reports include a discussion of "exposure" fire hazards, but the focus is primarily on the threat from nearby buildings, not vegetation. Additionally, there is little evidence that contractors include utilities and contaminated/restricted areas, which may be threatened by wildfires, in their self-assessment efforts. Neither the contractors nor the DOE field elements include wildland fire suppression capabilities as part of a comprehensive fire safety assessment of site emergency services (fire departments and other responsible organizations). In the absence of comprehensive analysis, vulnerabilities may exist or arise without an appropriate level of attention and mitigation.

In summary, the DOE feedback and improvement activities resulting from the wildland fires at DOE sites in CY 2000 have been focused largely on response efforts at the site level. DOE Headquarters program offices have not directed actions for reevaluating the hazard from wildland fires at DOE sites under their cognizance and ensuring that controls have been established to minimize this hazard. In addition, DOE oversight activities have not generally included an assessment of the emergency service capabilities for responding to wildland fires, the adequacy of hazard reduction activities (such as fuels management and maintenance of defensible areas), or the effectiveness of mutual aid agreements for wildland fire response.

3.0 Conclusions

The Department's ability to respond to wildland fires was severely tested by the extreme CY 2000 fire season. Overall, DOE sites demonstrated the capability to prevent serious damage to their major facilities, and most sites' emergency management systems and fire response infrastructures operated well under extreme conditions that affected multiple facilities and large areas of the sites over extended periods of time. The results of this review indicate that all of the DOE sites visited have developed plans and procedures and have dedicated personnel and equipment for preventing and responding to wildland fires. Additionally, exemplary practices were identified in some sites' wildland fire prevention and response programs; these are summarized on the following page.

However, the recent wildland fire experiences, the results of inquiries of various types following those fires, and the results of this review identified some significant program needs that must be dealt with in order to ensure that the Department's wildland fire programs are effective. Concerns at the Headquarters level include: 1) insufficient clarity of requirements or guidance in DOE policy; 2) the absence of a complex-wide policy on the use of prescribed burns as a fuel management practice; 3) the need for coordination between DOE and national wildland fire organizations; 4) the need for a budget process to ensure that financial resources are allocated for wildland fire management programs; 5) the need to reinforce the roles, responsibilities, and authorities within and between the Headquarters, operations office, and site tiers of DOE's emergency response organization, including communications protocols; and 6) the need to establish an agreement with the Environmental Protection Agency for coordinating environmental monitoring during wildland fire events.

At the site level, there are two general concerns: wildland fire prevention and response programs are generally based on informal, undocumented assessments, rather than formal, documented assessments; and they are not comprehensive in scope, often lacking such formal elements as requirements identification, hazards assessment and control, and feedback and continuous improvement. Specific concerns at individual sites include such issues as the ability to sustain prolonged emergency management and response operations and the adequacy of plans and equipment needed for interacting with offsite response agencies. In particular, plans for responding to fires that impact contaminated areas need to be developed (including determining whether personnel monitoring should be provided for responders to these events), and procedures and points of contact need to be specified for requesting regional or national fire support (e.g., tanker planes). Finally, a number of lessons learned were identified from sites' review of their response to the CY 2000 wildland fires, which are compiled in Appendix B. Many of these lessons learned apply not only to response to wildland fires, but also more generally to planning and response to any major event impacting a DOE site.

Although many basic wildland fire prevention and response program elements are in place and functioning complex-wide, and although the Department has been successful thus far in preventing major facility damage from wildland fires, the program nevertheless can be improved. The elements needing improvement (e.g., guidance, basis in formal hazard analysis, oversight) are precisely those that are necessary to provide increased assurance that the program is effective, efficient, and sustainable over the long term. Increased management attention is needed at all levels to achieve appropriate program improvements, particularly in the areas of policy, interagency coordination, hazard and risk assessment, and oversight. Section 4 of this report discusses a number of recommended actions for addressing these concerns.

Highlights of Good Wildland Fire Management Practices

- INEEL has procured extensive firefighting resources and pre-stages heavy equipment (e.g., bulldozers) to provide rapid response during the wildland fire season.
- SRS has an agreement with the USFS to provide for comprehensive wildland fuels management and wildland fire response.
- LLNL has a memorandum of understanding with the California Department of Forestry that specifically identifies the level of personnel and equipment resources based upon the degree of wildland fire potential.
- LANL has formed a local community group that meets every two weeks to coordinate on wildland fuels management issues.
- RFETS has quantitatively assessed the worst-case radiological consequences resulting from a wildland (grass) fire in the portion of the site that surrounds the core industrial area.
- LBNL has implemented an extensive fuels management program that is based on an analysis of risk of facility damage from wildland fires.
- The Oak Ridge Operations Office has designated a single organization to be responsible for managing all Oak Ridge Reservation wildland areas that are outside the boundaries of individual reservation sites. ORNL has established a Forestry Management Group to carry out these land management responsibilities.
- Hanford's management of vegetation on waste sites and controlled areas minimized the release of airborne radioactivity during the CY 2000 wildland fire.

4.0 Opportunities for Improvement

Even though DOE's response to wildland fires in CY 2000 was successful in limiting the impact on the affected sites, there are a number of areas where DOE preparedness can be improved. Some of these areas apply at the Departmental level, while others apply at the site level. A number of initiatives are under way to address the Departmental issues. In addition, certain site-level improvement items have already been implemented at some of the DOE facilities. The following actions are recommended to improve the Department's capabilities for wildland fire prevention and response.

Departmental-Level Improvements

1. Revise existing fire protection and emergency response orders and guidance to clearly convey Departmental expectations for site wildland fire programs.

DOE has a number of fire protection and emergency response orders and guidance that address aspects of a comprehensive wildland fire prevention and response program. However, these orders and guidance are not well integrated and lack the detail necessary to ensure that site programs are technically founded and comprehensive. Specific elements of wildland fire preparedness and response that should be addressed in a revision to current orders and guidance are:

- Roles and responsibilities for wildland fire program development and oversight
- Guidance for determining applicability of wildland fire standards (e.g., NFPA and NWCG)
- Requirements for analyzing wildland fire hazards as part of FHAs, EPHAs, EAs, or EISs, as appropriate, in order to establish a technical basis for the wildland fire prevention and response capabilities
- Requirements for developing and maintaining land management plans (e.g., wildland fuels management plans)
- Guidance for developing fire and emergency response plans for wildland fires
- DOE and contractor assessment of wildland fire programs.

2. Issue a DOE-wide policy on prescribed burning.

DOE sites have been under a prescribed burn moratorium since May 2000. DOE needs to determine, in the near term, the conditions under which the prescribed burn moratorium can be lifted so that wildland fuels control programs that utilize prescribed burns can be implemented before the next wildland fire season.

3. Institutionalize the process for interacting with national wildland fire organizations to ensure consistency with national standards and effective coordination.

DOE is currently participating in an interagency working group established by the Departments of Agriculture and Interior to review and update the 1995 Federal Wildland Fire Management Policy. In addition DOE is considering entering into a memorandum of understanding with the Departments of Agriculture and Interior to formalize cooperation on wildland fire prevention and response. Through these efforts or other mechanisms, as appropriate, DOE should institutionalize its coordination with national wildland fire organizations so that it can benefit from lessons learned and improvements in practices identified nationwide. In addition, these interactions should improve coordination between DOE and regional and national firefighting resources during major wildland fire events. DOE should become familiar with national fire response processes and should establish a communication protocol in order to provide support to the National Interagency Fire Center (e.g., provide hazards information) when major wildland fires impact a DOE site and regional and national fire response resources are dispatched from the National Interagency Coordination Center.

4. Revise the budget process to identify and allocate financial resources for wildland fire programs.

Presently, wildland fire efforts at the sites are funded through general overhead budget accounts, with no specific mechanism for allocating financial resources to support wildland fire activities. The budget process should be revised to ensure that funding is aligned with wildland fire prevention and response resource needs analysis.

5. Reinforce the roles, responsibilities, and authorities within and between the Headquarters, operations office, and site tiers of DOE's emergency response organization, including communications protocols for channeling all information requests through the Headquarters emergency operations center.

During the CY 2000 wildland fires, information requests from personnel from various DOE offices and other Federal agencies to the site emergency operations center added to the already large communications demand. The information demands can overwhelm site response personnel and adversely affect response operations.

During an emergency, communications must be coordinated to support site incident command. Protocols should require that all information requests from DOE offices and other Federal agencies be channeled through the Headquarters EOC. These steps must be taken to avoid overburdening the emergency response command and control structure. Senior management should reinforce the roles, responsibilities, and authorities within and between the Headquarters, operations office, and site tiers of DOE's emergency response organization, including protocols for channeling information flow through the Headquarters emergency operations center. An understanding of these roles and responsibilities must be supported by training (including senior management from Headquarters and field organizations) and participation in drills and exercises. This training should be conducted annually.

6. Establish an agreement immediately with the U.S. Environmental Protection Agency for conducting independent environmental monitoring during wildland fire events that may impact hazardous materials.

During the CY 2000 wildland fires, the U.S. Environmental Protection Agency performed independent monitoring that was useful in assuring the public that their health and safety were not adversely affected by the wildland fires. However, protocols for initiating and coordinating this independent monitoring need improvement. DOE should establish an agreement with the U.S. Environmental Protection Agency to ensure that environmental monitoring efforts are coordinated and that data quality objectives are consistent with state regulatory needs and the Federal Radiological Emergency Response Plan.

Site-Level Improvements

Although Departmental guidance is needed to promote development of site-specific programs that are commensurate with the risk of wildland fires and local community needs, there are a number of actions DOE sites can take to enhance their programs without waiting for Departmental guidance to be completed.

1. Evaluate and document the hazard from, and potential consequences of, wildland fires.

Sites' wildland fire programs are generally based on an informal, undocumented assessment, rather than a formal, documented evaluation of the hazard. Reliance on an informal, undocumented assessment does not provide assurance that all appropriate prevention and mitigation options have been considered. The following site-specific evaluations should be performed:

- Evaluate the hazard of wildland fires in order to establish a technical basis for sitewide fuel management programs and for creation of defensible spaces around facilities or areas containing hazardous materials.

- Evaluate impacts of wildland fires (or other major fires) on:

  - Site and facility accessibility
  - Maintenance of authorization basis requirements
  - Sitewide and facility safety system operability under adverse conditions, such as heavy smoke
  - Onsite communications demands
  - Onsite security.

  Consider the impact of not only the heat from the fire, but also ancillary effects, such as smoke and impact of fire suppression efforts (e.g., water, foam, or retardant).

- Evaluate the potential for release of hazardous materials in the event of a wildland fire so as to provide a technical basis for fire response plans and to determine potential

health consequences to site workers, offsite response organizations, and the public. In particular, determine the potential for and consequences of releases from a fire that involves contaminated land.

2. Expand the fire protection baseline needs assessment to reflect wildland fire response needs.

A fire protection baseline needs assessment is required by DOE Order 420.1. However, site baseline needs assessments have not historically addressed wildland fire response needs. The fire protection baseline needs assessment should be expanded to address wildland fire response in order to provide information on:

- Fire department staffing
- Firefighting equipment
- Mobile apparatus
- Training
- Qualifications.

3. Ensure that fire protection program implementing procedures adequately address wildland fire prevention and mitigation.

Sites should ensure that all relevant wildland fire safety measures are addressed in their fire protection program implementing procedures, including:

- Implementing controls on ignition sources
- Imposing restrictions on activities that may increase the risk from fire in wildland areas
- Creating and maintaining defensible areas
- Implementing safe-siting criteria for facilities and hazardous storage areas located in areas prone to wildland fires.

4. Ensure that fire and emergency response plans and procedures adequately address wildland fires.

Data collected during the initial joint review identified a number of areas where fire and emergency response plans could be improved:

- Fire pre-plans should be developed for responding to wildland fires that impact areas containing hazardous material, such as land contaminated with legacy radioactive material. These pre-plans should address the need for personnel monitoring equipment (e.g., dosimetry badges) for firefighters.

- Radiological monitoring plans should be coordinated with Federal, state, and local agencies to deploy joint monitoring teams. These memoranda of understanding or agreement should address such areas as integrated procedures for collecting and sharing monitoring data; assessing and interpreting the data and their impacts; and joint operational, technical, and logistical considerations. Existing Federal Radiological Monitoring and Assessment Center response documents could be used as a guide for establishing these plans.

- Plans and arrangements for communicating among fire and emergency response organizations should be reviewed to ensure that they are effective. This review may be accomplished during drills and exercises with offsite response organizations.

- Evaluate the need for emergency plans, procedures, or supporting documents to include information that identifies, for emergency responders, those facilities that contain hazardous materials, even if the materials have been screened out by the hazards assessment process because of the limited quantities involved.

- Establish a procedure for ensuring that all offsite response organizations are notified of the location of hazardous materials that may affect their response efforts.

- Evaluate the capability to staff the fire and emergency response organizations for extended periods of operation, which may be needed to respond to wildland fires. Consider entering into agreements with other DOE sites (or offsite organizations) for providing emergency staffing assistance.

- Ensure that all emergency response organization functions and site incident commanders are familiar with the capabilities and availability of national assets (e.g., tanker planes) to support wildland fire response. Establish explicit procedures and points of contact for securing these assets directly or through the Headquarters emergency operations center.

5. Conduct drills and exercises on wildland fire scenarios with fire and emergency response organizations that would be involved in responding to a major wildland fire at the site.

Several of the DOE sites visited as part of the initial joint review had identified improvements as a result of conducting drills and exercises involving wildland fire scenarios. Sites that have a potential to be impacted by a wildland fire should drill and exercise on wildland fires to identify potential problems in the areas of:

- Establishing an effective incident command system regardless of the origin and progression of the fire
- Communicating with and coordinating the efforts of multiple mutual aid response organizations
- Addressing site security concerns while still providing rapid fire scene access for both offsite and onsite fire response elements
- Requesting assistance from state and Federal wildland fire response agencies.

6. Implement or expand fire safety and emergency management self-assessments to include wildland fire prevention and response capabilities.

While DOE directives and contractor fire protection program documents typically address the need for fire safety self-assessments, these documents do not explicitly require that such assessments include a review of wildland fire prevention and response measures.

- Review and amend site policies and procedures, as necessary, to include appropriate direction for the inclusion of wildland fire safety issues in DOE oversight activities and contractor self-assessments.

- Include the maintenance of "defensible areas" and conformance with NFPA 299 in facility self-assessments.

7. Implement appropriate actions to address applicable lessons learned from the CY 2000 wildland fires (compiled in Appendix B).

The sites impacted by the CY 2000 wildland fires identified a number of specific lessons learned that may be applicable to other DOE sites. Some of these apply not only to response to wildland fires, but more generally to response to any major event. DOE sites should review these lessons learned and implement appropriate actions to address those that are applicable.

5.0 Recommendations for Scope and Conduct of the Comprehensive Fire Safety Review

As part of the fire safety initiative, the Secretary of Energy directed the Assistant Secretary for Environment, Safety and Health to take the lead in planning a comprehensive review of fire safety across the DOE complex. Information from the initial joint review was to be used to develop recommendations regarding the scope and conduct of the comprehensive fire safety review. This section provides these recommendations for consideration by EH and the Secretary's Fire Safety and Preparedness Commission on planning for the comprehensive study.

Background

Historically, the DOE has implemented a series of programs to review and evaluate fire protection at its sites. The most noteworthy was the "Independent Fire Safety Appraisal" program that was instituted by EH after the 1969 fire at the Rocky Flats site. This program utilized experts from industry, along with DOE fire protection engineers, who comprehensively assessed fire protection program documentation, infrastructure, all the facilities at each site visited, and emergency services (fire departments/brigades). It was the centerpiece of the Department's fire protection oversight effort for over 20 years.

Within the recent past, fire safety assessment responsibilities within DOE have been shared among several organizations. Site management and operations and integrating contractors, along with some program and field offices, perform self-assessments. The EH Office of Oversight evaluates the management of site environment, safety, and health programs; reviews authorization bases; and oversees construction and demolition activities, among other responsibilities. The DNFSB assesses site nuclear fire safety from a multi-faceted perspective. OA evaluates emergency management. Supplementing these activities are special fire safety evaluations of a more limited scope. One of the most recent was performed by all sites at the direction of Deputy Secretary Elizabeth Moler in May 1998, in response to concerns regarding the implementation of integrated safety management principles as applied to fire protection. Evaluations or investigations have also been performed in response to serious accidents.

The October 2, 2000, tasking memorandum from Secretary Richardson directed the staff to implement a new "comprehensive study of facility fire safety." This effort is to "include the involvement…of Headquarters organizations, and DOE and contractor line management." The scope will encompass "fire detection and suppression systems and any facility-specific programs that may be implemented." It is to commence in "early CY 2001."

Scope of Review

A sample of sites should be selected to represent a cross-section of differing fire vulnerabilities and hazards. The review should address the following six areas and should include the following elements within these areas:

1. Fire protection and emergency services program documentation

- Incorporation of the essential elements of comprehensive fire protection and emergency services programs into contractor policies, programs and procedures, including the Work Smart Standards set
- Implementation of site-specific policies and practices where DOE directives and industry standards may be insufficient to mitigate risk
- Comprehensive written agreements with offsite organizations that have roles and responsibilities for site fire safety.

2. Management of site fire protection and emergency services programs

- Adoption of a comprehensive set of fire protection and emergency services "performance measures," such as those developed by the DOE Fire Safety Committee

- Application of fire protection program requirements to the activities of subcontractors, to the extent that they involve operations that pose a risk to the public, site workers, DOE programs, and Government facilities

- Existence of an appropriate level of oversight and direction related to fire protection by the DOE program and field offices.

3. Identification and evaluation of fire and related safety hazards at a site or within a facility

- FHAs and self-assessments that address all essential elements for a complete analysis, as delineated in DOE fire safety directives and NFPA standards

- Evaluation of the impact from smoke from wildfires or co-located facility fires on safety systems and equipment, including emergency diesel generator intakes

- Evaluation, from a fire safety perspective, of radiologically- or chemically-contaminated land areas to characterize and document the potential risk from wildland fire.

4. The spectrum of fire safety features installed to mitigate fire risk

- Fire safety "defense-in-depth" that exists across the site and encompasses all significant facilities and activities for which fires and related hazards represent a credible threat

- Isolation, segregation, or special fire control systems (e.g. inert gas, explosion suppression) that protect against fire and related hazards unique to DOE and that are not addressed by industry standards

- Appropriate actions (such as the creation of "defensible areas" around facilities) that have been taken to mitigate the potential impact from wildland fires.

5. Qualification and training of personnel responsible for fire safety and workers at risk from fire

- Employees exposed to "special" fire hazards are provided with appropriate initial training and refresher training.

- The fire safety staff (engineers, technicians, firefighters, managers) are appropriately educated, trained and certified. Training should reflect site-specific hazards and other related considerations, such as radiologically or chemically contaminated areas.

6. Site emergency services capability

- A current "baseline needs assessment" (BNA) or equivalent document has been conducted for the emergency services organization in accordance with DOE Order 420.1.

- The BNA is complete and comprehensive, as compared with DOE directives and available models.

- The fire department (or brigade) conforms to applicable NFPA standards and applicable state and local requirements. This includes firefighter qualifications and training, mobile apparatus design, the provision of necessary firefighting equipment, the development of fire pre-plans, the adoption of comprehensive standard operating procedures, and the implementation of a emergency responder safety program.

- Where offsite emergency services organizations are relied upon to supplement the site fire department/ brigade, there are comprehensive agreements in place, emergency response is coordinated, equipment is compatible, joint training is performed routinely, and responder safety and health have been addressed.

- Maps of radiologically or chemically contaminated land areas are provided in the emergency operations center and to mutual aid emergency response organizations.

Conduct of the Review

EH should review the state of fire protection across the DOE complex and provide this information to the newly established Fire Safety and Preparedness Commission. This information is intended to assist the commission in meeting its charter to provide guidance, advice, information, and recommendations on the readiness of the Department to meet the threat of wildland and facility fires.

The EH Office of Oversight should lead the fire safety review, and team composition should include Federal staff from EH, other Headquarters elements, field elements, and expert consultants, as appropriate. OA should provide support in the review of emergency management aspects of DOE's fire safety program.

The EH review of fire protection should be conducted in parallel with a line self-assessment at each site to update the status of criteria contained in the 1998 Secretarial Memorandum on Fire Protection. In order to provide maximum value to the Fire Safety and Preparedness Commission, the EH approach to this special review should involve the following key steps:

- Consulting with the Fire Safety and Preparedness Commission in January of 2001 regarding the proposed Fire Safety Review Plan to ensure evaluation of all aspects of fire protection of interest to the Commission

- Selecting a variety of DOE sites and facilities to provide a reasonable cross-section of the status of fire protection

- Building on information gathered, issues identified, and lessons learned from previous activities, including the initial joint review of fire programs

- Building on the Department's response to DNFSB Recommendation 2000-2 on vital safety systems, by independently evaluating the operability and material condition of fire protection systems in selected facilities (additional review will be incorporated into the three upcoming EH integrated safety management evaluations)

- Generating a separate report for each site evaluated to be provided to the Commission as it is completed

- Tracking to closure any site- or facility-specific safety issues in accordance with DOE Order 414.1A, *Quality Assurance*

- At the conclusion of all of the individual fire protection assessments, generating a final summary report on the overall conclusions.

APPENDIX A
REVIEW PROCESS AND TEAM COMPOSITION

Review Process

The initial joint review consisted of three primary elements: (1) a review of policy and guidance in place for wildland fire safety both nationwide and within DOE, (2) a review of various DOE and non-DOE analyses of major wildland fires in CY 2000 that affected DOE sites to identify lessons learned, and (3) site data collection (interviews and document reviews) at four DOE sites that were not affected by the recent major wildland fires.

The policy review included an evaluation of Federal and DOE guidance related to wildland fires as well as discussions with the Department of Agriculture and the Department of Interior wildland fire staff and a visit to the National Interagency Fire Center in Boise, Idaho.

The lessons-learned review effort began with the preliminary identification of lessons learned from an analysis of investigations of the wildland fires at INEEL, LANL, and Hanford. Videoconferences with emergency response and fire response personnel from INEEL, LANL, and Hanford were held to validate the lessons learned and to understand any barriers there may be to implementing the lessons learned. In addition, each of these sites was visited to gain a better understanding of the site environs and organizational structures that affect wildland fire emergency and fire response and to identify further lessons learned.

Each of the four onsite data collection efforts lasted one week. These visits involved document reviews and interviews with emergency response and fire response personnel at SRS, RFETS, ORNL and LLNL. A data summary was developed and validated with site representatives to clarify observations or correct inaccuracies.

Team Composition

Managers

Glenn Podonsky, Director, Independent Oversight and Performance Assurance (OA-1)
Michael A. Kilpatrick, Deputy Director, Independent Oversight and Performance Assurance (OA-1)
David Michaels, Assistant Secretary for Environment, Safety and Health (EH-1)
S. David Stadler, Deputy Assistant Secretary for Oversight (EH-2)
General Eugene E. Habiger, Director, Office of Security and Emergency Operations (SO-1)
General John M. McBroom, Director, Office of Emergency Operations (SO-40)

Quality Review Board

Michael A. Kilpatrick (OA)
Raymond Hardwick (EH)
Larry Gresham (SO)
Dean Hickman (OA)
Bob Nelson (OA)

Directors

Charles Lewis, Office of Emergency Management Oversight (OA-30)
Jose Maisonet, Site Response Division (SO-42)
Edward Blackwood, Office of ES&H Inspections (EH-24)

Project Coordinator

James O'Brien (OA)

Site Data Collection Team Leaders

Kathy McCarty (OA)
Steven Simonson (OA)

Lessons-Learned Review Team Leader

Peter Stang (SO)

Comprehensive Fire Safety Data Collection Leader

Dennis Kubicki (EH)

Team Members

Curtis Bartell (SO)
James Bisker (EH)
Alan Cerrone (OA)
Alan Dietz (SO)
Gary Goldberg (SO)
Dennis Kubicki (EH)
Kirk Russell (OA)
Jeffrey Robertson (OA)
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Michael Zanotti (SO)

Acknowledgment

The initial joint team acknowledges the support provided to the team during the lessons-learned and data collection site visits by many DOE Field Office and site contract personnel. In addition, assistance was provided by personnel from the Department of Interior and Department of Agriculture. The initial joint review team in particular acknowledges the support provided by Wally Josephson, Wildland Fire Specialist, Department of Interior; Pat Kidder, State Fire Management Officer, Bureau of Land Management; and David W. Wilson, Forest Manager, U.S. Department of Agriculture.

APPENDIX B
WILDLAND FIRE LESSONS LEARNED

In CY 2000 significant wildland fires affected the LANL, Hanford, and INEEL sites. The evaluation of the effectiveness of the preparations made to minimize the impact of wildland fires and response efforts during the actual fires provided a number of lessons learned that can result in improvements both at the affected site and across the DOE complex. Prior to the initiation of the 60-day initial joint review, the Office of Emergency Management (SO-40) had developed a draft lesson-learned compilation from the CY 2000 wildland fires. During the 60-day initial joint review, videoconferences with staff from all three affected sites were held to share insights. These videoconferences were followed up by site visits to LANL, INEEL, and Hanford to gain additional perspective on DOE capabilities and the impact of the 2000 wildfires, and to identify further lessons learned. SO-40 intends to issue these to the complex so that each site can benefit from them. The information from this lessons learned compilation was used, along with information from visits to four additional DOE sites, to assess DOE wildland firefighting capabilities and level of preparedness and to develop recommendations for improvements as directed by the Secretary in his October 2, 2000, memorandum.

The following sections provide an overview of the CY 2000 wildland fires at LANL, Hanford, and INEEL, respectively. This is followed by a collation of lessons learned from these wildland fires.

Los Alamos National Laboratory (Cerro Grande Fire)

On Thursday, May 4, Bandelier National Monument workers in the Cerro Grande mountain area set a prescribed burn. By the next day, it had become a wildland fire. The emergency operations center (EOC) was activated late in the morning of May 5, only to be deactivated by the late afternoon, when the wildland fire appeared to be back under control. On Sunday, May 7, winds whipped the fire back out of control, and the EOC was reactivated. By that evening, the Laboratory announced emergency closure for Monday, May 8, and did not resume normal occupancy until Monday, May 22. During this two-week period, over 47,000 acres of national forest, county, Pueblo, and laboratory land burned. This included 7,500 acres of Laboratory land, 39 structures, and almost $130 million in fire-related costs.

Wildland Fire at Los Alamos

References

1. LA-UR-00-3471, "A Special Edition of the SWEIS Yearbook Wildfire 2000," August 2000

2. Coffman, C., Hall, D. and Salazar-Langley, T., "Cerro Grande Fire, FWO & Facilities Lessons to be Learned," June 2000

3. National Interagency Fire Center, "Cerro Grande Prescribed Fire Investigation Report." May 2000

Hanford Site (24 Command Fire)

Wildland Fire at Hanford

On June 27, 2000, a vehicle crash ignited a fire on the Fitaner-Eberhardt Arid Lands Ecology (ALE) Reserve. The ALE Reserve is a 120 square mile DOE-owned site adjacent to the Hanford site but managed by the U. S. Fish and Wildlife Agency. By the afternoon of June 28, the fire threatened facilities on the central Hanford Site. Before the fire was declared out on July 1, it had burned nearly 300 square miles of public and private lands. About 40 percent of the Hanford site was affected. Approximately 900 firefighters responded to the fire, including firefighting personnel from the Hanford Site, Benton County, and regional and national support resources.

No major DOE facilities were damaged and no significant injuries occurred to response or site personnel. However, 11 homes were destroyed in Benton City.

References

1. DOE/RL-2000-63, "24 Command Wildland Fire" November 2000

2. U.S. Fish & Wildlife, "24 Command Fire, A National Level Review by the Interagency Fire Team," September 2000

INEEL Site (Tea Kettle Fire, etc.)

Wildland Fire at INEEL

In CY 2000, three major wildfires affected INEEL. On July 26 through 27, the "Tea Kettle" fire burned 49,000 acres. On August 6, the "Grid 51" fire burned 5,400 acres, and on September 17 through 18, a wildfire near the Idaho Nuclear Technology and Engineering Center facility burned 8,000 acres. None of these fires damaged any major DOE facilities or caused the release of hazardous material. In addition, there were no injuries due to the fire.

References

1. Internal Memorandum, "July 26-27 and July 27-29, 2000 Emergency Response Organization Activation Report," August, 2000

2. Internal Memorandum, "August 5, 2000 Emergency Response Organiztion Activation Report," August 2000

3. Internal Memorandum, "Lessons Learned From Previous Wildland Fires at the INEEL Including the 1996 at ANL-W," August 2000

Compilation of Wildland Fire Lessons Learned

1. A pre-existing working relationship with the appropriate Federal, tribal, state, and local agencies is essential for effective coordination of wildland fire mitigation activities, as well as during a wildland fire response.

2. DOE needs Department-wide policy(s) for assessment of wildland fire threats, for mitigation of those threats, and for use of prescribed fires on DOE site property.

3. Site hazards assessments and safety analysis reports should address the potential threat of or vulnerability to wildland fires; if they do not, site emergency management and response plans may not adequately address wildland fire mitigation and response operations and needs.

4. National Environmental Protection Act considerations (e.g. endangered species, historic/cultural areas) should be included in hazards assessments and emergency plans. These considerations can have a significant impact on site preparedness, response, and recovery.

5. Emergency management and response facilities should have adequate backup power to accommodate documented threats, vulnerabilities, and support requirements.

6. As required by DOE Order 151.1, offsite responders should be briefed on radiation and other site work area hazards before beginning work. Personal monitoring and bioassay plans should ensure that all necessary information will be available and provided to offsite responders and that responder health and safety are fully protected.

7. DOE personnel who interface with offsite emergency response agencies are more effective if qualified in the incident management/incident command system; this ensures that sites can effectively function in a unified command environment.

8. Recovery planning should take place concurrently with the emergency response phase; recovery resources, funding, and liability issues should be identified and planned for. If not, recovery scope and impacts may not get addressed adequately or in a timely manner.

9. DOE representatives in coordination with the sites should develop memoranda of understanding or agreement with Federal, state, and local agencies to deploy joint monitoring teams. Use of joint field monitoring teams (e.g., DOE, Environmental Protection Agency, and state) helps resolve differences in radiological monitoring data collection and interpretation; early resolution of differences enhances the acceptance of such data and interpretations by Federal, tribal, state, and local jurisdictions.

10. Emergency management and response logistics and support should be anticipated and planned. Housing, food, transport, and other support that is not planned for may not get addressed before it is needed.

11. Post-incident analysis (PIA) reports should be prepared as soon as possible after an event impacting a DOE site has been resolved. PIAs should contain descriptions of remedial activities taken by an emergency response organization (ERO) and any lessons-learned information the site considers useful to onsite organizations and other organizations within the DOE complex.

12. The recovery planning process should include identification of current hazards. Wildland fires and the response to them affect radiological contamination deposition (natural or manmade) in the geographic area of the fire/response; baseline area radiological contamination deposition measurements taken before the fire/response may no longer be valid.

13. DOE operations or area office representative(s) should be designated as points of contact for Headquarters contacts and be present in the emergency operations center (EOC) during an event. The information demands of DOE Headquarters can overwhelm site response personnel and affect both onsite response coordination activities and emergency operations.

14. Foreign nationals visiting or using DOE laboratory facilities should be briefed that they may not be able to collect compensation for losses

incurred as a result of a wildland fire or the response to it.

15. Sites and facilities should adequately train, drill, and exercise their EROs (and their non-DOE counterparts) with wildland fire scenarios.

16. Onsite and offsite response agency media relations should be coordinated so that contradictory information is not released.

17. Site-level emergency planners need to become more familiar with the various standards and information available on wildland fires. DOE sites that are vulnerable to wildland fires should have personnel trained and qualified as Prescribed Fire Planners (and other necessary positions) under the National Wildfire Coordinating Group's "Wildland and Prescribed Fire Qualification System Guide" (Performance Management Standard 310-1). Personnel qualified in these positions are better able to evaluate proposed prescribed burn fire plans and operations.

18. Communication operability and interoperability issues can complicate the response effort. A procedure for issuing site communications equipment and providing training on this equipment to arriving offsite emergency responders should be included in the emergency plan. Site ERO paging systems do not always function in a timely manner. Offsite emergency responder communications equipment is not always compatible with onsite communications systems.

19. Unexploded ordnance, inert ordnance, and other hazards not specifically associated with particular facility operations should be identified and mapped as part of environmental restoration activities. Restoration personnel should periodically update these maps as new items are discovered.

20. A long-term staffing procedure, policy, or mechanism should be in place for staffing appropriate positions during extended operations.

21. Evacuation procedures should address wildland fires and, if possible, the removal of private vehicles from parking lots. Current facility evacuation and accountability procedures primarily address evacuation due to radiological or chemical emergencies and should be extended to address evacuation and personnel accountability during wildland fire events.

22. The need for information screened out of hazards assessments should be evaluated. Hazards assessments sometimes screen out facilities containing materials that are below the planning thresholds. However, such facilities may contain materials that could complicate a wildland fire response (e.g., explosives storage, small quantities of chemicals, limited amounts of ammunition). Mitigation activities may also reduce or eliminate a facility's threat during a wildland fire, but this information may not be readily available.

23. Response and recovery efforts should include critical incident stress debriefings for responders and victims.

24. Sites should ensure that information on DOE's radiological emergency response asset capabilities are included in orientations provided to offsite agencies that will respond to emergencies at DOE facilities. State, tribal, and local emergency planners and responders have not always been aware of the full range of DOE's radiological emergency response asset capabilities that could help address radiological materials issues.

25. Sites should explore the possible benefits of a National Oceanic and Atmospheric Administration meteorologist augmenting the site EOC staff. During a recent wildland fire at one site, a National Oceanic and Atmospheric Administration meteorologist assisted with weather forecasting and provided timely meteorological information for both plume modeling and weather impacts on emergency responders.

26. Briefings on site hazards and response capabilities should be offered to emergency preparedness liaison officers (EPLOs). Each state has Department of Defense (DoD) EPLOs in their state and region. These EPLOs provide the interface between DoD and state, tribal, local, and DOE site emergency response agencies.

APPENDIX C
SITE DATA COLLECTION

The site data collection component of the initial joint review focused on the programmatic aspects of each site's wildland fire prevention and response capabilities. This appendix provides highlights of data collected during this review, organized by the five key topical areas. The four sites shown in the table below were visited as part of this data collection effort.

The site data collection visits were not evaluations of the individual sites, but rather information-gathering efforts to help assess the capabilities of sites throughout the DOE complex and to identify recommendations for improvements. The attached tables are only highlights from a larger volume of data collected.

Site	Cognizant Secretarial Office	Date of Review
Savannah River Site	Environmental Management	Oct. 16-20, 2000
Rocky Flats Environmental Technology Site	Environmental Management	Oct. 30-Nov. 3, 2000
Oak Ridge National Laboratory	Science	Nov. 6-9, 2000
Lawrence Livermore National Laboratory	Defense Programs	Nov. 13-17, 2000

Savannah River Site

The Savannah River Site (SRS), managed by the Westinghouse Savannah River Company (WSRC), encompasses approximately 310 square miles, of which approximately 80 percent is forested. There are 17 operating areas on the site; activities range from nuclear material handling to facility administration.

Over the past ten years, the site has averaged about ten wildfires per year. The largest fire burned 230 acres. The DOE-Savannah River Office (SR) has established an interagency agreement with the U.S. Forest Service (USFS) whereby a contingent of USFS personnel and apparatus are resident at SRS. The USFS is responsible for conducting natural resource stewardship and land management programs at SRS.

Prescribed Burn in Progress

Mop Up After Prescribed Burn

Prescribed Burn at SRS

SRS WILDLAND FIRE PREVENTION AND RESPONSE PROGRAM ELEMENT HIGHLIGHTS

Wildland Fire Management Policy

- Prescribed burning is performed at a rate of 12,000 to 15,000 acres per year. The prescribed burn program at SRS is defined by a Fire Management Plan, Annual Controlled Burn Plan, and individual burn plans. The prescribed burn program was suspended as part of the May 2000 DOE-wide prescribed burn moratorium. SR has submitted a request for an exemption to the moratorium, which is pending at DOE Headquarters.
- The WSRC Fire Protection Manual specifically identifies the NFPA codes and standards that may have some applicability to SRS. The NFPA standards associated with wildland firefighting (NFPA 295, 299, and 1051) are not included in WSRC implementing procedures since the WSRC fire departmnet does not perform true wildland firefighting operations.

Fire/Emergency Hazards Analysis

- Wildland fire hazards have not been addressed in facility fire hazards analyses, safety analysis reports, emergency preparedness hazards assessments, environmental assessments, or environmental impact statements. As a result of the Los Alamos wildfire, a risk analysis was performed by Westinghouse Safety Management Systems (WSMS) and reviewed by SR ("Wildland Fire Risk at SRS," WSMS-SAE-00-0177, issued October 2000) to determine the relative risk to various SRS facilities from wildfire. The analysis determined the risk was less than that already analyzed in the facility safety analysis reports. Steps have also been taken to review wildfire impacts in future fire hazards analyses and safety analysis report revisions.
- WSRC has documented and mapped known radiologically and/or chemically contaminated land surface areas. These areas have not been characterized to document the health risks from such contaminants if these areas are involved in a wildland fire; however, they are scheduled for characterization.

Wildland Fire Prevention and Response

- The USFS-SR uses the National Fire Management Analysis System – a nationally recognized system for identifying wildland firefighting needs – to determine the staffing levels necessary for responding to wildland fires at SRS based on hazard conditions.
- Evacuation procedures are imbedded into the overall emergency program and are implemented frequently in drills and exercises.
- USFS-SR personnel are trained in accordance with the National Wildfire Coordinating Group (NWCG) Performance Management Standard 310-1. The USFS-SR uses only certified wildland firefighting personnel for fighting fires and for conducting prescribed burns.
- WSRC conducted an exercise specifically designed to test the integration of SRS and offsite field monitoring activities. WSRC is scheduled to conduct additional wilfire exercises in January 2001 for all three emergency response organization shifts.

Offsite Interfaces and Agreements

- SR and the USFS-SR have established an interagency agreement that sets forth the USFS activities and responsibilities in conducting a natural resource stewardship program at SRS. This agreement provides general direction for the USFS-SR to enter into other agreements with state and Federal agencies. In addition, SRS maintains mutual aid agreements with its four surrounding counties.

Feedback and Continuous Improvement

- The site has been very proactive in taking actions in response to the Los Alamos wildland fire.
- SRS commissioned a multi-agency team to perform an independent review of SRS wildland management practices, conducting walkdowns of the combustible loading and wildland areas near all major facilities and performing a tabletop performance exercise using a wildland fire event scenario. The study was conducted July 24-28, 2000.

Rocky Flats Environmental Technology Site

The Rocky Flats Environmental Technology Site (RFETS), managed by Kaiser-Hill (KH), is located about 15 miles northwest of Denver, Colorado, on a 385-acre industrial area surrounded nearly 6,000 acres of controlled open space that serves as a buffer. The ground cover is a meadow-type habitat with areas of marsh and/or stream bank vegetation. The topography consists of a gentle slope, but the northeast and southeast edges of the site drop relatively sharply to form several natural drainage channels.

Brush fires occur annually at RFETS. During CY 2000, two wildland fires occurred at RFETS, consuming between 10 and 12 acres. The fire, which took place in an area of the buffer zone where contamination levels are estimated to be between 1 and 10 picocuries per gram (pCi/g), was completely contained within an hour. No contamination was detected on any of the responding crew members from fire departments who supported RFETS firefighters.

RFETS WILDLAND FIRE PREVENTION AND RESPONSE PROGRAM ELEMENT HIGHLIGHTS

Wildland Fire Management Policy

- Planning and execution of prescribed burning at RFETS in CY 2000 was subcontracted to the USFS. The planning, coordination, implementation of safety controls, and follow-on actions for the April 2000 prescribed (test) burn were extensive. In addition to prescribed burning, the site routinely controls vegetation by various means, such as grading fire breaks, mowing, and sterilization spraying.
- RFETS evaluates NFPA codes for applicability to RFETS. However, the applicable codes are not identified in the KH contract.

Fire/Emergency Hazards Analysis

- RFETS has performed a number of analyses of the hazards from wildland fire. The threat from range fires is addressed in the site safety analysis report. The threat from wildland fires is considered as part of facility-specific fire hazards analyses; however, these analyses do not specifically reference this threat. The site has not evaluated the vulnerability of facilities and equipment to smoke from wildland fires.
- RFETS has documented known radiologically and/or chemically contaminated land surface areas. The site has assessed the worst-case radiological consequences resulting from wildland fires in the buffer zone. RFETS has established an emergency action level for categorizing a buffer-zone grass fire.

Wildland Fire Prevention and Response

- RFETS wildland fire equipment needs were determined through an informal process that considered the capabilities of mutual aid response agencies, historical adequacy of site equipment in combatting wildland fires, and lessons learned from the July 2000 buffer-zone grass fire.
- The site emergency plan, building-specific emergency response operations procedures, and the procedure for emergency protective actions define facility evacuation routes and primary and alternate regional assembly and accountability areas. Procedures specifically address the safe configuration of the facility and equipment, depending on the nature of the evacuation, as well as protocols for accessing facilities during evacuation.
- The State of Colorado certifies RFETS fire department personnel. State certification includes a wildland firefighting academic component and a practical activity.
- Sitewide emergency response exercises with participation by mutual aid assets test the compatibility of response equipment, communications equipment, and response protocols. No drills related to wildland fires have been conducted.

Offsite Interfaces and Agreements

- A mutual aid agreement with the Coal Creek Fire Protection District specifically mentions mutual aid support in the event of a wildland or brush fire. RFETS relies on provisions of the Federal Response Plan for support from regional or national wildland fire organizations.

Feedback and Continuous Improvement

- Following the July 2000 buffer-zone grass fire, RFETS published a formal report of the emergency response actions, containing a list of issues derived from the immediate post-incident critique. The RFETS fire department published a critique that identifies many lessons learned.

Oak Ridge National Laboratory

Oak Ridge National Laboratory (ORNL), managed by University of Tennessee (UT)-Battelle, is a part of the Oak Ridge Reservation (ORR) which also includes Y-12 and East Tennessee Technology Park. The Reservation consists of 35,000 acres characterized by long parallel ridges (slopes of 15 to 25 percent) separated by narrow valleys (slopes of 0 to 15 percent). Three major DOE production and research installations are located in adjacent valleys. Several important rivers and Tennessee Valley Authority (TVA) reservoirs are nearby.

Four wildland fires have occurred in CY 2000, all affecting less than 0.1 acre; however, between 19,000 and 20,000 acres have burned in neighboring counties since October 15, 2000. The largest wildland fire at the reservation burned 48.8 acres in 1977. Prescribed burns have not been used since the 1970s but are currently being considered for the future.

ORNL WILDLAND FIRE PREVENTION AND RESPONSE PROGRAM ELEMENT HIGHLIGHTS

Wildland Fire Management Policy

- ORNL does not have a comprehensive process for managing the fuel loading in wildland areas. Prescribed burns are not currently being conducted at ORR but are being considered for the future.
- ORNL Work Smart Standards make a generic reference to NFPA codes, but there is no site-specific index of codes that have been determined to apply to ORNL.

Fire/Emergency Hazards Analysis

- Wildland fire hazards have not been consistently evaluated as part of site hazards assessment documents, although the risk from "exposure fires" from adjacent facilities is addressed. Some recent evaluations, such as the fire hazards analysis for the High Flux Isotope Reactor and the Spallation Neutron Source, do address wildland fire risk.
- Known contaminated land areas are indicated on maps. These maps are not available in the emergency operations center. Radiologically contaminated land areas have not been evaluated from a fire safety perspective to characterize and document the potential risk from a wildland fire. No ORNL fire department or Forest Management Group pre-fire plans or response strategies have been formalized for these locations.

Wildland Fire Prevention and Response

- The ORNL Forest Management Group is developing a "Wildland Fire Analysis and Evaluation of the DOE Oak Ridge Reservation" that addresses some wildland firefighting resource needs.
- Forest management personnel have received some training in accordance with National WildFire Coordinating Group (NWCG) standards and are scheduled to receive certification from the Tennessee Division of Forestry in early CY 2001. ORNL fire department personnel are not trained to NFPA 1051 or NWCG standards but have received some training in fighting brush fires as part of State of Tennessee Level 2 firefighter certification.
- A wildland fire scenario drill is scheduled to be conducted at Y-12 in early CY 2001. This drill is expected to activate the ORR Common Response Plan.

Offsite Interfaces and Agreements

- A draft Tennessee Multi-jurisdictional Emergency Plan for the ORR has been developed by the Tennessee Emergency Management Agency. The plan reflects centralized coordination of state and DOE-contractor field monitoring teams, including the exchanging of hazardous material samples with the state; incorporates reservation-specific hazard information into one document; and defines concepts of operation for multi-jurisdictional response to events.

Feedback and Continuous Improvement

- ORNL has taken actions recently to improve their wildland firefighting capability and coordination, including purchasing a "brush truck" firefighting apparatus, developing a new fire department instruction related to wildland fire, and drafting a wildland fire risk assessment and evaluation document.
- The DOE Oak Ridge Operations Office has not, historically, performed fire safety assessments of the ORNL Forest Management Group.

Lawrence Livermore National Laboratory

The Lawrence Livermore National Laboratory (LLNL) has two major sites, the LLNL main site and Site 300. The LLNL main site, located approximately 40 miles east of San Francisco in Livermore, California, contains about 600 buildings, including eight non-reactor nuclear facilities, and encompasses approximately 800 acres in a relatively flat, suburban-like setting. Nearly the entire main site is surrounded either by housing or light industrial areas.

Site 300, is located about 15 miles southeast of the LLNL main site, and occupies approximately 7,000 acres of grassland, ranging in altitude from 500 to 1800 feet and covering steep, rolling hills and low, rugged mountains. Prescribed burning of selected areas covering approximately 1500 acres is conducted annually. Two relatively minor wildland fires occurred in CY 2000, both started by ancillary work activities. Total affected acreage was less than seven acres. The largest wildland fire associated with Site 300 occurred in 1984 and was ignited as a result of high-explosive testing that was conducted prior to the annual controlled burn. This fire started on site and moved off site, burning a total of approximately 4700 acres.

LLNL WILDLAND FIRE PREVENTION AND RESPONSE PROGRAM ELEMENT HIGHLIGHTS

Wildland Fire Management Policy

- LLNL has developed a draft "Site 300 Vegetation Management Prescribed Fire Plan" that addresses land management goals and objectives to be accomplished via prescribed burning at Site 300. In addition to prescribed burns, LLNL reduces vegetation at Site 300 by mechanical mowing and herbicide spraying. A defensible space around all buildings is well defined and maintained, and vegetation is kept clear within a 20-foot radius of all wood power poles.
- The LLNL Work Smart Standards specifically invoke Volumes 1-13 of the NFPA codes. Many codes are also referenced explicitly in the standards, but this is an outgrowth of the Work Smart Standards development process. There is no further delineation of which NFPA codes and standards the laboratory considers "applicable" to its operations.

Fire/Emergency Hazards Analysis

- Wildland fire hazards have not been consistently or completely evaluated within the spectrum of hazard analysis documents on site. Certain documents, such as the Site 300 Chemistry Area Basis for Interim Operation and the Safety Analysis Report for the B-Division Firing Areas, consider wildland fire risk to a limited degree.

Wildland Fire Prevention and Response

- The apparatus and equipment available at the LLNL fire stations for responding to wildland fires are not discussed in the LLNL fire department baseline needs assessment (BNA). The BNA does address capabilities (i.e., staffing and training) for responding to wildland fires at Site 300.
- The Site 300 Emergency Evacuation Plan defines facility and site evacuation routes and reentry procedures. Protocols for placing facility processes in a safe, shutdown condition, and points of contact for accessing facilities during and after an evacuation are delineated in facility-specific "Self-Help Plans."
- All LLNL fire department personnel are trained in accordance with NFPA 1051, "Standard for Wildland Fire Fighter Professional Qualification." The State of California has developed a draft California Incident Command Certification system that is to be used in place of the National Wildlfire Coordinating Group (NWCG) training and certification standard NWCG 310-1. LLNL intends to train their firefighters to the state system in FY 2001.
- LLNL fire department personnel participate in a drill with other mutual aid responders each quarter. Annually, the LLNL fire department participates in a two-day wildland fire exercise conducted by the state, and in a county emergency operations center exercise.

Offsite Interfaces and Agreements

- The memorandum of understanding between LLNL and the California Department of Forestry (CDF) specifically identifies the level of personnel and equipment resources that will be assigned to respond to an assistance request based upon a CDF-determined burning index. It also establishes standard communications frequencies, and provides necessary air command aircraft and air support for dropping fire retardant.

Feedback and Continuous Improvement

- Since the establishment of the May 2000 DOE-wide moratorium on prescribed burns, LLNL has taken actions to reduce the risk from future wildland fires, including obtaining a waiver from the moratorium and updating the baseline needs assessment to discuss wildland fires.
- The DOE Oakland Operations Office has not performed comprehensive fire safety assessments of the LLNL fire department.