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Title: **Cerro Grande Fire: Facility and Waste Operations Division and Facilities Lessons to be Learned Report**
June 28, 2000

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Submitted to: Facility and Waste Operations Division

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FORM 836 (10/96)

Cerro Grande Fire

FWO & Facilities
Lessons To Be Learned
Report

June 28, 2000

Submitted by
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1.0 Introduction

During the month of May, the Laboratory experienced an emergency disaster unlike any it has experienced in its 50-year history. In the chaos that ensued, the Laboratory, and other community and government entities, responded with extraordinary effort, cooperation, and determination. No lives were lost, no major laboratory facilities destroyed.

It was evident that the Laboratory's resources and systems were challenged. In any emergency of this magnitude, it is good business practice to evaluate the events of the emergency. In examining the many experiences and observations made by those directly involved, we aim to identify lessons to be learned recommendations for improvements, and successes to be shared.

1.1 EVENT

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 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 re-activated. By that evening, the Laboratory announced emergency closure for Monday, 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 8,000 acres of Laboratory land, 39 structures, and almost $130 million in fire-related costs.

1.2 PURPOSE

Facilities Waste Operations (FWO) Division requested a lessons-to be-learned report be drafted that critiques the functional emergency roles, responsibilities, and responses that the Division and Laboratory Facilities performed during the emergency.

1.3 METHODOLOGY

In early June, 69 individuals who participated in emergency response and facility recovery were interviewed (see Attachment A) by the Facility Recovery Center (FRC) Lessons-learned Team. Those interviewed were Facility Managers; many of the EOC Primary and Secondary staff; DOE; PTLA, JCNNM, ESH, FWO, S Division management, and other personnel

involved in the emergency. Interviews averaged approximately one hour and consisted of a set of general questions and unstructured discussion. Comments were categorized into data summary sheets. A Web-based mechanism was set up to solicit feedback from other FWO personnel who worked during the fire emergency and did not participate in the interview process.

1.4 CAVEAT

Information presented is solely based on interviewee's perceptions, observations, level of knowledge, and experiences. Any recommendations are based on this information. In many cases, a more formal assessment process should be engaged to provide a complete or comprehensive Lab-wide evaluation.

2.0 Overview

Management systems define the requirements and parameters governing how LANL conducts operations, including emergency operations. How LANL formalizes its operations and what infrastructure is established to support its operations contributes to effective management systems. The impact of this emergency upon LANL's safety, facility management, support services, programmatic, and institutional systems are examined in this report.

Many of the comments made during the interview process proudly exclaimed that "LANL survived," "we made it through," and "we did it!" And in many cases, the existing systems in place provided adequate management of the emergency. In particular, there was a general consensus that most personnel maintained the ISM principles throughout the emergency.

But, there were instances interviewees felt that some management systems were found to be inadequate, underdeveloped, insufficiently defined or nonexistent. Some of those identified were:

- Disjointed emergency functional relationships across multiple organizations, such as HAZMAT, EM&R, and Fire Protection.
- The lack of a comprehensive proactive assessment of the impact of a site-wide emergency and site-wide evacuation on programmatic, facility, and infrastructure systems and operations and associated contingency plans.

The emergency also revealed the need for improvements to current routine systems, such as safe storage and record keeping of critical data and information and the need to re-visit long standing needs for upgrades

or system changes. Utilizing the ISM model, facilities can take the initiative to review, coordinate, and implement improvements.

The remainder of this report details the formality of operations during the emergency, the supporting infrastructure, and the associated issues, problems, and successes.

3.0 Formality of Operations

Formality of operations relates specifically to defined policies, procedures, and formalized organizational relationships, which are written, communicated, and training provided, for a specific audience. This section summarizes those issues that arose during the emergency with respect to LANL's formality of operations.

As they relate to formality of operations, the following observations combine to indicate that a greater degree of preparedness, a larger and more regional scope of reference, and many additional resources were needed and would be desired in future emergency situations.

3.1 OBSERVATION

Emergency management systems were inadequately defined and understood.

The magnitude and duration of the emergency impacted the Center's ability to fully manage the emergency. There were insufficient emergency logistical support identified with defined functional roles and responsibilities. By default, EOC attempted to manage many of these functions without adequate resources.

The EOC is structured primarily for radiological and security incidents. There is a lack of substantial number of processes and procedures governing a site-wide emergency, evacuation and contingency planning for all types of emergencies, such as this ecological disaster. These included procedures for decision making and chain-of-command; security; call-out and contact for management and essential personnel; worker emergency and evacuation information; procurement; and work process for crafts and utilities workers.

Access, to the site and to facilities, was extremely problematic. It is not known if there are established access and re-entry requirements for an evacuated site. There was no evident owner of the access process. Ad hoc systems were put in place in the absence of procedures. No clear lines of authority of who is responsible and who controls access in an emergency, excluding security access performed by PTLA, are established.

LANL has not adequately defined senior management emergency roles and responsibilities, beyond the identified EOC structure. Individual senior managers, not on a formal call-out list, participated in the EOC because of vested interests. In this emergency, this proved to be an essential asset because of their expertise and knowledge of the impacted area.

With the exception of the Emergency Director and the EOC Primary's, senior management did not have a visible presence and garnered the perception they did not fully understand the scale of resources, people, and time to necessary to conduct emergency operations.

LESSONS TO BE LEARNED

- Procedures for EOC operations should be reviewed.
- Examine functional responsibilities for EOC and logistical support personnel to better distribute tasks and clarify roles.
- Review emergency management procedures, including roles and responsibilities, for inclusion of site and community-wide emergency and evacuations.

3.2 OBSERVATION

Lack of standard institutional facility management emergency functions and authorities.

The distributed facility management system creates inconsistent approaches to emergency response and a varying understanding of emergency roles. The existing structure contributed to unclear lines of authority during the emergency; inadequate availability of resources and equipment for the emergency; and inconsistent knowledge of programmatic requirements and hazards in facility buildings. There was not a consistent definition or identification of key personnel across the facilities, as required for an emergency.

There is no established centralized mechanism for the EOC to communicate to the facility managers, or for the facility managers to communicate their emergency issues and concerns. Conflicting priority and philosophy for maintaining Authorization Basis during the emergency exposed potential circumstances that could compromise the surety of identified safety systems.

Many facility managers set up command posts at their site, but felt isolated and on their own. Often, multiple division owners in an FMU created unclear lines of authorities between programmatic tenants and facility management. Cases where the facility managers were able to work directly with their division management proved to be more effective in securing a facility than where there were multiple division owners residing in a single facility.

LESSONS TO BE LEARNED

- Conduct an extensive assessment of the facility management system structure for systemic emergency management and response issues.
- Determine and implement standard, graded institutional functional emergency roles and responsibilities for facility management.
- Review facility-tenant agreements for site-wide emergency and evacuation processes and procedures.

3.3 OBSERVATION

The organizational structure of the EOC did not include all the entities impacted by this emergency, which would have provided a greater depth of response ability.

During the emergency, there was inconsistent coverage by non-LANL entities, such as the Forest Service and Los Alamos County, who provided critical informational links. Questions were raised as to whether EOC should continue to operate within its defined mission or whether it needs to have a more regional scope and operate off-site. There was a lack of a comprehensive regional emergency plan for response and evacuation. Of note, DOE-LAAO's and the County's emergency director were considered valuable assets in the EOC operations.

LESSONS TO BE LEARNED

- Examine operational protocols; identify a potential site location and an organizational structure that could support a more regional scope.
- Because the fire crossed so many jurisdictional areas (Pueblo, Federal, State, and County), initiate the development of a regional emergency management plan.
- Examine the tactical and strategic functions within the EOC to enhance operations.

3.4 OBSERVATION

Insufficient, unavailable, or outdated site-specific information was problematic for EOC and other emergency personnel needing to respond to areas in jeopardy because of the fire or evacuation.

From a risk-management perspective, information was needed regarding hazards (chemical, radiological, mechanical, etc.), valuable equipment,

high-priority projects, inventory, sealed sources, resources, utility locations, TSRs/ABs/SARs for nuclear facilities, and procedures and decision points for shutting down systems. Many as-builts were out-dated or unavailable, the MOADS list was not accurate. The LANL site-map Green Book does not contain utilities information.

LESSONS TO BE LEARNED

- Develop procedures requiring this information be gathered and updated regularly for emergency purposes.
- Make this information available in a central location or electronically accessible from a secure server, so that emergency crews can access in the event of a site-wide evacuation.

3.5 OBSERVATION

Inadequate access to real-time information.

Real-time meteorological information for the region, real-time fire information, current status of utilities and facilities, locations of personnel working in the field were all extremely difficult for the EOC, facility, and emergency field support personnel to access.

LESSONS TO BE LEARNED

- Determine the types, sources, and methods of delivery for real-time information to the EOC, facility, and emergency field support personnel that may be required or needed in emergency circumstances.

3.6 OBSERVATION

Lack of a centralized communications center for field-support activities.

There was a lack of a single source with authority for receiving and disseminating emergency field operations information; issuing directives for tasks or requesting information; and reporting back status of tasks and emergency situations.

Coordinated communication and activities among emergency field support personnel during the emergency was difficult; many set-up auxiliary, local communication and control centers, using whatever communication tools were available to them. Cross-utilities information was necessary (i.e., gas personnel needed to know where the electrical linemen were at times; Roads & Grounds did not want to fell trees where there was still power.)

Facility Management personnel needed to know the status of buildings and utilities at their sites. It was necessary to coordinate distribution of supplies and equipment.

Additionally, requests for services did not come through a single channel. Some requests came from the EOC, some from the Fire Department, some from Facility Managers, etc. In some instances, the availability of personnel to respond to a request was limited and conflicting requests drained resources. In other instances, more than one group was asked to respond to a request, resulting in an inefficient use of resources.

LESSONS TO BE LEARNED

- Develop an institutional process, with clear lines of authority protocols defined
- Establish procedures for coordinated communication and response for emergency support personnel.

3.7 OBSERVATION

Technically, psychologically, and physically, many personnel involved in the EOC and emergency operations were not adequately prepared for their roles, defined or undefined, in the emergency environment.

Procedures for relief of Primarys from their responsibilities were not executed well. Consequently, many directing the emergency did so impaired from exhaustion. Many Primaries did not utilize their alternates effectively or have their auxiliary staffs identified and trained to their responsibilities. Additionally, the appropriate resources to provide real-time answers needed for types and effects of certain hazards to fire were not always available.

LESSONS TO BE LEARNED

- Expand required emergency response training to a broader audience.
- Review training content to include new processes and procedures for emergency operations, including how to plan and respond under extreme pressure.
- Institute fire-safety training for all facility managers, JCNNM, and other identified key personnel.
- Enforce mandatory shift requirements.
- Develop call-out process for obtaining appropriate SME assistance to the EOC, according to nature of emergency.

3.8 OBSERVATIONS

LANL had inadequate worker-information and public-information mechanisms. Risk communication did not address a diverse audience.

The EOC number was placed on the Web, and its lines were tied up with non-essential phone calls. Standard and communicated procedures for obtaining relevant information in an emergency, including off-site evacuations, are lacking. Information was not available for hearing-impaired. Difficulty getting current and frequent information to the workers and public.

Dealing with public perception during the emergency was problematic. Issues associated with the smoke and hazard releases were inadequately communicated, contributing to enhanced fears. Additionally, non-LANL emergency response workers, such as fire fighters, did not know or understand the context of hazard signs and postings.

LESSONS TO BE LEARNED

- Examine methods, including mixed media & captioned, for distributing information to workers and the public.
- Institute and publicize single point of contact and phone number to call in the event of a site & community-wide emergency and evacuation.
- Evaluate appropriate mechanisms to enhance risk communication efforts during an emergency. Initiate risk communication outreach to non-LANL groups that may be involved in emergency response.

4.0 Infrastructure

LANL infrastructure is the physical assets and services of the institution needed to support the management of its operations. A diverse set of organizations, internal and external, maintains the infrastructure with equally diverse owners, authorities, and responsibilities. This section summarizes the issues that arose during the emergency period with respect to LANL's infrastructure.

4.1 OBSERVATION

Telephone, pager, cellular phone equipment was problematic.

Each type of equipment had varying degrees of usability, effectiveness, and reliability during this emergency. Contributing factors were an overloaded system, repeater tower going down on Parajito Mountain, dead zones, replacement battery unavailability, and long-distance access numbers. Personal cells were used when battery-depleted LANL cells became unusable, but this introduced security concerns in secure areas.

SWANs radios were the most reliable of communication devices. PTLA's multi-channel radio system proved very effective, as was the Utilities' central dispatch system. US West's presence at the EOC during the emergency allowed for real-time fixes to the system, preventing significant down time.

LESSONS TO BE LEARNED

- Standardize communications systems; all pagers and cells from same source with universal capability.
- Examine feasibility of satellite system to gain reliability.
- Proactively determine quantity of devices required for each organization and store centrally in the event of an emergency.
- Evaluate types of resources required to maintain communication systems.

4.2 OBSERVATION

Inconsistent ability to maintain positive access control across facilities.

Gates and badge readers took time to override or do manually in order to allow entry to emergency responders or county utilities personnel.

LESSONS TO BE LEARNED

- Badge readers and physical barriers (gates) need to have a defined emergency programming contingency plan controlled by FMs or other identified entity.

4.3 OBSERVATION

Keys and cores became problematic

Keys to rooms, vehicles, and heavy equipment were not always readily available. Tracing owners or location of keys became a time-consuming exercise.

LESSONS TO BE LEARNED

- Establish emergency process and procedure for facility key inventory and control.
- Evaluate key custodian emergency preparedness.
- Evaluate protocols for building and vehicle master key inventory.
- Have LANL locksmith in the EOC.

4.4 OBSERVATION

Lack of adequate coordination between facility and programmatic operations.

Lack of adequate coordination allowed for gaps of knowledge about what is essential and how to save programmatic equipment. Consequently, thousands of dollars worth of equipment was lost.

LESSONS TO BE LEARNED

- Establish engineering systems that allow for leaving operations in safe configuration.
- Review nuclear facility model on how this information is captured.
- Review BEP content requirements: create more comprehensive facility emergency plans that detail information about the operations

in the buildings and rooms within a facility, and which are essential operations.

- Review facility-tenant agreements for inclusion of programmatic information.

4.5 OBSERVATION

Facility siting issues.

Buildings are sited next to cliffs that are vulnerable to wildfires. Some facilities have only one egress. The spacing between buildings does not follow the DOE or International Code requirements. In some cases, damage to adjacent structures resulted from the close proximity of burning buildings.

LESSONS TO BE LEARNED

- Evaluate siting configurations against current codes and safety considerations in relation to site-wide fire emergency.
- Have fewer, larger protected buildings, rather than more smaller, scattered buildings.

4.6 OBSERVATION

LANL's physical boundaries of facilities are problematic.

The difference in geographical size of Facility Management Units (FMUs) contributes to constrained resource availability and coordination. Multiple designations and nomenclatures for facilities, buildings, and areas within the Laboratory, create confusion in an emergency environment for those without corporate historical knowledge of LANL.

LESSONS TO BE LEARNED

- Evaluate FMU physical boundaries in light of emergency response considerations.
- Standardize nomenclature for LANL structures.

4.7 OBSERVATION

Inconsistent and insufficient level of knowledge for protecting computers, peripherals, and stored data.

Many organizational servers and backup systems were in locations that were at risk or not accessible during the fire.

LESSONS TO BE LEARNED

- Examine off-site server locations and data storage.
- Evaluate impact loss of computer capability on infrastructure systems and operations, such as SCADA systems, fire suppression, water and power supplies, waste stream operations, etc.

4.8 OBSERVATION

Inadequate availability, usability, and/or coordination of resources and equipment.

Concern was expressed at the lack of access to equipment and data critical to decision-making during the fire. This included real time meteorological information, for a larger geographical area than was available, and access to current, up-to-date utility and facility data and maps. There was a general lack of knowledge of extent of resources available for use or loan in emergency circumstances, whether vehicles or equipment. Initially, security roadblocks prevented access to HAZMAT equipment, with perception that the emergency was a fire not HAZMAT emergency.

LESSONS TO BE LEARNED

- Determine the key physical resources needed for emergency operations, such as, vehicles, supplies, equipment, and access mechanisms for use or loan.
- Develop a mechanism for transferring identified critical data and information to a central repository accessible during an emergency.
- Evaluate feasibility of a staging area for emergency vehicle pool.
- Develop better pre-emergency plan for rescuing emergency assets.

4.9 OBSERVATION

The EOC building proved inadequate during this emergency in terms of size, space, and technological capability.

LESSONS TO BE LEARNED

- Build a new complex that meets a comprehensive emergency response, includes technological enhancements, and is ADA compliant.
- FWO should evaluate and communicate its EOC requirements and needs.

4.10 OBSERVATION

Inadequate protection of physical assets.

Proliferation of transportables, sheds, and transportainers for storage of expensive equipment, spare parts, computers, etc., increased losses (these were the types of structures that burned in the fire). Essential facilities, buildings and equipment have not been adequately identified. There is not an essential facility prioritization list, based on institutional programmatic or mission critical criteria that would direct emergency response resources and restart efforts. Some buildings that were saved were later abandoned and thus could have burned with no consequence.

LESSONS TO BE LEARNED

- Develop institution-wide list of every facility, building, structure, and critical equipment and prioritize for emergency and recovery operations.
- Develop comprehensive profile of building usage--identify how and where assets are stored.

4.11 OBSERVATION

Fire protection not always prioritized adequately.

In the past, parts of the fire protection budget were re-allocated to support other priorities. Need to pay attention more to grounds and surrounding area. Need to do a lot more thinning.

LESSONS TO BE LEARNED

- The Dome Fire of 1996 started a proactive approach and understanding of the importance of thinning and brush clearing around buildings, as did LANL's work with the Interagency Wildfire Team. This needs to be a continued priority.

- Where advanced thinning occurred, buildings did well. Strengthen LANL's proactive strategies for fire protection; evaluate budgetary resources for these activities to be applied consistently Lab-wide.

4.12 OBSERVATION

Key suppliers of power and water (County) are not sufficiently integrated into LANL emergency planning and response.

LANL does not have access to the status of water tanks and pumps (County responsibility) prior to and during the emergency. In a wildfire, well locations are at risk. Electrical power is dependent on County power source. During the emergency, lack of information and coordination between EOC and JCNNM Utilities efforts and EOC and LANL Utility group. Emergency power generator inventory and maintenance moved from centralized to distributed owners, creating a gap in readiness and availability knowledge during the emergency.

LESSONS TO BE LEARNED

- Los Alamos County, JCNNM, and LANL should establish closely coordinated emergency operating protocols. (That power was maintained is a tribute to the utilities and County personnel's extraordinary efforts).
- FWO should examine facility functions related to fire response needs, spelling out which should be centralized and which should remain distributed.

5.0 Attachment

Attachment A: Interviewee List

ATTACHMENT A: INTERVIEWEE LIST

Rick Alexander, FWO-WFM
Scott Alexander, NIS-FM
Tom Alexander, DX-FM
Dennis Armstrong, S-8
Kurt Beckman, FWO-SEM
Tom Blum, NMT-8 (TA-55)
Michael Brandt, ESH-5
Ron Brodd, FWO-DF
Melvin Burnett, FWO-SEM
Roger Cardon, FWO-SEM
Jim Covey, FWO-DO
Danny Castaneda, JCNNM
Rex Crook, B-FM
Kathy De Lucas, PA-DO
Scott Dick, NMT-13 (CMR)
Scott Downing, B-FM
George Dufour, JCNNM
Jerry Dunlop, NMT-8 (TA-55)
Jean Elson, ESA-DO
Dennis Erickson, ESH-DO
Eric Ernst, NMT-13 (CMR)
Rob Farris, FWO-Fire
Mike Fogle (notes only), FWO-DF
Jim Fraser, LANSCE-FM
Jim Frybarger, CIC-FM
Larkin Garcia, E-D&D
Lisa Garner, MST-FM
Tori George, FWO-DO
Jim Gourdoux, FWO-Fire
Bob Grace, ESA-FM
Tony Grieggs, ESH-19
David Gurule, DOE-LAAO
John Gustafson, PA-DO
Barbara Hargis, ESH-5
Sara Helmick, CST-FM
Doug Hof, CST-FM
Judith Huchton, ESA-FM
John Killeen, PTLA
David Knapp, FWO-WFM
Wally McCorkle, FWO-FMS
Dennis McLain, FWO-WFM
Larry McKnight, JCNNM
John Merhege, JCNNM
Pat Nelson, FWO-I2M
Duane Nizio, FWO-SEM
Edward T. Norris, JCNNM
Hugo Ojeda, FWO-DF
Jackie Paris-Chitanvis, PA-DO
Bob Patterson, FWO-S2CM
Phil Pellette, NIS-FM (TA-18)
Emilio Racinez, FWO-UI
Beverly Ramsey, FWO-DO
Keith Rendell, E-D&D
Phil Romero, ESH-5
John Ruminer, ESA-DO
Miguel Salazar, E-D&D
Dina Sassone, ESH-5
Ken Schlindwein, LANSCE-FM
Dan Thomas, P-FM
James Tsiagkouris, NMT-13 (CMR)

Gene Tucker, S-DO
George Vantiem, EM&R
Robert Warling, ESH-5
Diana Webb, ESH-20
Julie S. Wilson, B-FM
Don Winchell, JCNNM
Lisa Woodrow, MST-FM
Deidra Yearwood, NMT-8 (TA-55)
Bill Flor, ESH-10