

**National Nuclear Security Administration**  
**FINAL REPORT**  
**for**  
**Criticality Safety Program Weaknesses Resulting in an Operational**  
**Pause at the Plutonium Facility (PF-4)**

*A Root Cause Analysis of Federal Oversight*



Washington, D.C.  
April 2014

## EXECUTIVE SUMMARY

In June 2013, the Los Alamos National Laboratory (LANL) Director paused operations at the Plutonium Facility (PF-4) at Technical Area 55 (TA-55) to address concerns with weaknesses in the criticality safety programs supporting the programmatic operations in this facility. The National Nuclear Security Administration (NNSA), as the owner and overseer of operations in PF-4, decided to evaluate the actions or inactions that may have contributed to this occurrence. A team of senior subject matter experts and managers in the organization with experience in root cause analysis, event and causal analysis, and accident investigations undertook this task.

Detailed event, causal factor, and barrier analyses were conducted to analyze the timeline of events leading up to this pause. The results of this analysis are detailed in this report. The key root causes identified by the team are as follows:

**There was inadequate recognition on the part of the Field Office that the programmatic criticality safety problems were significant.** For a variety of reasons, Field Office management and staff did not fully understand that the criticality safety issues were serious enough to warrant Department of Energy (DOE)/NNSA involvement and assumed that these issues were being adequately managed by Los Alamos National Security, LLC (LANS), the LANL management and operating (M&O) contractor. This assumption persisted even though there were prevalent indications to the contrary, such as the attrition of criticality safety staff, an increase in the number of criticality safety infractions that were not self-identified, an increase in the backlog of criticality safety evaluations, and several other incidents indicating a fundamental breakdown in work control and conduct of operations. Recognition of the problems evolved somewhat over time, and some Field Office staff eventually attempted to bring attention to the issues. However, the safety culture that existed within NNSA was to allow the contractor to manage the problem with minimal Federal intervention throughout most of the time period addressed during this review.

**There was a lack of a questioning attitude on the part of senior officials at NNSA Headquarters (HQ) regarding the health of LANL's criticality safety program.** Senior officials (both safety and line management) at NNSA HQ were made aware of concerns about the criticality safety and conduct of operations programs at LANL. (In this context, the Federal Criticality Safety Program Manager is considered to be "staff" and not a "senior official.") There were sufficient signals to demonstrate that there were serious concerns. Examples of these include multiple reports from the Criticality Safety Support Group (CSSG) noting problems, letters to LANS from the Field Office expressing concerns, verbiage in annual reports, and e-mails sent by the Federal Criticality Safety Program Manager and other federal criticality safety support staff. The team could find no evidence to indicate that NNSA HQ senior officials questioned the conflicting information to fully understand the concerns. If senior officials at NNSA HQ had exhibited more of a questioning attitude towards these signals that were often mixed and inconsistently communicated through the line, they could have prevented the situation from deteriorating further.

**The structure of the M&O contract and the performance-based incentives contributed to a perception among some personnel that production—not safety—was the most important measure of success.** The LANL contract incentivized and prioritized production, and consequently in some cases, fee for safety performance was not reduced even though there were safety concerns.

A number of contributing causes were also identified. These contributing causes are discussed in detail in the report as well as the team's basis for drawing these conclusions. A listing of these contributing causes follows:

- There was inconsistent communication regarding the significance of criticality safety issues throughout all levels of NNSA: from LANL, to the Field Office, to NNSA HQ.
- The process for correcting weaknesses in criticality safety performance via the fee determining award structure was ineffective.
- There was a prevalent culture of deference to the LANS criticality safety experts, both by LANL and the Field Office.
- Pressure to meet production schedules led to a lack of critical analysis and follow-up on previous commitments by both the Field Office and LANS.
- Senior management in the Field Office perceived that the problems with the LANS criticality safety staff were simply human resource issues and therefore not within the Field Office's purview.
- There was a false perception from some oversight elements that other LANL programs, such as work planning and control and conduct of operations, were adequate to offset weaknesses in the criticality safety program.

The team generated recommendations for consideration by management based on the root and contributing causes that were identified. It is recommended that NNSA HQ line management consider:

- Sharing the results of this investigation in a timely manner across the entire NNSA Enterprise as a means to reinforce the commitment to improve the organization's communication process;
- Re-evaluating the recommendations from the 2013 NNSA Safety Culture Report for common themes (e.g., communication and engagement of staff, management of concerns);
- Developing additional paths to raise emergent issues up the chain of command. (Examples might include an informal safety issues review board as a forum for the peer-to-peer discussion of potential issues);



- Continuing to aggressively pursue improvements in safety culture by improving communication of issues via the most direct and effective channels;
- Recognizing that award fee for mission performance cannot be separated or judged independently of safety performance. Final fee decisions and their bases should be shared broadly to enhance corporate learning;
- Reviewing and clarifying the current safety and program nexus in the organization to ensure balanced priorities in effective decision-making. Reviewing and clarifying safety roles and responsibilities across the organization, as appropriate, to achieve this result;
- Following up on and ensuring the efficacy of closure actions associated with the LANL Performance Improvement Plan for criticality safety;
- Assessing the processes and procedures at the Los Alamos Field Office for tracking, addressing, and closing corrective actions to determine if changes should be made in light of the findings in this report; and
- Conducting an extent-of-condition evaluation to determine if there are other potential safety issues that are developing in the NNSA organization (e.g., at a particular site or sites).

The team is grateful for the opportunity to undertake this task. It is our strong desire that the lessons learned and recommendations included in this report will serve to improve overall operations in the enterprise and to prevent the occurrence of similar events in the future.

While this report serves to identify errors and shortcomings in current processes, it is important to note that these actions were undertaken prior to any accident or serious casualty at the facility. Line management is improving safety culture through activities such as this, addressing trends, taking corrective actions, and learning lessons prior to the advent of significant negative events.

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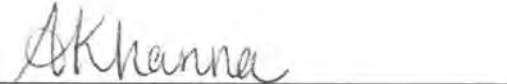
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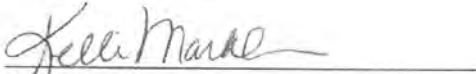
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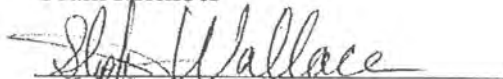
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## **1.0 INTRODUCTION AND BACKGROUND**

In June 2013, the Los Alamos National Laboratory (LANL) Director paused operations in the Plutonium Facility (PF-4) at Technical Area 55 (TA-55). This pause in operations was to address concerns with weaknesses in the criticality safety programs supporting the programmatic operations in this facility. These weaknesses had existed for some time and were the subject of several corrective action plans and performance improvement plans over the course of several years preceding this pause in operations. LANL managing and operating (M&O) contractor Los Alamos National Security, LLC (LANS) has performed root cause analyses and other investigations to determine why corrective actions and formal improvement plans were not effective in eliminating these weaknesses and allowing PF-4 to proceed with needed program operations.

The National Nuclear Security Administration (NNSA), as both the owner and overseer of operations in PF-4, decided to evaluate the actions or inactions that may have contributed to this occurrence. This report documents a Federal review of the root and contributing causes related to the Federal and contractor actions or inactions that contributed to this pause in executing the program mission.

This review was conducted by a team of senior subject matter experts and managers in the organization with experience in root cause analysis, event and causal analysis, and accident investigations. One of the experts was external to the NNSA to add an independent perspective to the report. Biographies of the participants in this analysis can be found in Appendix C of this report. A detailed timeline of events is provided in Section 4. The team used the event and causal analysis method to analyze the data. An event tree and causal analysis diagram is also included in Appendix A. A brief description of this methodology follows to provide context for the results contained in this report.

## **2.0 ANALYSIS PROCESS**

### **2.1. Accident Analysis**

#### **2.1.1. Barrier Analysis**

The root cause analysis team collected data from various sources, including reports, interviews with knowledgeable staff, memoranda, and e-mails. The team used the data collected to develop a basic chronology of events. The team then performed a barrier analysis of the incident using the methodology for accident investigations. The team needed to select the target (the person or item to be protected) and the hazard (what the person or item is to be protected from). Unlike an accident investigation, where the terminal event is generally evident as the point of the injury, fatality, or excursion, the team had to decide the terminal event. In this instance, the team selected as the terminal event the degradation of the criticality safety capability at LANL to the point that it resulted in a shutdown. Therefore, the target was viewed as the health of the criticality safety program and the hazard was the degradation of the program.



The team identified and analyzed six barrier failures:

- Healthy skepticism on the part of the Field Office and NNSA Headquarters (HQ) related to LANS's ability to recognize and address problems with the criticality safety program;
- Open and accurate communications at all levels about the status of the criticality safety program;
- Contract incentives that acted as tools to influence desired changes by the contractor;
- Emphasis on safety in light of production pressure and pressure not to shut down operations;
- Correct recognition of problems in the program and an accurate view of underlying causes; and
- The ability to hold the contractor accountable to address problems when they are identified.

The team's analysis indicated that the failure of barriers significantly degraded the criticality safety program.

### 2.1.2. Event and Causal Factors Chart

The team developed a basic chronology of events and performed a barrier analysis of the incident. The team then assigned results from the root cause and barrier analyses to events on the chronology of events. This involved assigning analysis results as conditions that were related to, or initiated, the events within the chronology.

Assigning these conditions with events resulted in the Events and Causal Factors (ECF) chart in Appendix A. Once conditions were assigned, the team examined the ECF chart to determine which events were significant (i.e., which events played a role in causing the accident). The team then assessed the significant events (and the conditions of each) to determine the causal factors of the accident. The causal factors that resulted were:

**Root Cause (RC)** – causal factors that, if corrected, would prevent recurrence of the same or similar accidents.

**There was inadequate recognition on the part of the Field Office that programmatic criticality safety problems were significant.** For a variety of reasons, Field Office management and staff did not fully understand that the criticality safety issues were serious enough to warrant Department of Energy (DOE)/NNSA involvement and assumed that these issues were being adequately managed by LANS. This assumption persisted even though there were prevalent indications to the contrary, such as the departure of criticality safety staff, an increase in the number of criticality safety infractions that were not self-identified, an increase in the backlog of criticality safety evaluations, and several other incidents indicating a fundamental breakdown in work control and conduct of operations (Conops). Recognition of the problem evolved somewhat over time, and some Field Office staff eventually attempted to bring attention to the issues. However, the safety culture that existed within NNSA was to allow the contractor to manage the problem with minimal Federal intervention throughout most of the time period addressed during this review.



**There was a lack of a questioning attitude on the part of senior officials at NNSA HQ regarding the health of the LANL criticality safety program.** Senior officials (both safety and line management) at NNSA HQ were made aware of concerns about the criticality safety and conduct of operations programs at LANL. (In this context, the Federal Criticality Safety Program Manager is considered to be “staff” and not a “senior official.”) There were sufficient signals to demonstrate that there were serious concerns. Examples of these include multiple reports from the Criticality Safety Support Group (CSSG) noting problems, letters to LANS from the Field Office expressing concerns, verbiage in annual reports, and e-mails sent by the Federal Criticality Safety Program Manager and other federal criticality safety support staff. The team could find no evidence to indicate that NNSA HQ senior officials questioned the conflicting information to fully understand the concerns. If senior officials at NNSA HQ had exhibited more of a questioning attitude towards these signals that were often mixed and inconsistently communicated through the line, they could have prevented the situation from deteriorating further.

**The structure of the contract and performance-based incentives contributed to a perception among some personnel that production—not safety—was the most important measure of success.** The LANL contract was established to incentivize and prioritize production, and consequently in some cases, fee for safety performance was not reduced even though there were safety concerns.

**Contributing Cause (CC)** – event or condition that, collectively with other causes, increased the likelihood or severity of an accident but that, individually, did not cause the accident. The team identified six contributing causes to this accident:

**There was inconsistent communication regarding the significance of criticality safety issues throughout all levels of NNSA: from LANL, to the Field Office, to NNSA Headquarters.** Inconsistent messages were being sent to LANL and to and from NNSA senior management. LANS continued to receive its fee even after significant safety events in which criticality safety control limits were exceeded. In addition, the annual reports that were sent to NNSA senior management from the Field Office continued to use verbiage indicating that the situation was not significant and no dramatic action or intervention was necessary. This situation was exacerbated by changing roles and responsibilities; specifically, in the reporting structure at NNSA Headquarters, numerous changes at the Field Office Manager level, and inconsistent reporting through line management by the Federal Criticality Safety Program Manager, who had been assigned to various line support and staff support positions throughout this time period.

**The process for correcting weaknesses in criticality safety performance via the fee determining award structure was ineffective.** The Field Office recommendation to reduce fee and not award an additional term to the contractor in response to weaknesses in criticality safety performance was not accepted by the Fee Determining Official (FDO); as a result, an opportunity was missed to drive the desired performance. In the December 2012 timeframe, the Field Office concluded that the situation with the criticality safety program had degraded to the point that that it should use the most punitive contractor oversight tool: withholding fee and award term. However, the FDO did not accept that recommendation and approved fee and award term for the contractor. While it is within the FDO’s right to make the final decision

regarding fee and term, this particular decision essentially amounted to NNSA's tacit approval of the contractor's approach in addressing criticality safety issues. In addition, the Field Office lost an opportunity to drive the desired safety performance at a critical juncture. An additional factor in this decision was that the FDO was also the Acting Administrator. Therefore, not only did the Senior Managers and staff at the Field Office perceive that they had lost the ability to effect change through contractual mechanisms, they felt they had lost the support of their senior leader in addressing the problems.

**There was a prevalent culture of deference to the criticality experts at LANL by both the contractor and the Field Office.** This situation led the Field Office to lack a questioning attitude, resulting in inadequate follow-up on issues. As a result, LANS was not held accountable for correcting deficiencies. LANS criticality safety staff were world-renowned experts in criticality safety. There was a belief that the criticality safety staff at LANL had the situation under control, even when there was evidence to the contrary, such as events indicating criticality safety problems and infractions. This culture persisted even after evidence surfaced that there was friction between the operations and criticality safety personnel to the point that operations personnel did not seek criticality safety assistance when necessary. In a related matter, the effort to transition from an expert-based to a standards-based approach to criticality safety did not involve input from the current criticality safety staff, hindering the hiring of additional personnel.

**Pressure to meet production schedules led to a lack of judicious analysis and follow-up on previous commitments by both the Field Office and LANS.** Production pressures drove two significant areas: contract incentives and the reluctance of Field Office staff to follow up on issues that may have delayed production. The Field Office allowed subsequent events to supersede the closure of issues associated with criticality safety. Presumed higher-priority issues (e.g., PF-4 seismic, Los Conchas wildfire, formality of operations, emergency management, fire protection, safety basis) diverted attention from the longer-term corrective actions needed to improve criticality safety functions at PF-4. Many of these deficiencies remain open, as documented by LANL's own internal assessment in 2013.

**Senior management in the Field Office perceived that some of the problems with LANS criticality safety staff were simply human resource issues and therefore not within the purview of the Field Office.** The Field Office discounted the effects of staff attrition and low morale on criticality safety because it accepted LANL's explanation that the problem was not significant or would be resolved by the attrition of seasoned criticality safety experts who held differing safety philosophies. This belief persisted until the situation was so obvious that it could no longer be accepted.

**There was a false perception from some oversight elements that other LANL programs, such as work planning and control and conduct of operations, were adequate to offset weaknesses in the criticality safety program.** Conops was cited by some field personnel as a reason for the lack of concern about the criticality safety program, even after incidents occurred demonstrating weaknesses in the program. Federal oversight did not drive long-term improvement and corrective actions to closure or ensure the timeliness and effectiveness of improvement actions in some cases.



## 3.0 DISCUSSION OF RESULTS

### 3.1 Detailed Analysis of Root Causes

#### 3.1.1 **There was inadequate recognition on the part of the Field Office that the programmatic criticality safety problems were significant.**

For a variety of reasons, Field Office management and staff did not fully understand that the criticality safety issues were serious enough to warrant DOE/NNSA involvement and assumed that these issues were being adequately managed by LANS. This sentiment was expressed in various communications. In a series of annual reports submitted to the Defense Nuclear Facilities Safety Board (DNFSB) throughout this timeframe, NNSA acknowledged that the criticality safety program was understaffed, but verbiage repeatedly indicated that the Field Office did not consider the situation to be serious. For example, the report submitted in 2010 noted that the Los Alamos Site Office (LASO) staff accessed the criticality safety program as understaffed; however, the report also noted that “LASO does not believe any dramatic changes in the current approach are needed.” This conclusion was reached even though the 2009 report also indicated that LANL was understaffed, noting that, “Of the six [NNSA] sites, currently only one, the Los Alamos National Laboratory, is understaffed.”

The assumption that the issues with the criticality safety program were not serious persisted even when there were prevalent indications to the contrary, such as the departure of criticality safety staff, an increase in the number of criticality safety infractions that were not self-identified, an increase in the backlog of criticality safety evaluations, and several other incidents indicating a fundamental breakdown in work control and conduct of operations. Interviews were conducted with staff members and managers at the Field Office who were involved with the criticality program and providing input to the annual reports. Staff indicated that, in making their assessments of the health of the LANL criticality safety program, they gave greater weight to LANS’s plans to hire more staff. This assessment shows that the Field Office continued to have confidence in LANS’s ability to address the problems even though issues with the program continued to manifest themselves in production delays, potential inadequacies in the safety analysis (PISAs), and safety incidents. As noted elsewhere, some Field Office personnel believed that other systems, such as ConOps, were adequate to offset any issues with criticality safety. However, in interviews with the root cause analysis team, Field Office staff members and support staff acknowledged that the Field Office staff did not know the Conops program had significant problems until DNFSB staff witnessed a criticality safety infraction that occurred in the April –May 2013 timeframe in room 429.

A robust hazard recognition program is critical for effective oversight. The ability of the overseeing entity to not only recognize that a hazard exists, but appreciate the magnitude of the hazard, is essential. Even with all the indications that the criticality safety program had significant problems, Field Office management and staff did not identify and recognize the depths of these problems. While the recognition of the problems evolved somewhat over time, and some Field Office staff eventually attempted to bring attention to the issues, the safety culture that existed within NNSA was to allow the contractor to manage the issues with minimal



Federal intervention throughout most of the time period addressed during this review. That approach was exacerbated by the failure on the part of the Field Office to recognize the true state of the program. Had the Field Office management adequately understood the issues, they could have intervened sooner, thereby reducing the severity and longevity of the problems.

### **3.1.2 There was a lack of a questioning attitude on the part of senior officials at NNSA Headquarters regarding the health of the LANL criticality safety program.**

Senior officials (both safety and line management) at NNSA HQ were made aware of concerns about the criticality safety and Conops programs at LANL. The Federal Criticality Safety Program Manager (CSPM) did not have line management responsibility for the oversight of the criticality safety program at LANL, and therefore raised awareness to other senior NNSA HQ officials in the line via e-mail, briefings, and program reviews (In this context, the Federal Criticality Safety Program Manager is considered to be “staff” and not a “senior official.”). The senior officials did not actively pursue resolution of these concerns. There were sufficient signals to demonstrate that there were serious concerns. Examples of these include multiple reports from the Criticality Safety Support Group (CSSG) noting problems, letters to the Lab from the Field Office expressing concerns, verbiage in annual reports, and e-mails sent by the Federal Criticality Safety Program Manager and other federal criticality safety support staff. The team did not identify extensive evidence that HQ line management exhibited a questioning attitude to resolve the conflicting information. Instead, it was evident that a commonly used response was to recommend and conduct another criticality safety review by either the Criticality Safety Support Group (CSSG) or the NNSA Office of the Chief of Defense Nuclear Safety (CDNS). The other senior HQ officials did not follow up on concerns raised by the Federal CSPM and other subject matter experts, instead relying on the Field Office to manage the issue; as a result, the situation further deteriorated. If senior officials at NNSA HQ had exhibited more of a questioning attitude towards these signals that were often mixed and inconsistently communicated through the line, they could have prevented the situation from deteriorating further.

The ongoing criticality safety issues at LANL eventually received the necessary attention and intervention from NNSA HQ as a result of a meeting held on February 25, 2013, between the acting NNSA Administrator, senior NNSA safety officials, and the Federal CSPM. During this meeting, conflicting perspectives were shared on the health of the LANL criticality safety program. As a result, the acting Administrator became actively engaged in addressing LANL’s criticality safety issues. This meeting was fortuitous as it served as the catalyst for bringing about direct and immediate NNSA HQ involvement in addressing the deteriorating criticality safety program at LANL.

Problems with the LANL criticality safety program were identified as a result of multiple criticality safety program (CSP) assessments. In October 2005, the CSSG performed a technical evaluation that identified criticality safety staff shortages and noted that “LANL has an expert-based system that is highly dependent upon the knowledge, experience, and diligence of staff that function largely without benefit of complete documentation or formal processes.” This report also challenged the basis for establishing and accepting the criticality risk of continued

operations. In addition, the 2005 Annual Criticality Safety Report to the DNFSB stated that 5-8 additional criticality safety engineers were needed at LANL.

In October 2006, the CDNS sponsored a focused review of criticality safety at LANL to look at progress made since the October 2005 CSSG review. The CDNS review concluded that, while the criticality safety program was not fully compliant with DOE Orders and ANSI/ANS-8 standards, progress had been made and there was an established, documented, and auditable criticality safety basis. Further, the CDNS team found that sufficient documentation and operational controls existed to permit criticality safety experts to deduce that the risk of a criticality accident for operations ongoing at the time of the CDNS review was acceptably low.

Given the findings and verbiage in these three reports, this could have been an opportunity, in the late 2006 timeframe, for NNSA HQ senior leadership to question these conflicting reports and determine the health of LANL's criticality safety program. The root cause analysis team did not find evidence of such queries by NNSA HQ senior leadership; rather, when assessments showed criticality safety deficiencies, corrective actions were generated to address the findings, followed by additional CSP assessments to look into progress on previous findings. The subsequent assessment identified some progress, albeit deficiencies lingered. Still, the more recent assessment results were those that were accepted, and thus operations continued.

In just over seven years, NNSA line management requested at least seven special assessments:

- October 2005 CSSG review;
- January 2007 CDNS review;
- April 2009 assessment by LASO;
- June 2009 CDNS biennial review;
- January 2011 LANL self-assessment of Area G;
- February 2012 CSSG limited-scope review; and the
- March 2013 CSSG limited review.

The above-average frequency of additional CSP assessments should have raised awareness of underlying, lingering issues. Instead, it seemed as though assessments were used as a tool to evaluate and accept some progress and thus justify "staying the course." This behavior allowed a situation to persist without adequate corrective actions or closure.

There also appeared to be a clear trend by HQ to rely on the Field Office to manage the CSP deficiencies at LANL. In general, allowing those closest to the work to manage their own issues is viewed as a positive trait exhibited by NNSA HQ and the Field Office. However, it appears that both the Field and NNSA HQ relied on those under their purview to manage the safety deficiencies (i.e., LASO relied on LANS to manage the issues, and NNSA HQ relied on LASO). While this management strategy can be particularly effective to allow efficient resolution of issues, a healthy level of operational awareness needs to occur to ensure that overall risk is appropriately managed.

The team observed that some officials at HQ felt that their involvement was not necessary unless they were alerted that LANL needed to be shut down. In addition, there was an admitted



reluctance by all of those interviewed to recommend shutting LANL down, many indicating that the situation had not degraded to that level, or that unintended consequences would arise from a shutdown of operations. There is evidence that the Federal CSPM proposed a strategy to pause higher-risk operations, allowing some other operations to continue. However, this message was not carried forward from field line management and therefore was still not clear enough to gain the attention of NNSA HQ senior officials.

The culpability for the individual deficiencies in LANL's CSP is not solely the responsibility of NNSA HQ, but the lack of questioning attitude allowed a problematic situation to linger, resulting in NNSA accepting risk that was not fully realized. These observations illustrate the need for senior officials at HQ to maintain a questioning attitude and are examples of missed opportunities to address a deficient program where the deficiencies could have had serious safety and health impacts. Had HQ involvement been more prompt and balanced, this situation would not have been likely to linger, and operations that posed the greatest risk could have been appropriately curtailed to mitigate the risk of operating under a deficient criticality safety program.

**3.1.3 The structure of the M&O contract and the performance-based incentives contributed to a perception among some personnel that production—not safety—was the most important measure of success.**

Performance management via the contract underwent numerous changes over the period of time covered by this review. There was a consistent theme throughout, however, that production outputs received significant attention in most all of the incentive structures established by NNSA. While safety matters were addressed, the comparative value was significantly smaller. Due to the more complicated nature of safety performance, as compared to an award for producing a specific number of discrete products, it was more challenging to send a clear message in this area. The details are discussed below.

In 2004, NNSA implemented a change in contract strategy whereby the LANL contract was rebid from the nonprofit University of California (UC) to consortiums of for-profit corporations. One of the intents of this revised contract strategy was to reward the contractor with fee for performing identified activities important to the NNSA. Prior to this reward-type contracting system, NNSA, as LANL's owner and customer, had much less influence on LANL's activities and internal processes. The use of award fee significantly enhanced NNSA's ability to specifically direct LANL activities and processes and to reward LANL for work important to the agency.

The consortium of UC, Bechtel International, Babcock and Wilcox, URS, and support subcontractors was awarded the contract in 2005, under the title of Los Alamos National Security, LLC. The initial contract was to operate LANL for 10 years, with additional years added to the contract based on performance, for up to 20 years. The annual operating budget for LANL was approximately \$2 billion. Potential fee earned by LANS was in the area of \$70 to \$80 million per year, split between a base fee and an earned performance fee. In 2006, only the base fee was paid, since performance objectives had not been developed. Earned fee was further



divided up by LANS, with shares going to each of the parent companies. These companies then paid performance bonuses to senior LANS employees, but not to lower-tiered workers.

The fiscal year 2007 Performance Evaluation Plan (PEP) included 13 specific performance objectives, encompassing 170 specific milestones. The PEP covered the period October 2006 to September 2007. Fixed fee was approximately \$22 million, while incentive fee was projected to be approximately \$51 million. Award term incentives were not included in this PEP. Of the \$51 million of incentive fee, approximately \$7 million was for weapons deliverables, of which almost all was earned. Performance-Based Incentive (PBI) 4.2, entitled *Safety Basis and Criticality Safety*, was included in the PEP to address inadequacies in safety basis and criticality safety. A fee of \$300K was assigned to this task, all of which was awarded.

The 2008 PEP designated 30 percent of the available fee as fixed fee and 70 percent as performance incentive fee. The total fee available for the year was approximately \$73 million, with approximately \$51 million at risk. Performance fee could be earned in 14 target sub-measures and was divided between base and stretch measures, divided (65 percent/35 percent). Of the "at-risk fee," 20 percent was also included as a subjective measure. An award term measure to operate LANL for an additional year was also included, based on the results of the performance in five PBIs (to include weapons work). Twenty percent of the incentive fee was also designated as "subjective" in PBI 15, allowing LASO to measure performance on LANS's overall management of LANL. The weapons PBI was worth approximately \$7.5 million in fee. PBI 7.6, criticality safety performance, was worth \$175K, with the requirement to maintain and accelerate the completion of the Nuclear Criticality Safety (NCS) Program Improvement Plan (PIP), with demonstrated progress toward the out-year milestones. During that evaluation year, the significant criticality safety deficiency with the TA-55 vault was identified which resulted in a pause in operations. However, due to the specific nature of the PBIs, LANS earned full fee in the criticality safety area for fiscal year 2008.

Following the 2009 PEP, specific criticality safety elements were eliminated. This could also be perceived as a reduced emphasis on safety programs as compared to the production requirements levied on LANL. Options remained in the more subjective area to address safety performance, but zeroing in on the criticality safety issues at TA-55 would have been greatly diluted amid the broad set of activities taking place at LANL.

Using the contract structure as a tool for managing contractor performance was difficult for safety matters. Much more clear and effective measures were available to drive production and delivery of specific products; therefore, the incentive process seemed to gravitate toward these production objectives. Even when safety objectives were used, difficulties in defining the objective led to mixed signals related to safety performance being communicated to LANS. The structure of the M&O contract and the performance-based incentives reinforced the perception that production, not safety, was the most important measure of success.

## 3.2 Detailed Analysis of Contributing Causes

### 3.2.1 There was inconsistent communication regarding the significance of criticality safety issues throughout all levels of NNSA: from LANL, to the Field Office, to NNSA HQ.

A key deliverable to NNSA HQ management is the Annual Criticality Safety Report. In a letter dated August 7, 2003, DNFSB closed Recommendation 97-2, *Criticality Safety*, and established an annual reporting requirement. The DNFSB requires that DOE submit the Nuclear Criticality Safety Program (NCSP) report on contractor safety staffing as part of the annual report. Early reports in 2003 and 2004 provided staffing numbers of the Criticality Safety Engineers (CSEs), but did not indicate that there was a staffing shortage. In 2005, LANL identified that it had a staff of eight qualified CSEs, with five to eight additional CSEs needed, thereby declaring that the LANL nuclear safety group was significantly understaffed. In addition, the Executive Summary of the 2005 annual report stated that “the Los Alamos National Laboratory was found to have significant weaknesses in its criticality safety program.”

In 2008, the need for extra staffing continued to be identified; however, that year’s annual report indicated that LANS planned to two additional personnel with at least limited qualifications and experience. The number of new hires was limited by the availability of current staff to support and mentor new hires and the nationwide lack of criticality safety personnel. In 2008, the NCS program engaged criticality safety specialists from Pantex. LASO assessed the program as understaffed to address the emergent issues at the site, but approaching those needed to complete the Criticality Safety Improvement Plan. The report also stated that “LASO does not believe that any dramatic changes in the current approach are needed.” The 2009 annual report stated that “LANL is pursuing internal hiring and has been adding staff slowly. The current increase of staffing is judged to be an appropriate balance between backlog work and training of new staff.”

In 2011, with eight CSEs (including the manager and senior advisor plus two available consultants), LASO assessed the program to be understaffed, but did not provide an indication of significant concern. The 2012 annual report indicated LANL CSE staffing levels as four engineers (two senior), one qualified in another group, and four in training, and remarked that “Staff losses were catastrophic but do not appear market driven.” Although the staffing losses were discussed, the report did not indicate any significant concern other than “inadequate to support mission.” The annual reports discussed above seemed to indicate that the situation was not significant and that no major actions were necessary by NNSA.

Communications from the Federal CSPM had a different tone. The Federal CSPM sent several e-mails to NNSA HQ senior officials indicating that there was a staffing problem at LANL that could result in potentially serious criticality incidents. In June 2012 and again on October 17, 2012, the Federal CSPM voiced his concerns to senior HQ managers about the perilous staffing situation that LANL was in regarding NCS. The October communication was entitled “A Criticality Train Wreck Coming at LANL.” At that point, there was indication that the last two qualified CSEs were leaving. The Federal CSPM expressed concern that the criticality safety program at LANL would collapse and become nonfunctional, identifying staffing as a leading



indicator of potentially serious, high-visibility criticality events that would show up in the coming year.

Similar communications occurred in November 2012 where the Federal CSPM, by e-mail, stated to senior HQ leaders that it had been eight months since the CSSG review of selected elements of the LANL NCS Program in February 2012. One of the findings in the CSSG review was that a major exodus of criticality safety engineering staff was about to happen that would cripple the program. In sharp contrast to the noncommittal language in the annual reports, the e-mail from the Federal CSPM recommended that NNSA issue a show-cause letter to LANS requiring it to justify how it could continue managing nuclear operations safely while re-establishing an adequate criticality safety staff.

The LASO criticality safety subject matter expert (SME) communicated on several occasions to his management that LANS had not aggressively pursued correction of significant criticality safety program issues resulting from the loss of staff and provided other indicators that he had concerns with LANS's management of the program, such as:

- The LANL integrated assessment schedule did not include a single assessment of the criticality safety program for fiscal year 2013. This was an indicator that LANS was not actively managing the program, as it was specifically mentioned in the CSSG assessment findings.
- The corrective action plan for the CSSG assessment was not tasked until just before the due date (30 days). An extension to the due date was requested and approved (another 30 days); that final due date was September 14, 2012, and had not been met at the time of the SME's communication.

The communication from the Site Office Manager (SOM) in October 2012 to the Federal CSPM stated that LASO felt that LANS had a Green program in implementation, operator awareness, management awareness, reporting, and was making effort to correct the staffing issue. LASO stated that it had added several oversight items to watch the weak areas. LANS had four pending hires at the time, and LASO perceived this was an elevated risk program that still had the ability to recover. The SOM stated that "...we don't see a stop work point yet. So let's give it about 4 weeks and see if the hires come through and several of the yellow/red factors have their trends reversed". NNSA HQ continued to hear from LASO that the situation was being managed and that the risks were low.

During the 2008-2012 timeframe, the LANL Dashboard Briefing Book was "Green" for criticality safety. This led LANS, the Field Office, and NNSA HQ to believe that there were no immediate concerns with the criticality safety program at LANL. In October 2012, the LASO criticality safety SME suggested to Field Office management that there was an indication that the metrics used to track NCS Program performance were inadequate to identify significant reductions in group resources. In November 2012, the metrics were changed to "Yellow."

At the end of the 2012 fiscal year, the Field Office recommended a significant reduction in the monetary fee awarded to LANS. In addition, it also recommended that term be withheld. The



weaknesses in the criticality safety program were a major contributor to this recommendation. This message was in stark contrast to the previous communications that had occurred from the Field Office to HQ, and this further added to the inconsistent communication that had occurred between the NNSA leaders. The FDO did not accept the recommendation provided by the Field Office and awarded term to LANS in addition to an increase in monetary fee. As a result, LANS received mixed messages from the Field Office and NNSA HQ.

This situation was exacerbated by the changing roles and responsibilities, specifically in the reporting structure at NNSA Headquarters, numerous changes at the Field Office Manager level, and inconsistent reporting through line management by the Federal CSPM (also serving as the head of the CSSG). The Federal CSPM had been assigned to various line support and staff support positions throughout this time period. Had the message from the Field Office not been diluted by transmission through non-line channels, and been more consistent with the messages that had been communicated by the Federal CSPM, senior officials at NNSA HQ would have had a clearer understanding of the situation.

### **3.2.2 The process for correcting weaknesses in criticality safety performance via the fee determining award structure was ineffective.**

At the close of the 2012 contract evaluation year for LANL, the Field Office had come to the realization that the actions taken to date had not been effective in resolving the deficiencies in the LANL criticality safety program. The Field Office chose to use one of the most powerful tools available via the contract: a reduction in the monetary fee awarded for the year. More significantly, the Field Office recommended that award term be withheld. This would reduce the overall contract period of performance awarded to LANS and constituted a significant, negative reflection on LANS' performance. The systemic weakness in the criticality safety program was one of the major contributors to this recommendation.

The Field Office sent these recommendations forward believing that an accurate assessment of LANS's weak performance was appropriately reflected. Interview with line personnel indicated that they felt this was a strong, necessary message that had the potential to get the appropriate attention of LANL line management to focus on correcting the continuing weaknesses.

The FDO made the decision to restore the award term to LANS and increase the monetary fee. While it was within the purview of the FDO to make the final decision, a significant opportunity was missed to drive the desired performance. This particular decision essentially amounted to NNSA's tacit approval of LANS's approach in addressing criticality safety issues. An additional contributor to this decision could have been a lack of full awareness of the criticality safety deficiencies at the FDO level due to the communications weaknesses identified elsewhere in this report. Another factor in this decision was that the FDO was also the acting NNSA Administrator. Therefore, not only did the senior managers and staff at the Field Office perceive that they had lost the ability to effect change through contractual mechanisms, they felt they had lost the support of their senior leader in addressing the problems.

The Field Office, in effect, lost an effective tool to drive safety performance. The basis for the decision was not communicated back to the Field Office other than the statement that this

decision was in the best interests of NNSA. The Field Office lost leverage in influencing LANS to take the significant actions needed to arrest the decline in the criticality safety program.

LANS concluded that its approach to issues, including criticality safety concerns, had NNSA's tacit approval. The significant actions needed were not taken. Shortly thereafter, the last senior CSE left LANL for other employment.

The general response during interviews with line managers at the Field Office indicated disappointment in the decision that their rationale was not accepted. Had a more detailed basis for the decision been communicated, the Field Office may still have had some leverage to influence LANS in this area.

### **3.2.3 There was a prevalent culture of deference to the criticality experts at LANL, by both LANS and the Field Office.**

Two events occurred that changed NNSA's and LANS's criticality safety culture. With the loss of production and the subsequent closure of Rocky Flats starting in 1989, there was no longer a capability to mass-produce weapons components. PF-4, although built for research, had the capacity to fill this role on a limited basis. The NNSA weapons program worked with LANL to implement the capability to produce various replacement components on a greater-than-research scale. Research facilities were converted to production facilities. As this process progressed, work that was skills- or expert-based—to include the criticality safety program—was replaced by documented procedures.

In October 2005, the CSSG completed a criticality safety program assessment at LANL. The report, *Technical Evaluation of the Los Alamos National Laboratory Nuclear Criticality Safety Program*, stated that LANL criticality safety programs were expert-based and undocumented, and that, although no unsafe operations were observed, the program was not compliant with ANSI/ANS 8.1 requirements.

LANL responded to the CSSG report with the submittal entitled *Los Alamos National Laboratory Nuclear Criticality Safety Program Improvement Plan (PIP)*. In October 2006, the CDNS completed a follow up criticality safety review at PF-4. The CDNS team concluded that LANL's criticality safety basis was auditable and documented and that the chances for a criticality accident were acceptably low, but noted that the program still did not comply with ANSI/ANS 8 standards and appeared to be primarily implemented on an expert-based level.

Also in 2006, NNSA explored two new interrelated initiatives: Governance and the Contractor Assurance System (CAS). Requirements for the CAS were included in the initial NNSA/LANS contract. CAS requirements were included in the NNSA Policy Letter NAP-21, *Transformational Governance and Oversight*, which formally documented the NNSA's position in February 2011, and was applicable to all sites. Tenets of the policy at the Field Office level included the completion of scheduled assessments across all aspects of contractor operations, with specific oversight on operations using a risk-based, graded approach. Floor oversight was performed by Facility Representatives in the nuclear and high-hazard facilities with support from LASO safety SMEs. LASO Plan 00.14, *Integrated Management System Description including*



*Functions, Responsibilities and Authorities (FRA)*, carried forward this approach through specific Site Office implementing procedures covering DOE P 226.1 requirements.

Between 2007 and 2009, LASO monitored criticality safety-related PIP closure progress, primarily through the newly assigned criticality safety SME. In 2007 and 2008, fee was awarded for progress. Following the discovery of criticality safety issues in the PF-4 vaults, no fee was awarded in 2009. Follow-up versions of the PIP attempted to address identified criticality safety issues, but also extended the issue closure schedules and strained LANS's criticality safety staff. In the years 2010 to 2013, no specific criticality safety PBIs were included in the PEPs. Governance and the CAS, whereby, the contractor would police itself, reduced the need for NNSA oversight. Management direction to the NNSA oversight staff was "Eyes on, hands off."

In fiscal year 2010, 23 criticality safety infractions were reported at PF-4. In August 2011, an operator in PF-4 was observed violating three criticality safety limits. LANS had slipped the criticality safety PIP milestones at least three times. Given the results of the previous events and reports, on September 16, 2011, the LASO Assistant Manager for Safety Operations directed LANS to review the criticality safety margins for various PF-4 operations. This letter was followed by a letter to the LANL Director from the SOM questioning PF-4 criticality safety, Conops, and configuration management. The letter questioned LANL's CAS and nuclear safety culture. On March 19, 2013, due to insufficient criticality safety staffing, the Field Office directed LANS to stand down criticality safety evaluations for operations at PF-4, unless specifically released by the Field Office, resulting in the potential stoppage of fissile material operations. In June 2013, LANL ceased all fissile material operations in PF-4.

From December 2005 to February 2013, there was a continuous cycle of assessments, corrective action plans, plan extensions, and contract direction. Although documented progress has been made, key issues remained unresolved. Criticality infractions still occurred, conduct of operations issues remained, and configuration management was still an issue. Roles and responsibilities issues were consistently identified, as were issues with management interaction. This situation led the Field Office to lack a questioning attitude, resulting in inadequate follow-up on issues. As a result, LANS was not held accountable for correcting deficiencies. There was a sense that the LANL criticality safety staff had the situation under control, even when there was evidence to the contrary, such as events indicating criticality safety problems and additional delays closing out the criticality safety PIP. Only after operations at PF-4 were suspended in June 2013 were these issues actually being addressed and corrected.

#### **3.2.4 Pressure to meet production schedules led to a lack of judicious analysis and follow-up on previous commitments by both the Field Office and LANS.**

In 2004, the NNSA implemented a change in contract strategy at Los Alamos, whereby the Los Alamos National Laboratory (LANL) contract was re-competed and opened up from the non-profit University of California (UC) to for profit corporations. The use of award fee significantly enhanced NNSA's ability to specifically direct Laboratory activities and processes, rewarding the Lab for specific work important to the agency. In early 2005, a consortium of UC, Bechtel International, Babcock and Wilcox, URS, and other specialty subcontractors was awarded the contract, under the title of Los Alamos National Security, LLC (LANS). The initial contract was

to operate LANL for 10 years, with an additional 10 years added to the contract based on performance. Fee earned by the LANS was in the area of \$60 - \$80 million per year, split between a base fee and an earned performance fee. Fee was further divided up by LANS, with shares going to each of the partners. These companies then paid performance bonuses to senior LANS employees, but generally not to lower tiered managers or employees. LANS took over operations of LANL in June, 2006.

Under the revised contracting approach, LANS was able to earn fee of \$452 million out of \$579 million available over the past eight years. In addition to earned fee, an award term provision, initiated in 2008, could earn LANS up to 10 additional years onto the initial 10-year contract.

The majority of the earned fee was in the areas of Weapons Program; Threat Reduction; Multi-Site Complex Integration; Infrastructure Management; and Science, Technology, and Engineering; predominantly LANL strengths. Primary fee work at PF-4 included pit production, plutonium stabilization, mixed oxide processing, uranium packaging, and plutonium-238 packaging and production.

Fee was lost in areas of overall LANL operational management, health and safety, quality assurance, and construction management, traditionally LANL weaknesses.

Award term, although variable during the first seven years of the contract, was primarily based on a combination of Weapons Program; Threat Reduction; Multi-Site Complex Integration; Project Management; Operations; and Science, Technology, and Engineering.

Besides pressure to produce to meet incentives, LANS also had to manage changes among presumed higher-priority issues. Following the 2005 CSSG criticality assessment, which required significant revisions and enhancements to the PF-4 criticality safety program, the DNFSB issued Recommendation 2008-1, *Safety Classification of Fire Protection Systems*, which recommended that fire protection systems in nuclear facilities be upgraded to safety-class, requiring higher levels of maintenance, surveillance, and operability determinations. In October 2009, following lengthy discussions with LASO, LANL, and the DNFSB, the DNFSB issued Recommendation 2009-2, *Los Alamos National Laboratory Plutonium Facility Seismic Safety*, to address PF-4 seismic stability and subsequent fire-related issues. Analyzing, responding to, and implementing corrective actions for these two DNFSB recommendations drew valuable resources away from the criticality safety issues for both LANL and LASO.

In June 2011, the Las Conchas wildland fire threatened LANL property and the town of Los Alamos. Following on the heels of Cerro Grande Fire in May 2000, the Las Conchas wildland fire burned over 155,000 acres. A new perspective on wildland fire and emergency response was initiated. The follow-up response to this event provided another requirement for resources and was a further distraction for LANL and LASO.

In 2012, a major radiological contamination event occurred at the Los Alamos Neutron Science Center (LANSCE). After a lengthy accident investigation, it was determined that poor Conops and radiological safety processes contributed to the event.



Criticality Safety Staff was further stressed with criticality safety issues related to the move of the Criticality Experiments Facility (CEF) to the Nevada Nuclear Security Site, and other criticality safety concerns involving operations at TA-35, the SIGMA project, CMR, Area G, and NISC.

The response to these major issues, along with continuing problems related to safety basis and formality of operations (Conops, nuclear maintenance, engineering, configuration management and training and qualification), relegated criticality safety to just another safety management program, such that it no longer had specific PBIs in the PEPs. There were no CS-specific PBIs after 2009. CS was a subset under the Conops and nuclear safety PBIs, also showing up in the subjective PBI section.

In the end, priority, management attention, staff attention, and incentives were diverted from ensuring that the longer-term actions needed to improve criticality safety functions at PF-4 were completed.

Although LASO has had an assigned criticality safety SME since 2007, he has since been assigned additional duties such as the primary NA-LA oversight of the LANL training and qualification program and is the Field Office DNFSB point of contact.

**3.2.5 Senior management in the Field Office perceived that the problems with the LANL criticality safety staff were simply human resource issues and therefore not within the purview of the Field Office.**

As a result, the safety effects of staff attrition and low morale were discounted, as the Field Office accepted LANL's explanation that the problem was not significant. The CSSG determined that there were concerns with the criticality safety staff and that the organization was in danger of losing much-needed expertise and would be unable to replace it. The CSSG felt that this situation was a significant risk to safety and proposed solutions designed to retain staff and avoid a shutdown of operations. The solutions proposed by the CSSG included providing bonuses and reorganizing the criticality safety group. Senior managers at the Field Office stated that they believed the problems within the criticality safety staff to be human resources problems and therefore not within the Field Office's purview. However, this view confused the effects of the problems with the solutions proposed and resulted in a passive approach to staff attrition. While the solutions proposed had elements of human resources—such as bonuses—the very real risks posed by the loss of criticality safety expertise was not a human resources issue. The ultimate potential consequence was not low staff morale; rather, it was the loss of criticality safety expertise. By viewing the problem through the lens of a human resource issue rather than the solutions proposed, the Field Office misdiagnosed the risks and delayed intervening in any significant way.

**3.2.6 There was a false perception from some oversight elements that other LANL programs, such as work planning and control and Conops, were adequate to offset weaknesses in the criticality safety program.**

NNSA conducted a review of the LANL criticality safety program in October 2005. The report, entitled *Technical Evaluation of the Los Alamos National Laboratory Nuclear Criticality Safety Program*, identified 3 safety recommendations, 14 findings, 16 recommendations, 13 opportunities for improvement, and 2 noteworthy practices. In response, LANL submitted an NCS PIP. Revision 1 of the PIP was submitted to NNSA for approval in August 2006, and Revision 2 in March 2008. Revision 2 was as a result of the Augmented Limited Review (ALR) that was performed due to a PISA and resulting positive unreviewed safety question, which identified inadequacies in two separate nuclear criticality safety evaluations for storage of fissile materials in the plutonium storage vault in TA-55.

Revisions to the PIP continued to occur; however, criticality safety infractions continued to occur at LANL. In January 2007, the CDNS conducted a review of the CSP. This review concluded that while the CSP was not fully compliant with DOE Orders and ANSI/ANS-8 standards, progress had been made, and that LANL had established a documented, auditable criticality safety basis. Further, the CDNS team found that sufficient documentation and operational controls existed to permit criticality safety experts to deduce that the risk of a criticality accident for operations ongoing at the time of the CDNS review was acceptably low.

On September 16, 2011 a memorandum was issued to the LANL Principal Associate Director of Operations. Attachment 1 to the memorandum, *Status of Plutonium Facility Criticality Safety and Conduct of Operations*, stated that in fiscal year 2010, LANS self-identified 23 criticality safety infractions at PF-4, nearly all of which were due to incompletely implemented conduct of operations. On August 11, 2011, a major criticality infraction occurred where three limits were violated, which was a major indicator that conduct of operations was of concern. One operator violated two interaction controls and created an overmass condition that was recognized by a second operator. However, the second operator incorrectly advised the first operator to restore the material to its initial configuration ("Photo-op Incident").

Although the above mentioned document stated that LANL had significant weaknesses in its Conops program and that NNSA was concerned, interviews with key Federal criticality safety personnel indicated that, as a result of the ALR extent of condition reviews that were conducted, LANL had a sufficient Conops program in place that would not tax the limited resources of the safety analysts. The interviewees indicated that although incidents continued to be discovered and the situation may not have been good, it was not dire enough to result in a pause. The Federal technical staff believed that even if all of the LANS criticality safety staff left LANL and the facility had a good safety basis, operations could continue for a period of time. One interviewee also mentioned that he didn't think there was "imminent danger," as the entire community was discussing this concern weekly. Had he felt that the situation was serious, he would not have hesitated to raise that concern to management.

Conops was continually cited as a reason for the apparent lack of concern about the criticality safety program, even after incidents occurred demonstrating weaknesses in these programs. Had the Federal oversight been more proactive in driving long-term improvement and corrective actions to closure and disregarding the false perception that good conduct of operations could sustain the CSP, there could have been an entirely different result, with LANL taking timely improvement actions.



#### 4.0 EVENTS TIMELINE

Year	LASO Leadership	Event or E-mail
2005	Ed Wilmot (from 2004 to Jan 2007)	LANL TA-55 SST ORR – Identified no LASO CS SME/program manager. Support from HQ and Albuquerque.
		New LANL Nuclear Criticality Safety Group Leader (GL-1)
		Move National Criticality Experiments Research Center from LANL TA-18 to NTS DAF.
		October 2005 - NNSA Technical Evaluation of the Los Alamos National Laboratory Nuclear Criticality Safety Program – assessment performed. (Primarily TA-55, TA-18, and CMR)
2006		December 8, 2005 - Above report transmitted from NNSA HQ to LASO. Three safety recommendations, 14 findings, 16 recommendations, 13 OFIs (Major issue – expert-based vs standards-based, lack of formality and documentation). CAP required in 3 months for LASO approval.
		2006 LANL NCS PIP, Rev.0 submitted to LASO for approval.
		2006 – Annual Crit Safety report notes five open positions and that staff will be trained to an equivalent or better overall context
		December 11, 2006, LANL NCS PIP, Rev. 1 (SB-CS-06-147) submitted to LASO.
2007	Dan Glenn, Acting Feb-Jul 2007	January 2007, NNSA Criticality Review at LANL by CDNS.
		April 1, 2007, LASO CS SME/Program Manager selected and assigned.
	Don Winchell (Jul 2007- 2010)	September 24, 2007, Transmittal from LANL PISA of the CSE in the PF-4 Vault.  (b)(3)
		October 18, 2007, Letter LASO to LANL (SBT/5485.3/PR:07-013), Direction to Provide Evaluation of the Safety of the Situation and Describe the Plan to Resolve the PF-4 Vault Criticality Safety Issue (directed ESS be completed by October 22, 2007).
		October 30, 2007, LANL Transmittal of ALR plan and release policy for TA-55 to LASO (ADNHHO 07-281.) ADNHHO 07-281-Transmittal of ALR and Operational Release
		November 19, 2007, AD-NHHO 07-286 - Transmittal of Justification for Continued Operation
		November 23, 2007, TA-54 Area G LASO FR identifies CS issues with drum storage. Discovery of drums potentially exceeding the TA-54 Area G criticality limit
		December 13, 2007, AD-NHHO 07-318-Transmittal of Justification for Continued Operation
		December 20, 2007, LASO transmittal 5485.3/SBT:4PR:07-00 "Approval of Justification for Continued Operation to Remove the Criticality Safety Operational Restrictions  (b)(3)
		SBT.5485.3.5PR.07-013 Direction to Provide an Evaluation of the Safety of the Situation and Describe
2008	Don Winchell (Jul 2007- 2010)	April 9, 2008, LANL NCS PIP Rev. 2, transmittal to LASO for approval. (Phase I complete) includes ALR. AD-NHHO 08-038-Nuclear Criticality Safety Program Improvement Plan NCS PIP.
		April 17, 2008 – NCS PIP for 2008, NNSA approval of LANL NCS PIP Rev. 2. SET/ 4PM-002 NCS PIP for FY 2008.

		May 12, 2008- T.C. Short-Announcement of a Quality Audit of Criticality Experiments Facility CEF – Planet
		Quality Audit Report: Audit of CEF Planet and Flat-Top Criticality Machines Prior to Delivery
		May 29, 2008, LANL (AD-NHHO:08- 129) transmits TA55-JCO-07-002 Revision 4 requesting removal of operational restrictions for Rooms B and I of the PF-4 vault after reconfiguration to meet the controls in the new Criticality Safety Evaluations. AD-NHHO:08-129 Request to Remove Criticality Safety Operational Restrictions
		June 24, 2008, LANL (AS-NHHO 08-147) transmits revised JCO Rev 4.1 to LASO. AD-NHHO:08-147 Request to Remove Criticality Safety Operational Restrictions
		July 3, 2008, SET: 4PM-72037: Approval of Revision to Justification for Continued Operation to Remove Criticality Safety Operational Restrictions for Rooms B and I of the Plutonium Facility 4 Vault
		August 21, 2008, LASO FR reports Crit Safety Limits Exceeded in Glovebox at TA-55 (55-DC-08-24F).
		September 4, 2008, LASO Transmittal of Finding (55-DC-08-24F) in TA-55, PF-4, Room 319.
		September 17, 2008, Letter, Moss to McQuinn, Feedback on CS ALR at TA-55. SO:14PM-002 Submittal of the NNSA Criticality Safety Review
		November 17, 2008, Bonita Eichorst-Criticality Experiments Facility CEF Project
		October 17, 2008, PBI 7.6.1, FY08 PBI Completion Documentation, Criticality Safety Improvement
		October 28, 2008, PBI 7.6.1, FY08 PBI CSI completion certification, all actions closed, Award \$175,000.
		November 18, 2008, QA-IA 08-102-Quality Audit Report Audit of Criticality Experiments Facility CEF
		December 18, 2008, SAFE-1 08-025-CLASSIFICATION ISSUES REGARDING CRITICALITY LIMIT POSTINGS AT TA-55
2009	Don Winchell (Jul 2007- 2010)	March 13, 2009, LANL Transmittal to NCS PIP Rev. 3 to LASO for approval. AD-NHHO 09-082-Nuclear Criticality Safety Program Improvement Plan NCS PIP
		April 6-9, 2009, LASO NCS Assessment at LANL.
		June 10, 2009, FOD-CMR 09-019-Status of the Nuclear Criticality Safety Program at CMR
		June 24, 2009, PCM 08-346 Completion Package for PBI 7.6.1 Criticality Safety Improvement
		No date (2009), Letter from LASO to LANL Approval of NCS PIP for 2009, appears to be resubmittal for rev. 2. 4 COAs.
		July 29, 2009, FO/SET:19FB-125052: Safety System Oversight Assessment Plan – TA-55 Plutonium Facility Criticality
		August 3, 2009, Transmittal to Nuclear Criticality Safety Assessment of the Los Alamos National Laboratory conducted April 6 - 9, 2009.
		September 11, 2009, Report from June 2009 CDNS review of LASO.
		September 30, 2009, Transmittal of SD-130, R.0 to LASO for approval. Submission of System Description (SD) 130, Nuclear Criticality Safety Program.
		October 6, 2009, PBI 7.5.1. Criticality Safety Improvement Completion Document. – No fee awarded (\$100k).
		October 13, 2009, Transmittal, LASO approval of SD-130. No comments.



		October 28, 2009, Transmittal PCM 09-327 PBI 7.5.1 Criticality Safety Improvement
		November 17, 2009, Transmittal of the Criticality Safety Evaluation for the Temporary U (19.9) Fuel Plate Fabrication
		November 18, 2009, Approval of the Criticality Safety Evaluation for the Temporary U(19.9) Fuel Plate Fabrication.
		November 25, 2009, Safety System Oversight Assessment – PF-4 Criticality Alarm System.
		December 17, 2009, LASO VSSA of the TA-55 Criticality Alarm System
2010	Kevin Smith (Aug 2010 – Dec 2012)	"Eyes on hands off policy" instituted at NNSA
		January 2010, NCS PIP rev 4
		January 19, 2010, Annual crit safety report characterizing LANL CS staff as "understaffed"
		February 9, 2010, Annual report stated that additional staff is necessary
		February 2010, NCS PIP rev 5
		August 10, 2010, Assessment on Criticality Safety Staff Responsibilities and Emergency Response
		August 30, 2010, Approval of SD-130, "Nuclear Criticality Program", Revision 0.
		September 17, 2010, AD-NHHO:10-270 New and Updated SIGMA Facility Complex and BTF Criticality Safety Evaluations
		September 21, 2010, SO:21PM-284532, Concurrence with the New and Updated SIGMA Facility Complex and BTF Criticality Safety.
2011	Kevin Smith (Aug 2010 – Dec 2012)	January 19, 2011, FO:26CK-316344 Area G – Criticality Safety Program Implementation; ltr from LASO to LANL Area G crit safety
		January 26, 2011, AD-NHHO:11-028, Instructions to Perform Criticality Safety Program Assessment of Area-G; (LANL to LASO Area G crit safety assessment)
		February 1, 2011, AD-NHHO:11-033 NCS PIP for FY 2011
		February 4, 2011, FO:26CK-320854 Area G – Due Date Extension for Criticality Safety Program Review
		February 16, 2011, Nuclear Criticality Safety Assessment for TA-54, Area G
		February 18, 2011, AD-NHHO:11-053 Submittal of corrected Criticality Safety Effectiveness Evaluation Guidance checklist
		February 23, 2011, AD-NHHO:11-060 Area G - Criticality Safety Program Implementation
		Approved 4 new positions
		March 8, 2011, AD-NHHO:11-072;; Nuclear Criticality Safety Program Improvement Plan (NCS PIP) for FY11.
		March 29, 2011, SO:21PM-333659, Nuclear Criticality Safety Program Improvement Plan (NCS PIP) for FY11.
		May 16, 2011, ACTION: Criticality Experiments Facility (CEF) Project, Line Item 04-D-128, at the Nevada National Security Site
		June 2011, CSSG assessment at TA-55
		September 16, 2011, PF-4 Criticality Safety Program
		October 3, 2011, Transmittal of report - LA-UR-11-05363 Nuclear Criticality Safety Committee June 2011 Assessment of TA-55
		December 12, 2011, SO:26CK-405257 Plutonium Facility (PF-4) Criticality Safety Program
2012	Kevin Smith (Aug 2010 – Dec 2012)	E-MAIL: Jan 2012, "PF4 JCO"; LASO Manager asks LANL Mgr if there is a shortage of criticality safety staff. LANL Mgr admits to a shortage of criticality resources but that they are working through mitigation actions"

	LASO Mgr: "I will hold off engaging since you have it in work."
	NCERC at DAF (distractor)
	January 25, 2012, SO:26PM-413580 Coordination of Criticality Safety Program at the Nevada National Security Site
	February 1, 2012, AD-NHHO-12-025 Response to Criticality Safety Implementation issues at STO.
	February 28, 2012, Submittal of DOE Annual Report on Nuclear Criticality Safety for FY 2011
	Mar – Jul 2012, SIGMA crit issues (distractor)
	Mar 1, 2012 Outbrief of CSSG review to LANS
	E-MAIL: Mar 6-7, 2012, "Friday Meeting with [Deputy Lab Director]"; attachment described situation and urgency to be transmitted to the Deputy LD.
	March 6, 2012, Conduct a Federal Readiness Assessment for Processing of Hazard Category 3 FRP's at the Area G, 412 Bldg.
	March 8, 2012, SO:26JR-423683 Plutonium Facility - Approval of Evaluation of the Safety of the Situation TA55-ESS-1.
	March 8, 2012, AD-NHHO:12-057; Revised Schedule to LASO on Criticality Safety Programmatic Improvement Plan
	March 23, 2012, SO:26PM-427294 Approval of the Recovery Plan for Criticality Issue at SIGMA (TA-3, SM-66)
	March 23, 2012, AD-NHHO:12-081; Request for LASO Approval of Recovery Plan for the Criticality Safety Infraction
	March 29, 2012, AD-NHHO:12-091; Request for LASO Approval of Recovery Plan for the Criticality Safety Infraction.
	April 2, 2012, SO:26PM-429712 Approval of the Recovery Plan for Criticality Safety Infraction at SIGMA (TA-3, SM-66)
	April 9, 2012, TA-55 VSSA - report and field work were done well. Management review and approval was unacceptable.
	May 1, 2012, SO:26CK-436183 Transmittal of the Criticality Safety Support Group Assessment
	E-MAIL: June 12, 2012, "[Federal CSPM] agenda???" regarding confusion over upcoming visit and lack of coordination with ops office.
	E-MAIL: June 14, 2012, "Any News?" Federal CSPM Manager "sounded the alarms" to other Senior NNSA officials at HQ; possibility of 0 seniors; "Sr Mgmt finally paying attention, wish had been 3 mo before"
	E-MAIL: June 14, 2012, "LANL Crti [ <i>sic</i> ] Safety Staffing" e-mail to the CDNS from LASO Manager which stated that LASO was handling things but "without a smoking gun deficiency or clear data that their folks are not cutting it, [they are] reluctant to get directly into [LANL's] personnel issues."
	E-MAIL: June 18, 2012, "After Action Report" Federal CSPM e-mailed LASO Deputy Manager regarding recommendations to fix staffing
	July 2012, TA-35 B27 Fuel Rod criticality safety evaluation
	E-MAIL: Oct 17, 2012, "Status of LANL NCS" discussion about the last 2 senior engineers leaving between the Senior Criticality Safety Program Manager and the LASO Mgr, asked about the state of the group and corrective actions; LASO Mgr provided status [see e-mail Oct 23 for follow on]



	<p>E-MAIL: Oct 17, 2012, 2:03 PM – “Criticality Train Wreck Coming at LANL” from Federal CSPM to Line Management Senior Official at HQ; last 2 qualified NCS staff are leaving, serious concerns about a collapsing non-functional CSP</p>
	<p>E-MAIL: Oct 23-24, 2012, “Status of LANL NCS” LASO Mgr to Federal CSPM - CSP now a 'yellow' program due to throughput issues, quality and trends, etc.; LASO thinks it's a 'green' program in the making, have 4 pending hires, but will need to be trained; added several LASO oversight items, give it about 4 more weeks to see if hires go through and whether trends are reversing; Federal CSPM provided additional suggestions for oversight</p>
	<p>Oct 28, 2012, Last senior qualified CS engineer departs LANL</p>
	<p>E-MAIL: Oct 29-31, 2012, “Moving on”; LASO crit safety SME notified the Federal CSPM that the last senior crit engineer was leaving LANL; LASO mgmt reluctant to suspend ops since “we’re still good on the floor and don’t want to break the system by standing down;” LASO Mgr is active in pushing for enhanced oversight to drive awareness; overdue CAP so not sure how LANS is managing situation; detailed FR oversight efforts; Federal CSPM provided suggestions</p>
	<p>E-MAIL: Oct 31, 2012 “Moving on” between Federal CSPM and other senior NNSA HQ officials; Federal CSPM “exceedingly concerned;” others indicated that there have been reports on the crisis in staffing at LANL for a while but can see that the situation has gotten worse; asks for ideas of the root cause; Federal CSPM indicated they were documented in the Feb 2012 CSSG review, i.e., LANS senior management inattention, lack of involvement, and still in denial; still no CAP</p>
	<p>E-MAIL: Oct 31, 2012 6:28 PM, “LANL NCS” Federal CSPM alerted a senior NNSA line manager that one remaining junior CSE is leaving, NSC program is insolvent, recommend “show-cause” letter; indicated LANL had findings for 8 months and still no CAP</p>
	<p>E-MAIL: Nov 1, 2012 11:25 AM, “Moving on – LANL NCS” Federal CSPM passes on Oct 31, 2012 e-mail to LASO Manager and Deputy Manager and senior NNSA line manager and where he remains “exceedingly concerned” and questions how LANS can fulfill 830 and ANSI/ANS-8 requirements/responsibilities with two marginally qualified staff members (should be 10-15); gave predictions on how scenario could play out based on lessons learned.</p>
	<p>E-MAIL: Nov 1, 2012 12:39 PM, “CTA talking points on LANL NCS situation” Federal CSPM alerts senior NNSA line manager that all senior CSEs have left and only two CSEs remain; not meeting ANSI/ANS-8.19 requirements for ‘Mgmt Responsibilities’; recommend issue LANS ‘show cause’ letter to justify continued ops; attached CSSG outbrief slides, 8 mo since outbrief, no CAP still from LANS</p>
	<p>E-MAIL: Nov 6, 2012, “Crit Safety Executive Risk Management Item” LASO Manager notifies senior NNSA line manager and Federal CSPM that LANS crit safety and operational capability are 'red' on LD's dashboard; talked to URS re: resources and requirements</p>
	<p>Late 2012, Field Office recommended no award term (crit safety performance as an indicator)</p>
	<p>Late 2012, NCS Committee letter to Director (risk)</p>
	<p>Late 2012, NCS Committee Chair asked to step down (new high-level comm.)</p>



		<p>E-MAIL: Dec 13, 2012, "My Comments on the LANL CAP in Response to the CSSG Assessment and the NCS Staffing Shortage" Federal CSPM notifies LASO Management and senior NNSA line manager that the CAP is not acceptable, not relying on CSSG report or STD-1158 (performing contractor self-assessments of NCS program), no commitment for gap analysis on how to fulfill DSA/TSR commitments with limited staff; LASO Deputy Mgr response: LANS completed ~a third of 29 commitments, listed 4 things being done to follow the situation, don't want to create more paper but rather want resources actively managing and solving the problem; Senior Criticality Safety Program Manager response: path forward was to require LASO approval of the deliverables under the outline [of the CAP] since there were no specifics mentioned, the Federal CSPM did not recommend approval of the submitted CAP, stating that LANS is not engaged and is having to be led to the 'correct' solution, a CAP will not fix that; key features missing and could be quickly added.</p> <p>FDO awarded term to LANS (did not accept Field Office recommendation)</p>
2013	Juan Griego "Acting" (Jan – Mar 2013)	<p>E-MAIL: Jan 18, 2013, "LANL Status" Criticality safety SME (from support service center) detailed areas of some progress but also that LANL was not self-identifying infractions, a leading indicator for staff being able to stay within the current crit controls; first hint at degrading Conops but neither SMEs feel it is in the 'red' yet.</p>
		<p>E-MAIL: Jan 22, 2013, "LANL NCS Program" Federal CSPM suggests to LASO Mgrs that LANL justify nuclear ops with a degraded NCS program in upcoming revised NCS CAP; "I know that the existing limits and evaluations are adequate for current ops, but the system is living and organic and 'coasting' on the existing basis won't last long. The symptoms you will see from an inadequate NCS staff/program are described in the DOE 1999 NCS Self-Improvement Workshop Booklet;" describes problems getting new staff up to speed and warns that history has shown that these conditions have lead to a shutdown of facilities in the past; burden should be on LANL to defend why they are safe to operate.</p>
		<p>Feb 25, 2013, meeting with acting Administrator and other senior NNSA officials; briefed the acting Administrator that LANL has two junior crit engineers; acting Administrator questioned why the facility is still operating; staffing justified based on a significant quantity of comp measures</p>
		<p>E-MAIL: Feb 25, 2013, "Debrief from LANL NCS Discussion with [Acting Administrator]"; Federal CSPM to LASO Deputy Manager; summary of earlier meeting with Acting Administrator and actions stemming from that meeting</p>
		<p>E-MAIL: Feb 28, 2013 – "My Personal Crit Safety 'Watch' List As of Today" Federal CSPM details top 4 criticality safety concerns to senior NNSA officials and line managers; LANL criticality safety is listed at the top</p>
		<p>March 2013 – DOE CSSG limited review and causal analysis "persistent lack of trust"</p>
		<p>March 25, 2013 – 2012 Annual Criticality Safety Report notes LANL will receive staff assistance form LLNL "Staff losses are catastrophic but do not appear to be market driven."</p>
		<p>June 2013 – 11 criticality safety staff have departed</p>
	Geoff Beausoleil Acting (Apr – Sept 2013)	<p>E-MAIL June 10, 2013, "Path Forward on Criticality Safety at LANL" from Federal CSPM to LASO Mgrs and senior NNSA line manager;</p>



	<p>need definitive path forward on LANL crit safety to prep Acting Administrator for meeting with DNFSB, gave suggestions for a LANS crit safety mgr: identify highest risk ops and pause, reduce mass limits, train/qualify first-line supervisors/mgrs, CSOs, and fissile material handlers</p> <p>June 2013, Operational pause at TA-55</p> <p>E-MAIL: June 21, 2013, "Crit Safety at LANL" Federal CSPM recommends the need to pause and review solution ops and reduce quantity limits to LASO Mgrs and Sr NNSA Line Manager</p> <p>E-MAIL: Jun 26, 2013, "Discussion with LANL Director About Potential Stand-down of Selected Nuclear Operations for Criticality Safety Concerns" from Federal CSPM to other senior NNSA officials and LASO Mgrs; described meeting with acting Administrator with discussions to stand down higher-risk operations, call later that day to discuss.</p> <p>July 2013 – LANL Director commitment to Best in Class</p>
William (Ike) White Acting (Oct 2013 – Jan 2014)	E-MAIL: Nov 27, 2013, Federal CSPM notifies HSS/OE that NNSA committed to a Federal analysis of NCS staffing collapse

## 5.0 RECOMMENDATIONS

Based on the result and analysis contained in this report, the team provides the following recommendations for consideration by line management in response to this report. These recommendations have been drawn from each of the root and contributing causes; in some cases, recommendations apply to more than one cause. Some broader recommendations are also included regarding the conclusions of this report as they relate to other enterprise initiatives.

NNSA leadership should consider:

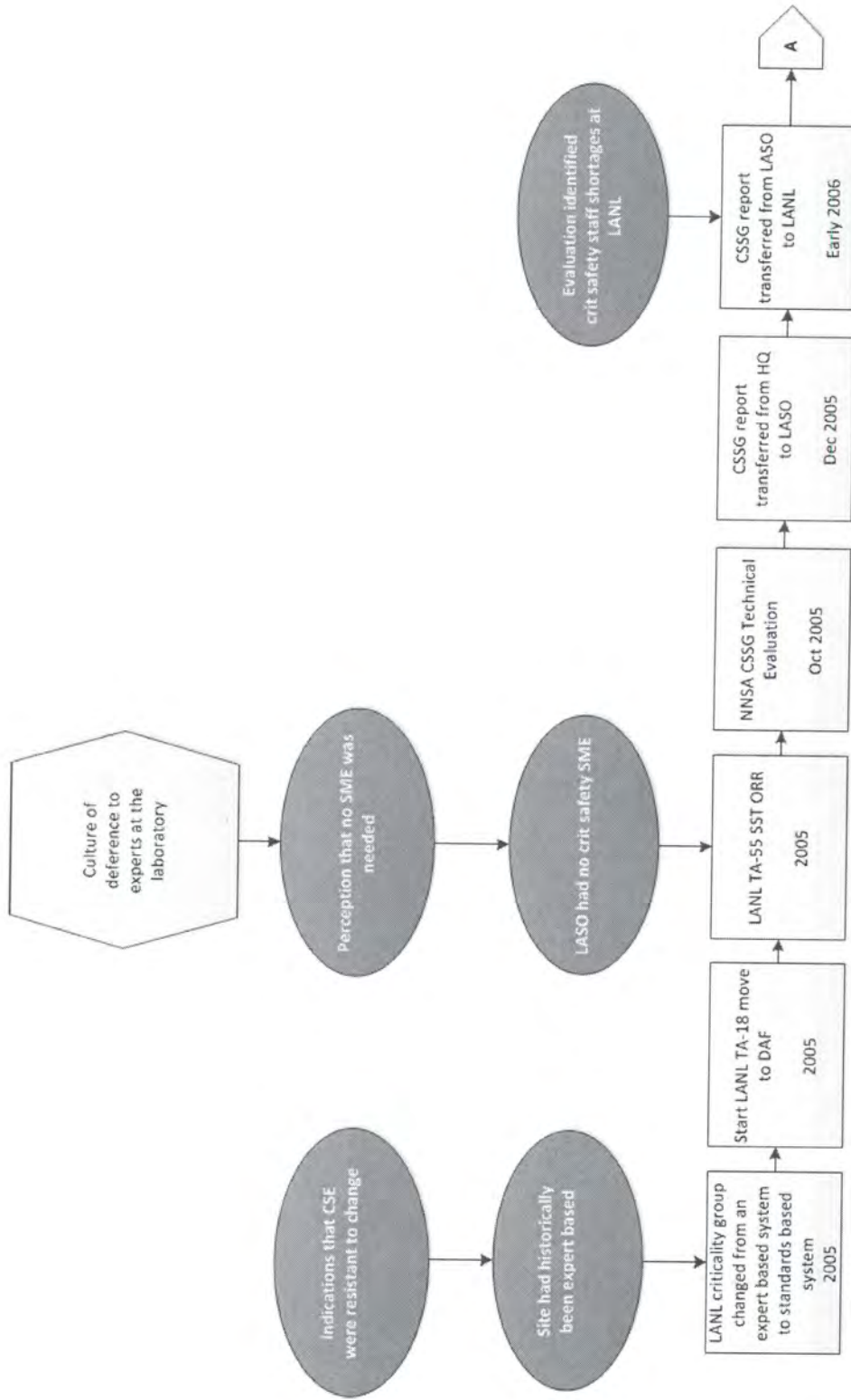
- Sharing the results of this investigation in a timely manner across the entire NNSA Enterprise as a means to reinforce the commitment to improve the organization's communications process.
- Developing additional paths to raise emergent issues up the chain of command. (Examples might include an informal Safety Issues Review Board as a forum for the peer-to-peer discussion of potential issues.)
- Re-evaluating the recommendations from the 2013 NNSA Safety Culture Report for common themes (e.g., communication/engagement of staff, management of concerns).
- Continuing to aggressively pursue improvements in safety culture to improve communication of issues via the most direct and effective channels.
- Recognizing that award fee for mission performance cannot be separated or judged independently of safety performance. Final fee decisions and their bases should be shared broadly to enhance corporate learning.

- Reviewing and clarifying the current safety and program nexus in the organization to ensure balanced priorities in effective decision-making. Reviewing and clarifying safety roles and responsibilities across the organization, as appropriate.
- Following up on, and ensuring the efficacy of, closure actions associated with the LANL PIP for criticality safety.
- Assessing the processes and procedures at the Field Office for tracking, addressing, and closing corrective actions to determine if changes should be made in light of the findings in this report.
- Conducting an extent of condition evaluation to determine if there are other potential safety issues that are developing in the organization (e.g., at a particular site or sites).

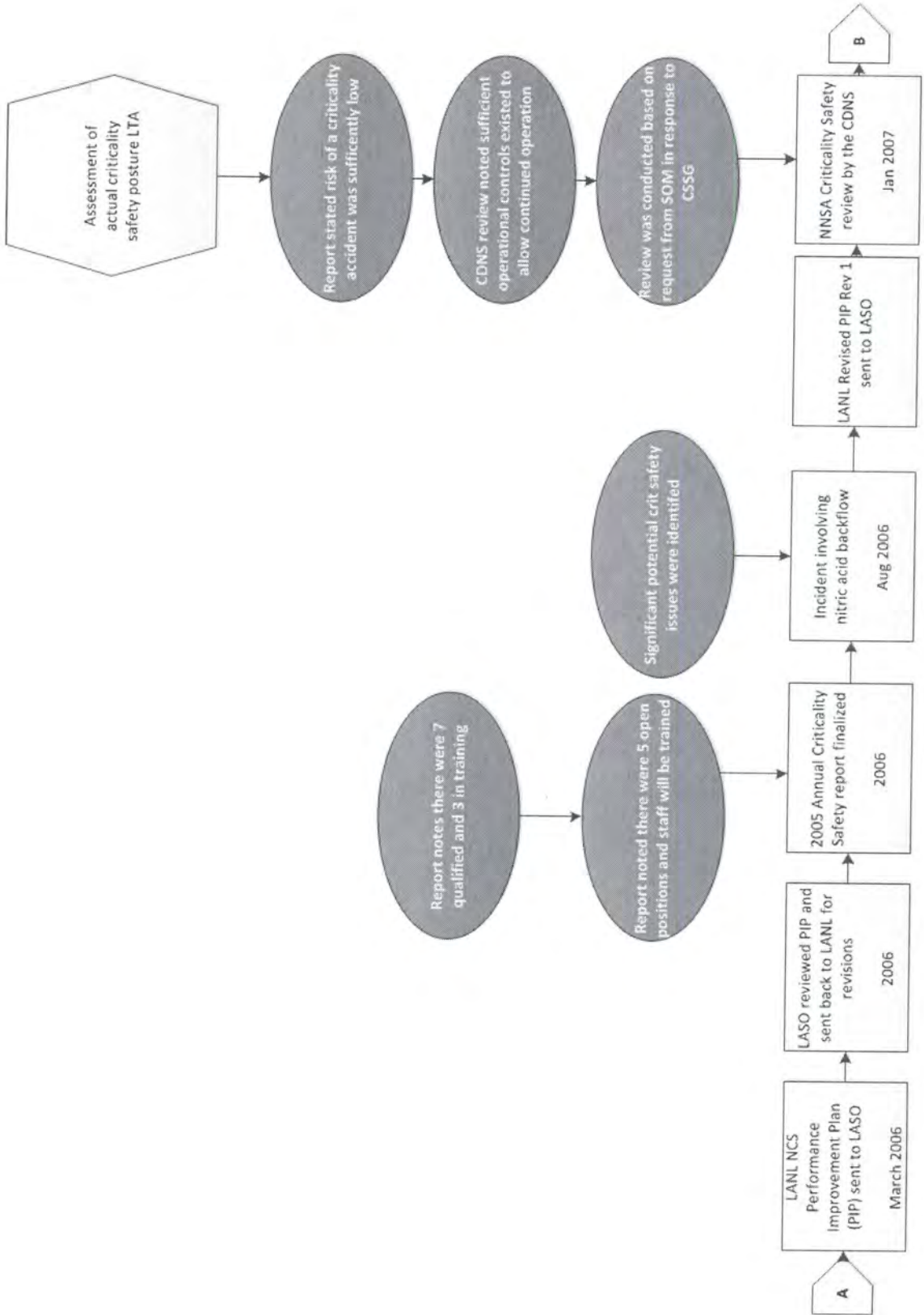


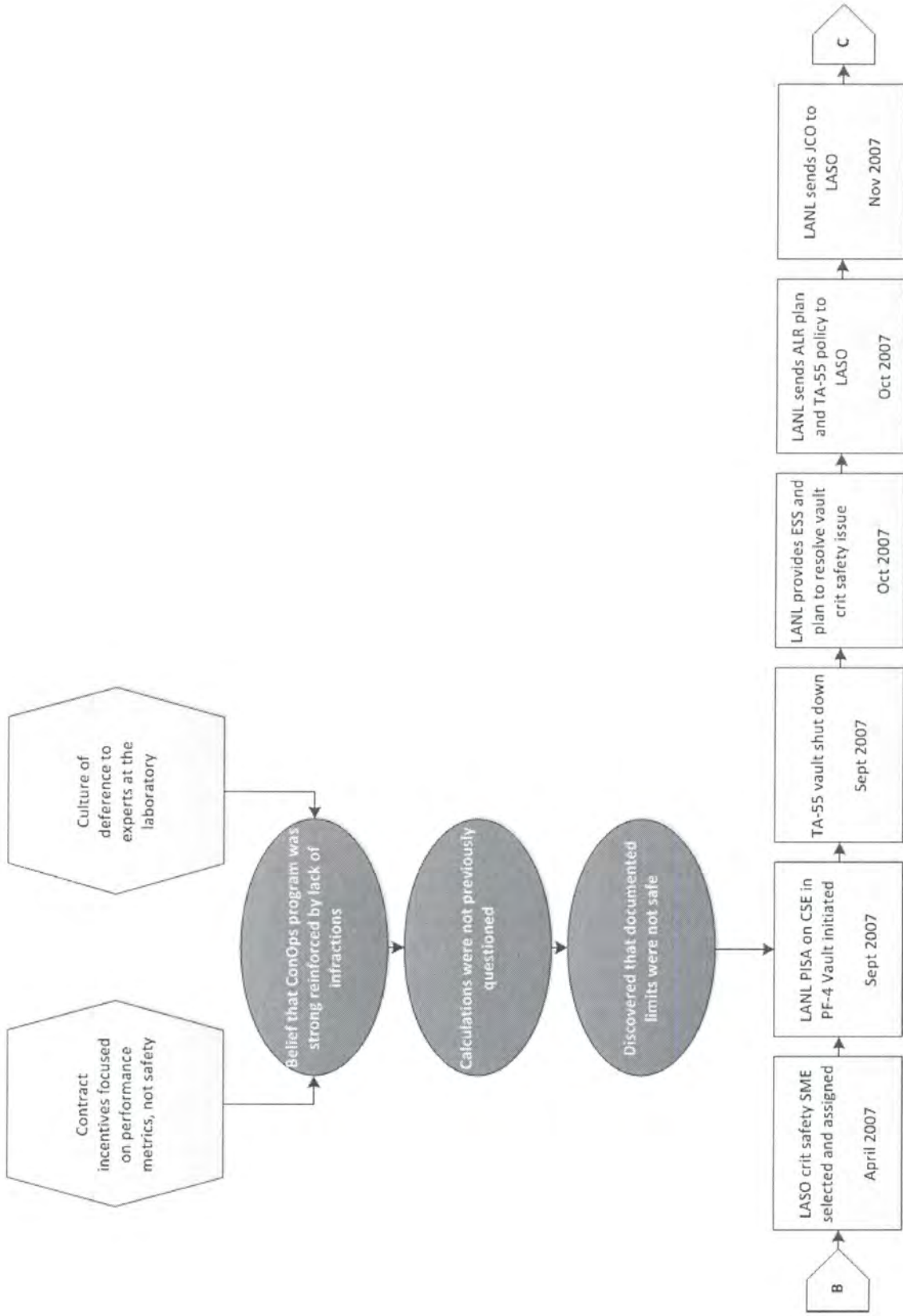
## APPENDIX A. EVENTS AND CAUSAL ANALYSIS DIAGRAM

The team performed an events and causal factors analysis in accordance with the DOE Handbook DOE-HDBK-1208-2012, *Accident Investigation and Prevention*. The events and causal factors analysis requires deductive reasoning to determine those events or conditions that contributed to the undesired condition or event. Causal factors are the events or conditions that produced or contributed to the undesired condition or event, and they consist of direct, contributing, and root causes. The direct cause is the immediate event or condition that caused the undesired condition or event. The contributing causes are the events or conditions that, collectively with the other causes, increased the likelihood or severity of the undesired condition or event, but did not solely cause it. Root causes are the events or conditions that, if corrected, would prevent recurrence of this and similar incidents.

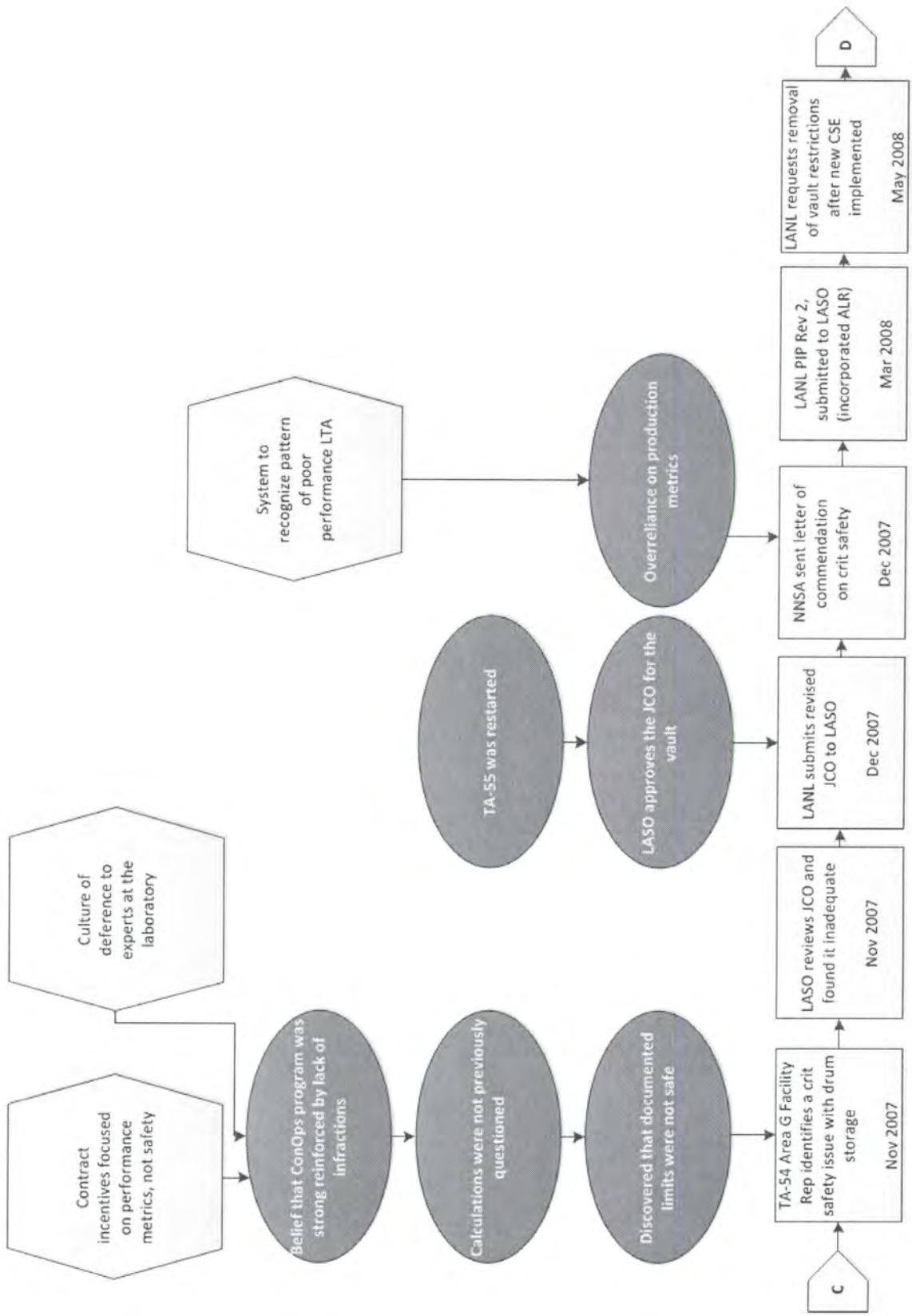


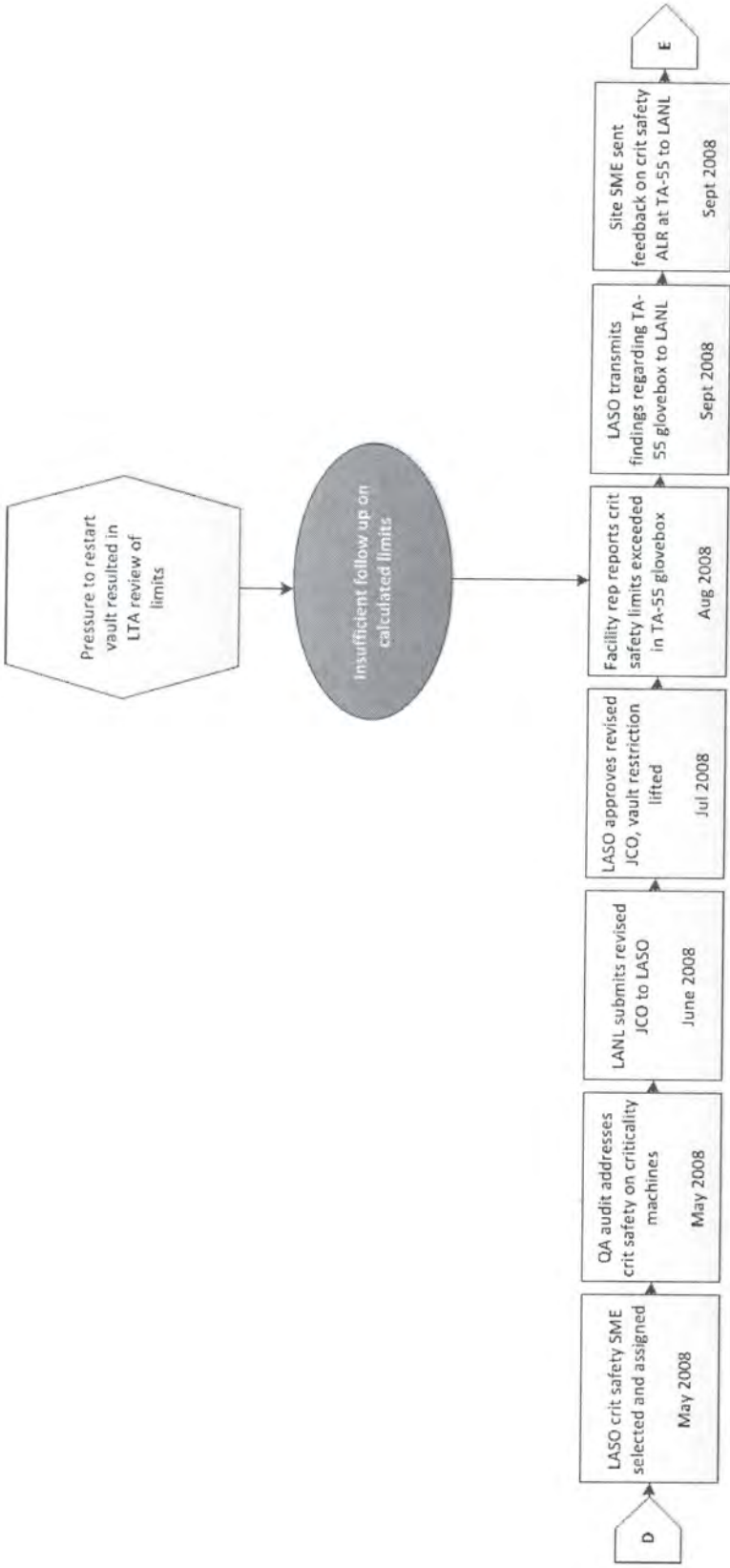




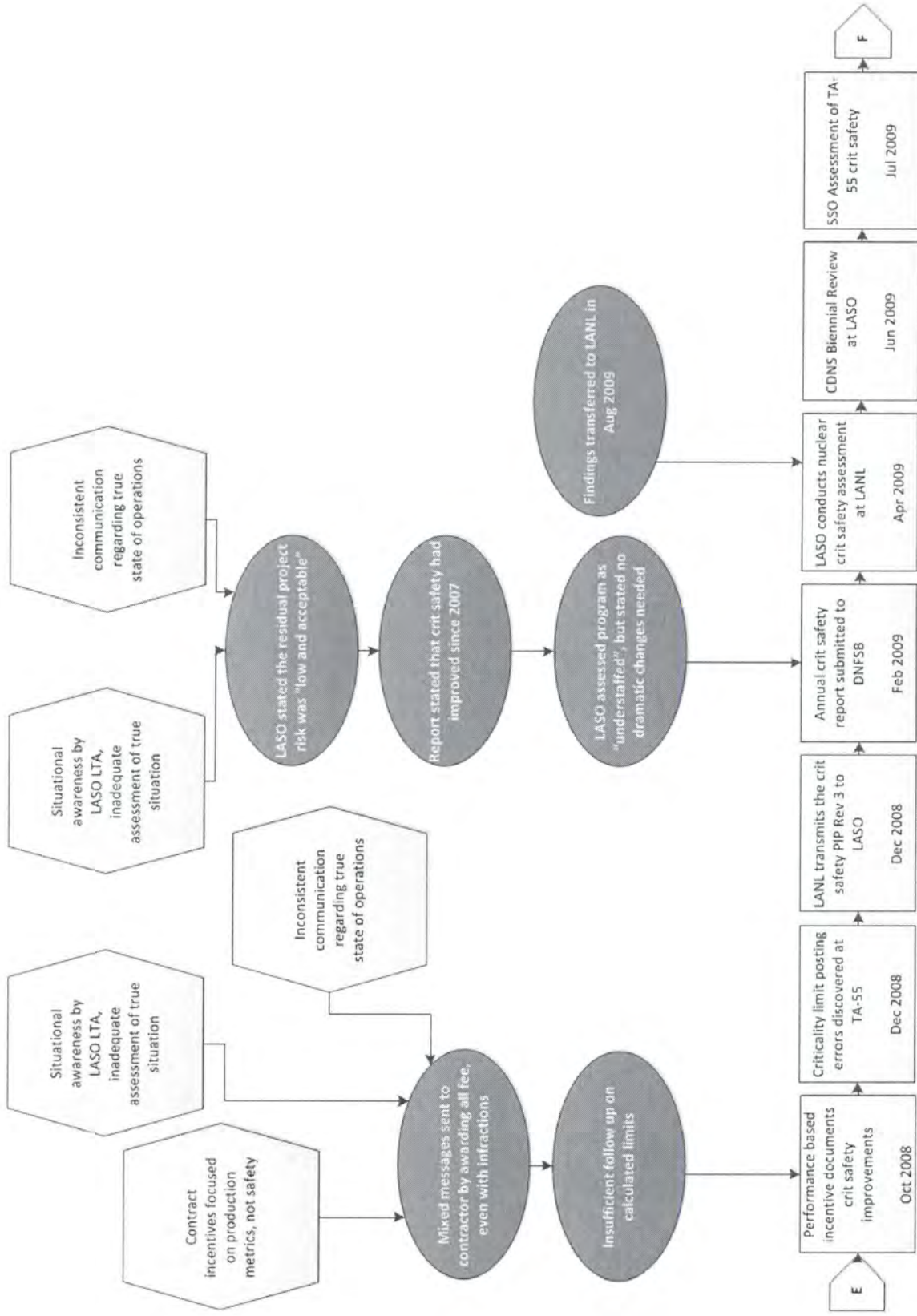


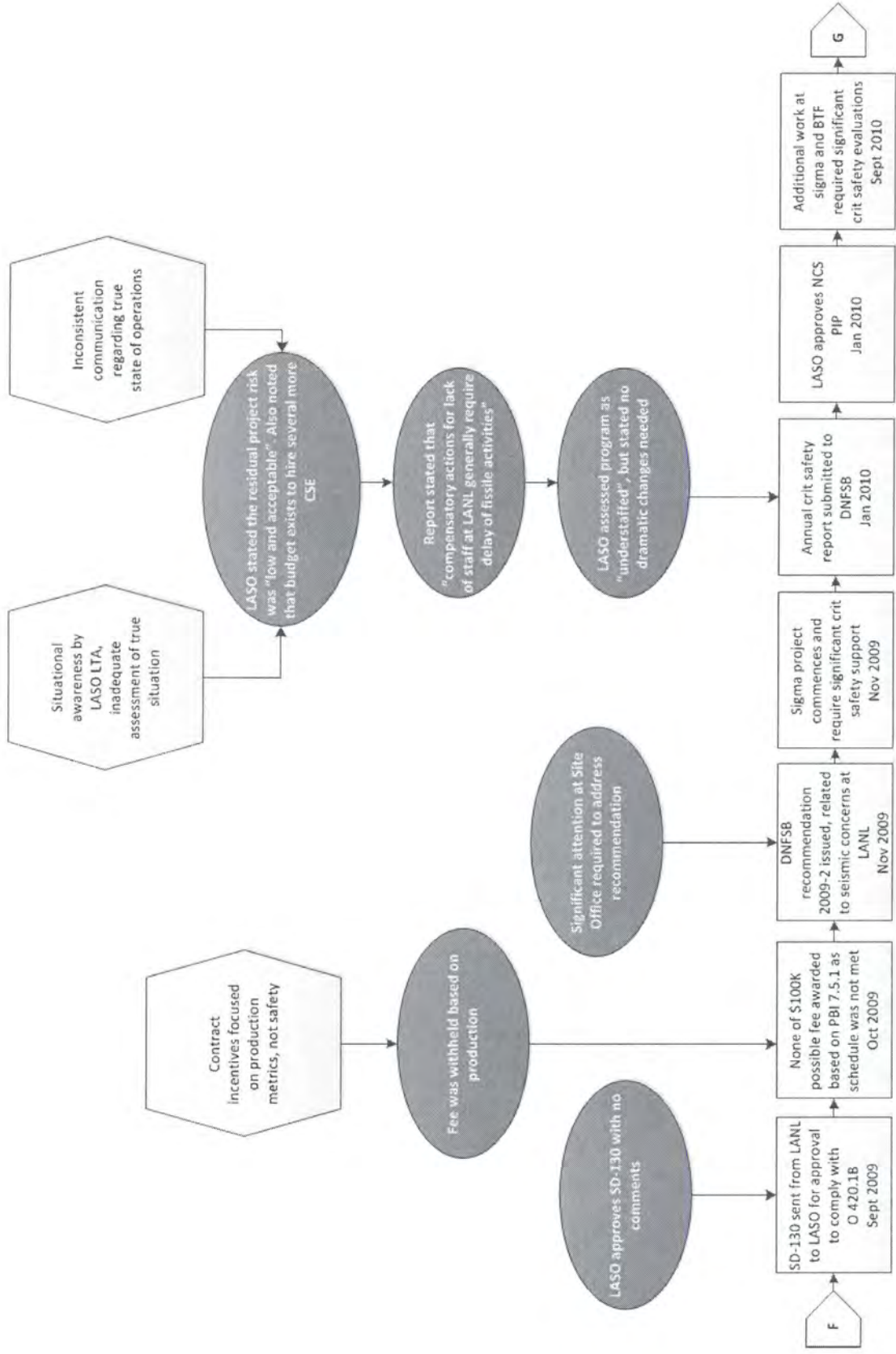




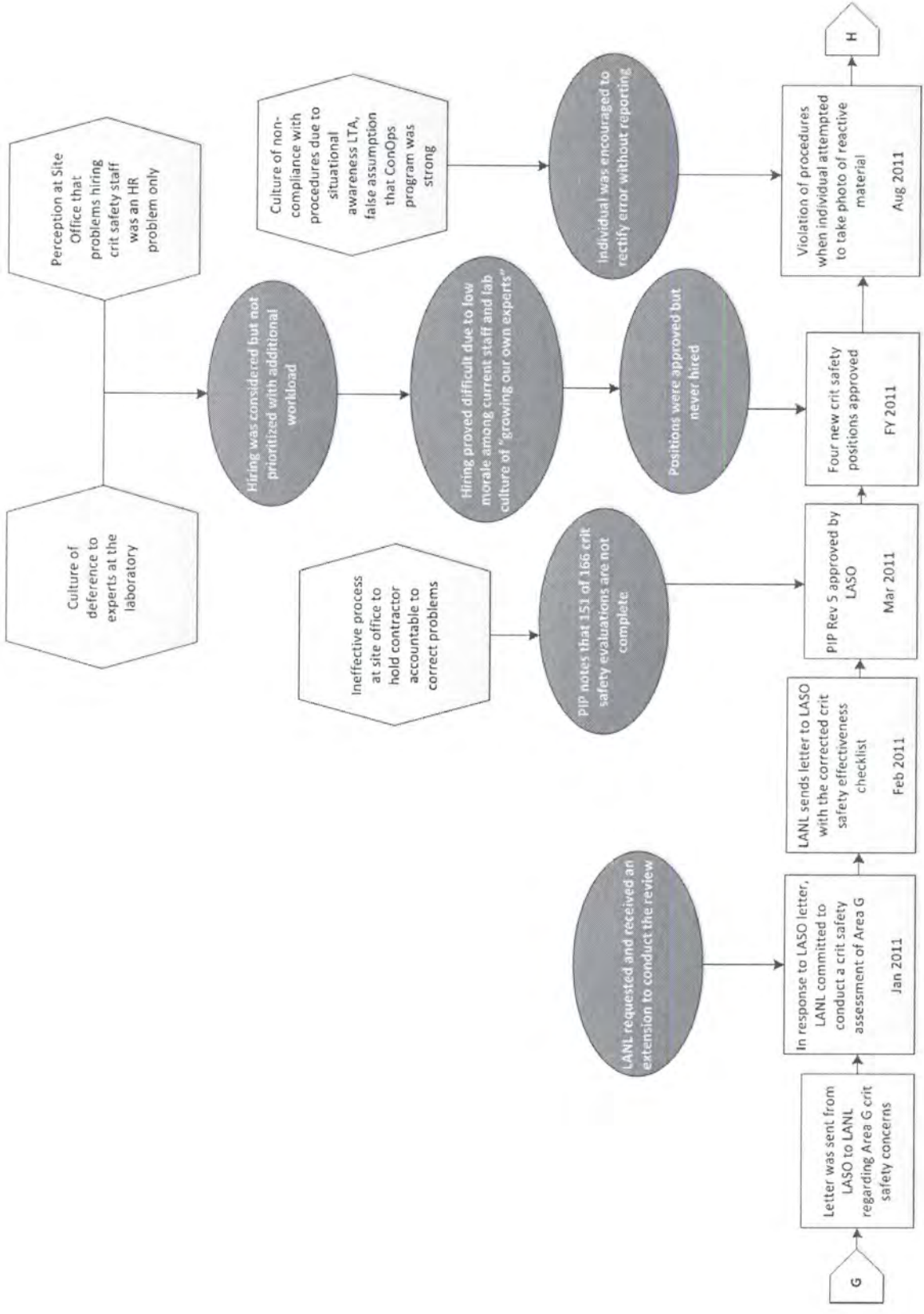


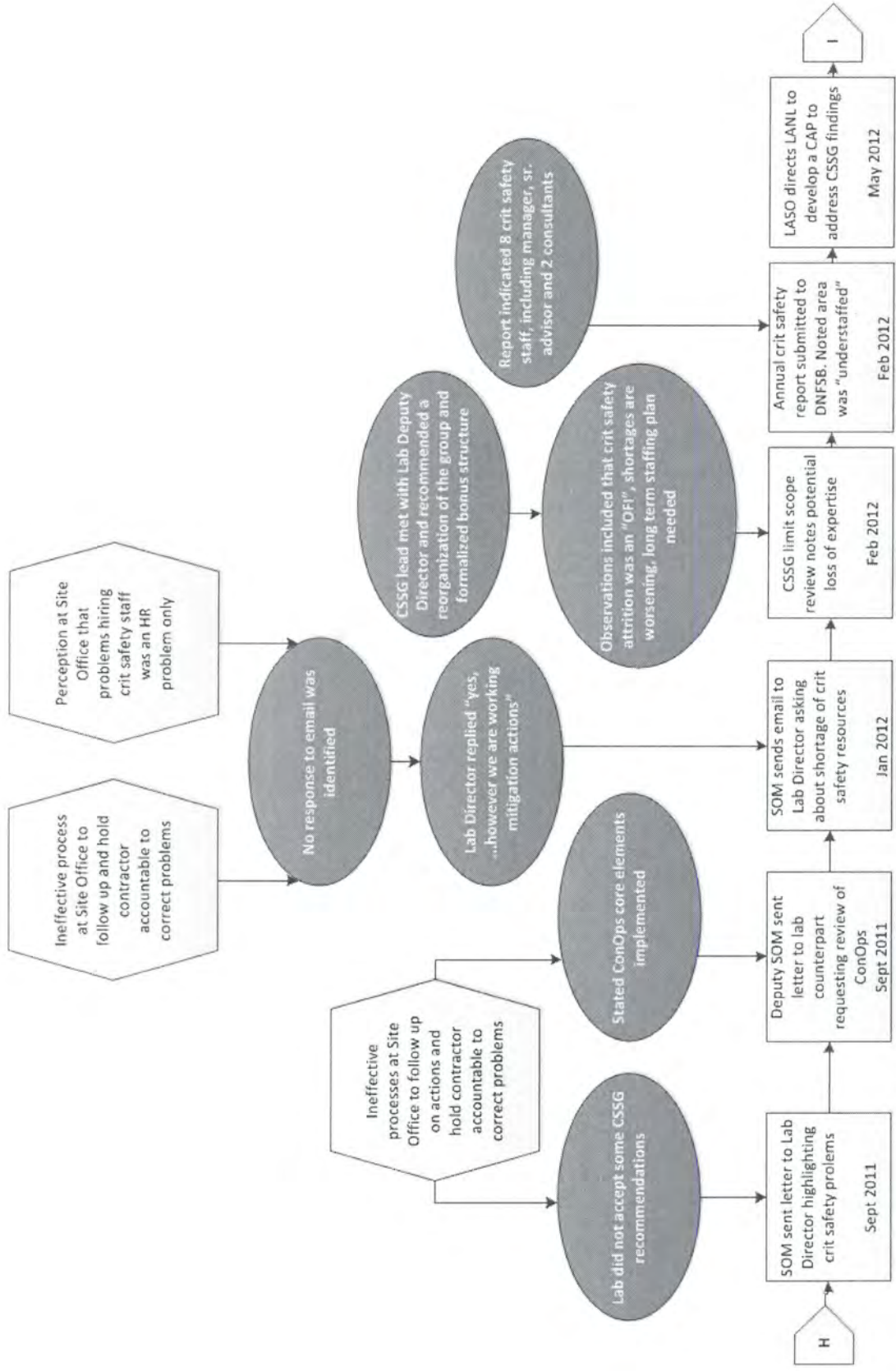




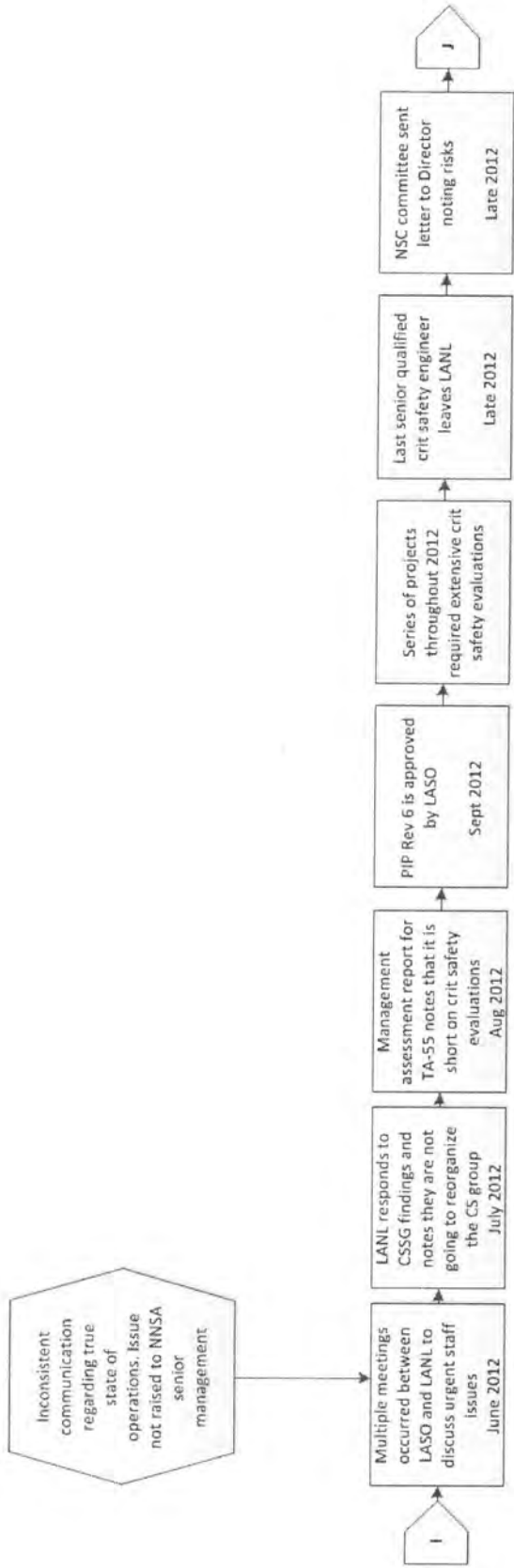


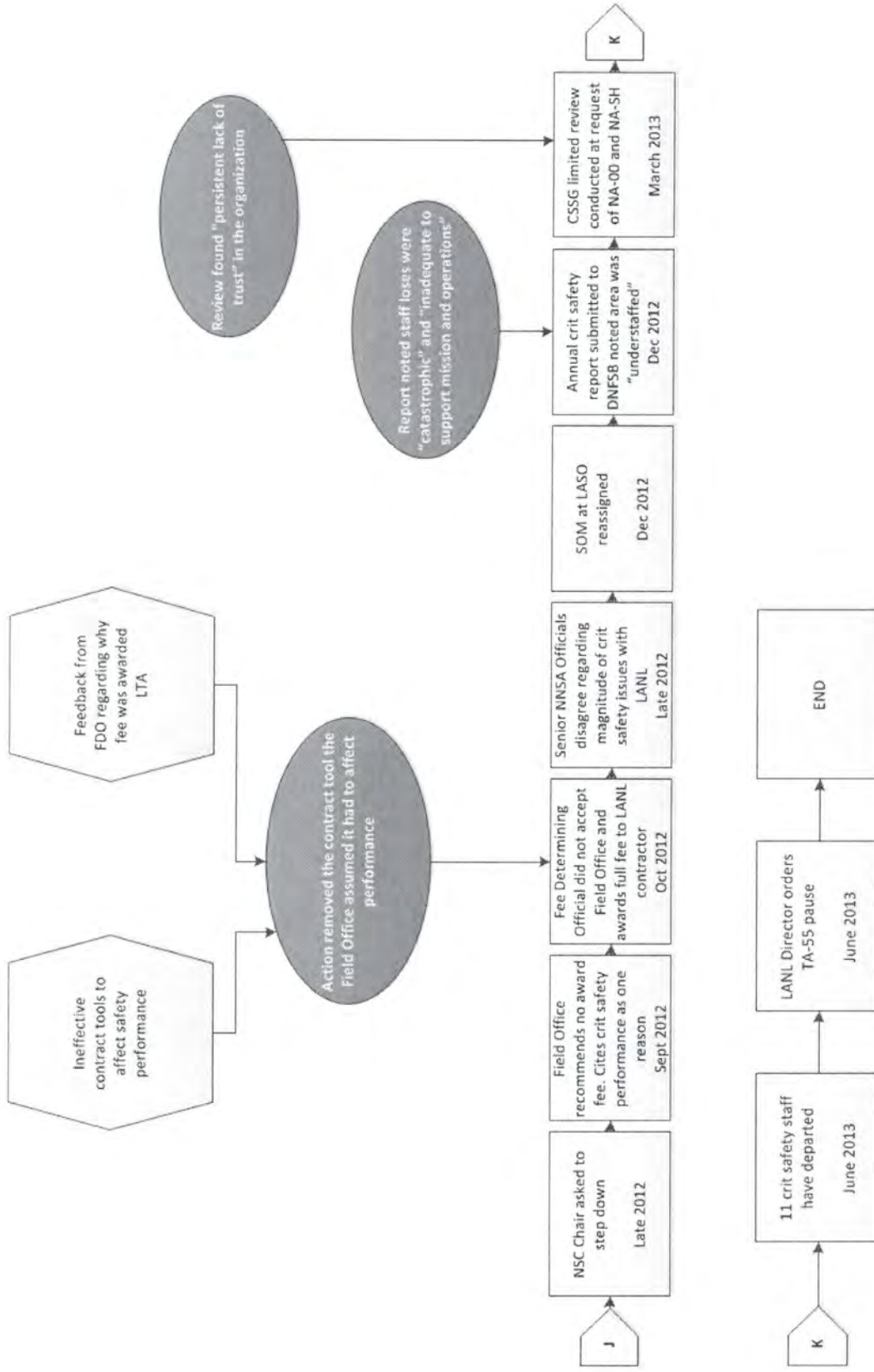














## APPENDIX B. SUMMARY OF DOCUMENTS REVIEWED AND INTERVIEWS CONDUCTED

### Documents Reviewed

- DOE Policy 226.1A, *Department of Energy Oversight Policy*
- DOE Order 226.1B, *Implementation of Department of Energy Oversight Policy*, April 25, 2011
- DOE Order 420.1C, *Facility Safety*, December 4, 2012
- NNSA Policy Letter NAP-21, *Transformational Governance and Oversight*, February 28, 2011
- LASO Plan 00.14, *Integrated Management System Description including Functions, Responsibilities and Authorities (FRA)*, January 15, 2012
- LASO MP 00.08, *Implementation of Los Alamos Site Office Line Oversight*, Rev. 4, December 18, 2009
- LASO MP 00.12, *LASO Independent Assessment Process*, Rev. 1, October 19, 2009
- LASO WI 00.04, *Assessment Shadow Activity Reporting*, Rev. 3, January 26, 2009
- LASO WI 06.01, *LASO Field Operations, Oversight/Surveillance Issues Reporting*, Rev. 2, March 5, 2010
- Contract Number DE-AC52-06NA25396, Los Alamos National Security LLC, and the Department of Energy, National Nuclear Security Administration, 2005
- Los Alamos National Laboratory, Policy 09.02, Nuclear Criticality Safety Group, *Augmented Limit Review and Operational Release*, October 26, 2007
- National Nuclear Security Administration, *Technical Evaluation of the Los Alamos National Laboratory Nuclear Criticality Safety Program*, October 2005
- National Nuclear Security Administration, Chief of Defense Nuclear Safety, *NNSA Criticality Safety Review at the Los Alamos National Laboratory*, January 2007
- National Nuclear Security Administration, *Headquarters Biennial Review of Site Nuclear Safety Performance, Final Report for the Los Alamos Site Office*, August 2007
- National Nuclear Security Administration, Criticality Safety Coordinating Team/Criticality Safety Support Group, *Nuclear Criticality Safety Assessment of the Los Alamos National Laboratory, Conducted July 21-24, 2008*
- National Nuclear Security Administration, Criticality Safety Coordinating Team, *Nuclear Criticality Safety Assessment of the Los Alamos National Laboratory, Conducted April 6-9, 2009*
- National Nuclear Security Administration, Criticality Safety Coordinating Team, *Nuclear Criticality Safety Assessment of the Los Alamos National Laboratory, Conducted June 28-July 1, 2010*
- National Nuclear Security Administration, Criticality Safety Support Group, *Focused Criticality Safety Review at LANL Plutonium Facility (PF-4)*, April 13, 2012
- Los Alamos Site Office, *LASO Self Assessment Form, Criticality Safety*, April 13, 2009
- Los Alamos National Laboratory, Office of the Laboratory Director, *External Review of the Los Alamos Nuclear Criticality Safety Program, Final Report*, Rev. 0, October 7, 2013
- LA-UR-11-05363, Los Alamos National Laboratory, *Nuclear Criticality Safety Committee June 2011 Assessment at TA-55*, September 20, 2011

- LA-UR-13-29297, Los Alamos National Laboratory, *Criticality Safety Infractions Causal Analysis*, November 12, 2013
- National Nuclear Security Administration, *Headquarters Biennial Review of Site Nuclear Safety Performance, Final Report for the Los Alamos Site Office (LASO)*, June 2009
- SBD-CS-PLAN-13-001-R0, Los Alamos National Laboratory, *Final Report for Nuclear Criticality Safety Program Assessment*, April 30, 2013
- SB-CS-06-147, Los Alamos National Laboratory *Nuclear Criticality Safety Program Improvement Plan*, Revision 1, December 11, 2006
- NCS-Memo-08-002, *Los Alamos National Laboratory Nuclear Criticality Safety Program Improvement Plan*, Revision 2, April 9, 2008
- NCS-MEMO-09-006, Los Alamos National Laboratory *Nuclear Criticality Safety Program Improvement Plan*, Revision 3, March 2, 2009
- NCS-MEMO-11-003, (UCNI) COR-SO-3.9.2011-329050) Los Alamos National Laboratory *Nuclear Criticality Safety Program Improvement Plan*, Revision 5, March 7, 2011
- NCS-MEMO-12-006, Los Alamos National Laboratory *Nuclear Criticality Safety Program Improvement Plan*, Revision 6, September 28, 2012
- SB-CS-CAP-12-265, *Corrective Action Plan For Nuclear Criticality Safety Program*, November 8, 2012
- SB-CS-CAP-12-265, *Corrective Action Plan For Nuclear Criticality Safety Program*, Rev. 1, February 14, 2013
- Los Alamos National Laboratory, *Management Assessment (MA) Report for TA-55 Criticality Safety, Plutonium Processing Facility, TA55*, August 16, 2012
- Department of Energy, National Nuclear Security Administration, Los Alamos Site Office, *FY 2007 Performance Evaluation Report of the Los Alamos National Security LLC, Management and Operation of the Los Alamos National Laboratory, Contract No. DE-AC52-06NA25396*, Performance Period October 1, 2006 through September 30, 2007, December 7, 2007
- Department of Energy, National Nuclear Security Administration, Los Alamos Site Office, *FY 2008 Performance Evaluation Plan for the Los Alamos National Security LLC, Management and Operation of the Los Alamos National Laboratory, Contract No. DE-AC52-06NA25396*, Performance Period October 1, 2007 through September 30, 2007, December 7, 2009
- Department of Energy, National Nuclear Security Administration, Los Alamos Site Office, *FY 2009 Performance Evaluation Plan for the Los Alamos National Security LLC's, Management and Operation of the Los Alamos National Laboratory, Contract No. DE-AC52-06NA25396*, Performance Period October 1, 2008 through September 30, 2009, August 31, 2009
- Department of Energy, National Nuclear Security Administration, Los Alamos Site Office, *FY 2010 Performance Evaluation Plan for the Los Alamos National Security LLC's, Management and Operation of the Los Alamos National Laboratory, Contract No. DE-AC52-06NA25396*, Performance Period October 1, 2009 through September 30, 2010, September 29, 2010
- Department of Energy, National Nuclear Security Administration, Los Alamos Site Office, *FY 2011 Performance Evaluation Plan for the Los Alamos National Security LLC's, Management and Operation of the Los Alamos National Laboratory, Contract No. DE-*



- AC52-06NA25396*, Performance Period October 1, 2010 through September 30, 2010, Summary, September 18, 2011
- Department of Energy, National Nuclear Security Administration, Los Alamos Site Office, *FY 2011 Performance Evaluation Report for the Los Alamos National Security LLC's, Management and Operation of the Los Alamos National Laboratory, Contract No. DE-AC52-06NA25396*, Performance Period October 1, 2011 through September 30, 2011, December 6, 2011.
  - Department of Energy, National Nuclear Security Administration, Los Alamos Site Office, *FY 2012 Performance Evaluation Plan for the Los Alamos National Security LLC's, Management and Operation of the Los Alamos National Laboratory, Contract No. DE-AC52-06NA25396*, Performance Period October 1, 2011 through September 30, 2012, September 28, 2011.
  - Department of Energy, National Nuclear Security Administration, Los Alamos Site Office, *FY 2012 Performance Evaluation Report for the Los Alamos National Security LLC's, Management and Operation of the Los Alamos National Laboratory, Contract No. DE-AC52-06NA25396*, Performance Period October 1, 2011 through September 30, 2012, Rev.7, November 26, 2012.
  - *Fiscal Year 2013 NNSA Strategic Performance Evaluation Plan (PEP) FOR MANAGEMENT AND OPERATION of Los Alamos National Security, LLC, Contract No. DE-AC52-06NA25396*, Performance Period October 1, 2012 through September 30, 2013, September 11, 2012.
  - National Nuclear Security Administration, Los Alamos Field Office, *FY 2013 PEP, LOS ALAMOS NATIONAL SECURITY, LLC, Performance Evaluation Report, Performance Period: October 2012-September 2013*, December 16, 2013.
  - FY 2008 PBI Completion Documentation, PCM:08-346, *PBI Element 7.6.1*, Title: *Criticality Safety Improvement*, October 17, 2008.
  - FY 2009 PBI Completion Documentation, PCM:09-327, *PBI Element 7.5.1*, Title: *Criticality Safety Improvement*, October 16, 2009.
  - DNFSB *Recommendation 2008-1, Safety Classification of Fire Protections Systems*, January 29, 2008.
  - DNFSB *Recommendation 2009-2, Los Alamos National laboratory Plutonium Facility Seismic Safety*, October 26, 2009.
  - DNFSB Letter To: The Honorable Earnest J. Moniz, Secretary of Energy, Washington DC, From: Peter S. Winokur, Ph.D., Chairman, DNFSB, July 15, 2013.
  - DNFSB Memorandum For: S. Stokes, Acting Technical Director, DNFSB, From: D. Kupferer and J. McComb, Staff Issue Report, Subject: *Criticality Safety at Los Alamos National Laboratory*, May 21- 23, 2013.
  - NNSA Letter To: The Honorable Peter S. Winokur, Chairman, DNFSB, From: James J. McConnell, AAAIO, NNSA, December 6, 2013.
  - NNSA Letter To: The Honorable John T. Conway, Chairman, DNFSB, From: David H. Crandall, ADA for Research, Development, and Simulation, Defense Programs, NNSA, Submittal of the Status of the Department of Energy Nuclear Criticality Safety Program for Calendar Year 2003, February 13, 2004.
  - NNSA Letter To: The Honorable John T. Conway, Chairman, DNFSB, From: David H. Crandall, ADA for Research, Development, and Simulation, Defense Programs, NNSA,



- Submittal of the Status of the Department of Energy Nuclear Criticality Safety Program for Calendar Year 2004, February 1, 2005.
- NNSA Letter To: The Honorable A.J. Eggenberger, Chairman, DNFSB, From: David H. Crandall, ADA for Research, Development, and Simulation, Defense Programs, NNSA, Submittal of the Status of the Department of Energy Nuclear Criticality Safety Program for Calendar Year 2005, February 08, 2006.
  - NNSA Letter To: The Honorable A.J. Eggenberger, Chairman, DNFSB, From: Thomas D'Agostino, Deputy Administrator, Defense Programs, NNSA, Submittal of the Status of the Department of Energy Nuclear Criticality Safety Program for Calendar year 2006, March 12, 2007.
  - NNSA Letter To: The Honorable A.J. Eggenberger, Chairman, DNFSB, From: Thomas D'Agostino, Deputy Administrator, Defense Programs, NNSA, Submittal of the Annual Report on Nuclear Criticality Safety Programs, National Nuclear Security Administration, February 23, 2009.
  - NNSA Letter To: The Honorable John E. Mansfield, Chairman, DNFSB, From: Garrett Harencak, Brig. Gen. , USAF, PADA for Military Application, Defense Programs, Transmittal of the Annual Report on Nuclear Criticality Safety Programs, January 19, 2010.
  - NNSA Letter To: The Honorable Peter S. Winokur, Chairman, DNFSB, From: Donald L. Cook, Deputy Administrator, Defense Programs NNSA, FY11 Annual Report on Nuclear Criticality Safety Programs, February 23, 2012. .
  - NNSA Letter To: The Honorable Peter S. Winokur, Chairman, DNFSB, From: Neile L. Miller, Acting Under Secretary for Nuclear Security, DOE, Fiscal Year (FY) 2012 Annual Report on Nuclear Criticality Safety Programs, March 25, 2013..
  - NNSA Memorandum For Robert W. Kuckuck, Director LANL, Ed. L. Wilmot, Manager, LASO, James J. McConnell, CDND, From: Jerry McKamy, NA-117, Subject: *Transmittal of the Los Alamos National Laboratory Nuclear Criticality Safety Program Review Report*, December 8, 2005.
  - NNSA Memorandum For The Revitalization Manager, LASO, from Thomas P. D'Agostino, Administrator, Subject: *Los Alamos Site Office Biennial Review of Site Nuclear Safety Performance Report*, September 27, 2007.
  - NNSA Memorandum For William I. White Manager, Los Alamos Field Office, and Robert B. Raines, Associate Administrator for Project Acquisition and Project Management, From: Edward Bruce Held, Acting Administrator, NA-1, HQ, NNSA, Subject: *Los Alamos National Security, LLC, DE-AC52-06NA25396, Fiscal Year 2013 Performance Fee*, December 16, 2013.
  - LASO Memorandum SO:2JV-001, To: Thomas D'Agostino, NA-1, HQ/FOR, From Donald L. Winchell, Jr., Site Manager, LASO, *Los Alamos Site Office (LASO) Corrective Action Plan for Chief Defense Nuclear Safety (CDNS) Management Concerns*, December 4, 2007.
  - LASO Memorandum SO:14PM-002, To: Mr. Robert L. McQuinn, ADNHHO, LANS, From: Joseph C. Vozella, COR, LASO, Subject: *Submittal of the National Nuclear Security Administration Criticality Safety Review Report*, September 22, 2008.
  - LASO Memorandum SO:19PM-162432, To: Mr. Robert L. McQuinn, ADNHHO, LANS, From: Joseph C. Vozella, COR, OSO, LASO, Subject: *Approval of SD-130, Nuclear Criticality Program*, Revision 0, October 13, 2009.

- LASO Memorandum SO:19PM-333659, To: Mr. Robert L. McQuinn, ADNHHO, LANS, From: Roger E. Snyder, DM, OOM, LASO, Subject: *Approval of Nuclear Criticality Safety Program Improvement Plan (NSS PIP) for FY11*, March 29, 2011.
- LASO Memorandum SO:32CK-374635, To: Charles F. McMillan, Director, LANS, From: Kevin W. Smith, OOM, LASO, Subject: *Los Alamos National Laboratory – Improving Nuclear Safety and Operations*, September 16, 2011.
- LASO Memorandum SO:99CK-378801, To: Mr. Carl Beard, PADOP, LANS, From: C.H. Keilers, COR, SO, LASO, Subject: *Plutonium Facility (PF-4) Criticality Safety Program*, September 16, 2011.
- LASO Memorandum SO:26CK-405257, To: Charles E. Anderson, ADNHHO, LANS, From: C.H. Keilers, COR, SO, LASO, Subject: *Plutonium Facility (PF-4) Criticality Safety Program*, December 14, 2011.
- LASO Memorandum SO:26CK-436183, To: Carl A. Beard, PADOPS, LANS, From: Juan L. Griego, Subject: *Transmittal of the Criticality Safety Support Group Assessment*, May 14, 2012.
- LASO Memorandum SO:26CK-456664, To: Charles E. Anderson, ADNHHO, LANS, From: C.H. Keilers, COR, SO, LASO, Subject: *Corrective Action Plan for the Criticality Safety Support Group Assessment*, August 8, 2012.
- LASO Memorandum SO:26CK-486666, To: Charles E. Anderson, ADNHHO, LANS, From: C.H. Keilers, COR, SO, LASO, Subject: *Los Alamos National Laboratory Improving the Criticality Safety Program*, December 21, 2012.
- LASO Memorandum SO:26CK-502622, To: Charles E. Anderson, ADNHHO, LANS, From: C.H. Keilers, COR, SO, LASO, Subject: *Criticality Safety Program – Concurrence in Release to Work Four Level 2/3 Analyses*, April 1, 2013.
- LASO Letter SET/4PM-002, COR-SO-4/17/2008/94588, To: Mr. Robert L. McQuinn, ADNHHO, LANS, From: Joseph C. Vozella, COR, OSO, LASO, Subject: *Nuclear Criticality Safety Improvement Plan (NCS PIP) for FY 2008*. April 17, 2008.
- LASO Letter To: Robert L. McQuinn, ADNHHO, LANL and Mr. Carl A. Beard, ADSMS, LANL, From: Patrick S. Moss, LASO, Subject: *Feedback on Criticality Safety ALR completed at TA-55*, September 17, 2008.
- LASO Letter To: Mr. Robert L. McQuinn, ADHNNO, LANS, From: Joseph C. Vozella, COR, LASO, Subject: *Submittal of National Nuclear Security Administration Criticality Safety Review Report*, April 13, 2009.
- LASO Letter To: Mr. Robert L. McQuinn, ADHNNO, LANS, From: Joseph C. Vozella, COR, OSO, LASO, Subject: *Nuclear Criticality Safety Program Improvement Plan (NCS PIP) for FY 2009*
- LASO Letter SO:21PM-ASM-216703, To: Mr. Robert L. McQuinn, ADHNNO, LANS, From: Joseph C. Vozella, COR, SO, LASO, Subject: *Submittal of National Nuclear Security Administration Criticality Safety Review Report*, August 3, 2010.
- NA-LA Letter SO-40PM-523751, To: Dr. Charles McMillan, Director, LANS, From: Geoffrey L. Beausoleil, Acting Manager, OOM, NA-LA, Subject: *Los Alamos National Laboratory – Improving the Criticality Safety Program Implementation and Operational Performance*, July 17, 2013.
- LANS Letter AD-NHHO:07-281 To: Mr. Joseph C. Vozella, LASO, NNSA, From Robert L. McQuinn, ADNHHO, LANS, Subject: *Transmittal of Augmented Limit Review and Operational Release Policy for Criticality Safety Reviews at TA-55*, October 30, 2007.



- LANS Letter AD-NHHO:08-038 To: Mr. Joseph C. Vozella, LASO, From Robert L. McQuinn, ADNHHO, LANS, Subject: *Nuclear Criticality Safety Program Improvement Plan (NCS PIP) for FY 2008*, April 9, 2008.
- LANS Letter, AD-NHHO:09-082, To: Mr. Joseph C. Vozella, LASO, From Robert L. McQuinn, ADNHHO, LANS, Subject: *Nuclear Criticality Safety Program Improvement Plan (NCS PIP) for FY 2009*, March 13, 2009.
- LANS Letter, AD-NHHO:09-271, To: Mr. Joseph C. Vozella, LASO, From Robert L. McQuinn, ADNHHO, LANS, Subject: *Submission of System Description (SD) 130, Nuclear Criticality Safety Program*, September 30, 2009.
- LANS Letter, AD-NHHO:11-053, To: Mr. Charles Keilers, LASO, From Robert L. McQuinn, ADNHHO, LANS, Subject: *Submittal of Corrected Criticality Safety Effectiveness Evaluation Guidance Checklist*, February 16, 2011.
- LANS Letter, AD-NHHO:11-072, COR-FO-2.18.2011-324901, To: Mr. Charles H. Keilers, AMSO, LASO, From Robert L. McQuinn, ADNHHO, LANS, Subject: *Nuclear Criticality Safety Program, Improvement Plan for FY 2011*, March 11, 2011.
- LANS Letter, AD-NHHO:12-203, To: Mr. Juan Griego, OOM, LASO, From: Charles E. Anderson, ADNHHO, LANS, Subject: *Response to Transmittal of Criticality Safety Support Group Assessment*, July 13, 2012.
- LANS Letter, AD-NHHO:12-283, COR-SO-10.2.2012-469138, To: Mr. Charles H. Keilers, AMSO, LASO, From Charles E. Anderson, ADNHHO, LANS, Subject: *Nuclear Criticality Safety Program, Improvement Plan*, September 12, 2012.
- LANS Letter PADOPS 11-116, To Kevin Smith, OOM, LASO, NNSA, and Charles Keilers, COR, SO, LASO, NNSA, Subject: *Improving Nuclear Safety and Operations*, September 23, 2011.
- LANS Letter, DIR, To: Kevin Smith, Manager, OOM, NNSA, From: Charles F. McMillan, DIR, LANS, Subject: *Improving Nuclear Safety and Operations (SO:32CK-374635)*, June, 27, 2012.
- LANS Letter, COR-BA-1.8.2012-479164, To: Mr. Juan Griego, OOM, LASO, From: Carl A. Beard, PADOPS, LANS, Subject: *Transmittal of a Corrective Action Plan and Compensatory Measures to Strengthen the LANL Nuclear Criticality Safety Program*, November 8, 2012.
- LANS Letter, AD-NHHO:12-362, To: Mr. Charles H. Keilers, AMSO, LASO, From: Charles E. Anderson, ADNHHO, LANS Subject: *Criticality Safety Accelerated Training and Qualification "Boot Camp"*, December 20, 2012.
- LANS Letter, AD-NHHO:13-029, COR-SO-2.1.2013-4952712, To: Mr. Charles H. Keilers, AMSO, LA-FO, From: Charles E. Anderson, ADNHHO, LANS Subject: *Complete Current PFITS Criticality Safety Action for the Nitric Acid Backflow in TA-55*. January 31, 2013.
- LANS Letter, PCM-:13-021, To: Contracting Officer, BA, LASO, From: Steve Shook, Prime Contracting Chief, LANL, Subject: *Contract No. DE-AC52-06NA2539, Request for Approval, Waiver to Retention Pay Policy: Retention Incentive Compensation for Criticality Safety Analysts*, January 28, 2013.
- LANS Letter, AD-NHHO:13-042, To: Mr. Charles H. Keilers, AMSO, NA-00-LA, , From: From: Charles E. Anderson ADNHHO, LANS Subject: *Transmittal of a Revision to the Corrective Action Plan (CAP) and Compensatory Measures to Strengthen the LANL Criticality Safety Program*, February 14, 2013.



- LANS Letter, AD-NHHO:13-044, COR-SO-2.15.2013-495394, To: Mr. Charles H. Keilers, AMSO, LASO, From: Charles E. Anderson, ADNHHO, LANS Subject: *Update of Nuclear Criticality Safety Program Metrics and Other Feedback Mechanisms*, February 15, 2013.
- LANS Letter, PADOPS-13-006, COR-OOM-3.7.2013-498579, To: Mr. Juan Griego, OOM, NA-LA, From: Carl A. Beard, PADOPS, LANS, Subject: *Curtailed Workload due to Criticality Safety Analyst Attrition*, March 6, 2013.
- LANS Letter, AD-NHHO:13-067, To: Mr. Charles H. Keilers, AMSO, LASO, From: Charles E. Anderson, ADNHHO, LANS, Subject: *Level 2/3 Criticality Safety Evaluations: Request to Release*, March 28, 2013.
- LANS Memorandum, LA-UR-11-05363, COR-SO-10.3.2011-384089, To: Charles F. McMillan, DIR, LANS, From: Laboratory Nuclear Criticality Safety Committee, Subject: *Nuclear Criticality Safety Committee June 2011 Assessment of TA-55*, September 20, 2011.
- LANS Memorandum ADPSM:11-023a, To: Carl Beard, PADOPS, LANS, From: Tim George, ADPSM, LANS, Subject: *ADPSM Response to 2011 Nuclear Criticality Safety Committee Assessment*, September 28, 2011.
- LANS Memorandum, DIR-12-183, To: Distribution, From Charles F. McMillan, DIR, LANS, Subject: *Thank You for Your Service on the Los Alamos Nuclear Criticality Safety Committee*, November 8, 2012.
- LANS Memorandum, DIR-12-184, To: Distribution, From Charles F. McMillan, DIR, LANS, Subject: *Appointment to Los Alamos Nuclear Criticality Safety Committee*, November 8, 2012.
- LANS Memorandum, AD-NHHO:12-328, To: Distribution, From Charles E. Anderson, AD-NHHO, LANS, Subject, *Safety Basis-Criticality Safety (SB-CS) Support to Operations*, November 28, 2012.
- LANS Memorandum, SB-CS:13-005, To: Distribution, From James H. Miller, SB-DO, LANL, Subject: *Review of the Los Alamos National Laboratory Criticality Safety Officer (CSO) Program at TA-55, CMR, and TA-54, Area G*, April 4, 2013
- LANS Memorandum, AD-NHHO:13-090, To: Robert C. Mason, FOD, TA-55, LANL, From: William T. Bivens, ADNHHO, LANS, Subject: *Criticality Safety Program Assessment for TA-55*, April 12, 2013.

#### **E-mail Correspondence Reviewed**

- E-MAIL: January 2012, "PF4 JCO"
- E-MAIL: March 6-7, 2012 "Friday Meeting with [Deputy Lab Director]"
- E-MAIL: June 14, 2012 – "Any News?"
- E-MAIL: June 14, 2012 – "LANL Crti [*sic*] Safety Staffing"
- E-MAIL: June 18, 2012 – "After Action Report"
- E-MAIL: October 17, 2012 – "Status of LANL NCS"
- E-MAIL: October 17, 2012 – "Criticality Train Wreck Coming at LANL"
- E-MAIL: October 23-24, 2012 - "Status of LANL NCS"
- E-MAIL: October 29-31, 2012 "Moving on"
- E-MAIL: October 31, 2012 "Moving on"
- E-MAIL: October 31, 2012 6:28 PM – "LANL NCS"
- E-MAIL: November 1, 2012 11:25 AM – "Moving on – LANL NCS"
- E-MAIL: November 1, 2012 12:39 PM – "CTA talking points on LANL NCS situation"

- E-MAIL: November 6, 2012 – “Crit Safety Executive Risk Management Item”
- E-MAIL: December 13, 2012 – “My Comments on the LANL CAP in Response to the CSSG Assessment and the NCSP Staffing Shortage”
- E-MAIL: January 18, 2013 – “LANL Status”
- E-MAIL: January 22, 2013 – “LANL NCS Program”
- E-MAIL: February 25, 2013 – “Debrief from LANL NCS Discussion with [Acting Administrator]”
- E-MAIL: February 28, 2013 – “My Personal Crit Safety 'Watch' List As of Today”
- E-MAIL: June 10, 2013 – “Path Forward on Criticality Safety at LANL”
- E-MAIL: June 21, 2013 – “Crit Safety at LANL”
- E-MAIL: June 26, 2013 – “Discussion with LANL Director About Potential Stand-down of Selected Nuclear Operations for Criticality Safety Concerns”

### **Interviews Conducted**

- Associate Administrator for Safety and Health
- Acting Associate Administrator for Infrastructure and Operations
- Associate Deputy Administrator for Major Modernization Programs
- Federal Nuclear Criticality Safety Program Manager
- Senior Technical Advisor for Criticality Safety Program
- Criticality Safety Subject Matter Expert Los Alamos Field Office
- Facility Representative, Los Alamos Field Office
- Assistant Manager for Field & Safety Operations, Los Alamos Field Office
- Former Los Alamos Field Office Manager
- Office of Safety and Health, Criticality Safety Subject Matter Expert
- Former Assistant Manager for Safety Operations, Los Alamos Field Office



## APPENDIX C: TEAM MEMBER BIOGRAPHIES

**Jeffrey L. Roberson** is the Startup and Restart Program Lead for NA-00-10 for the Office of Environment, Safety, and Health. He has led the NNSA readiness process for the enterprise as well as leading or advising on multiple readiness reviews. He was a principle author in the development of the Line Oversight/Contractor Assurance System affirmation process. He has completed assignments as the Project Director of the Zheleznogorsk Plutonium Production Elimination Project and Federal Project Director for the Seversk Plutonium Production Elimination Project for NA-20. He served in this line position for 5 years managing these projects through critical decisions establishing the cost range and baseline, and approving the start of construction. He is a certified level III project director for the Department of Energy.

Mr. Roberson holds a BS in Nuclear Engineering from the Georgia Institute of Technology, and a MS from the Industrial College of the Armed Forces. He has over 25 years' experience in the nuclear field. He spent the first years of his career at the E. I. Hatch, Nuclear Generating Facility of the Georgia Power Co, in Baxley, Ga in the reactor controls division during a refueling outage and subsequent startup. He then served in the Navy's Nuclear Power Program where he served as a division officer aboard a nuclear submarine completing overhaul, startup testing, and sea trials. He was certified as a Chief Nuclear Engineer by the Naval Reactors Branch of the DOE. As a result of his Navy and civilian experience, he has significant background in many areas of nuclear operations, maintenance, health physics, and nuclear design. He is qualified by the Department of Energy as a Senior Technical Safety Manager and was a significant contributor to the development of the Defense Programs readiness review process. He has served as a team member, team leader, and senior advisor for readiness reviews throughout the nuclear weapons enterprise.

**Patrick Cahalane** is the Deputy Director for the Office of Environment, Safety and Health, NA-00-10, NNSA Headquarters. He has been an Excepted Service, EN-05, since 2004. He has nearly 29 years of experience encompassing: safety oversight of high-hazard nuclear facility operations, including nuclear weapons facilities; international nuclear material protection (Russia); nuclear/radiological emergency response; accident/incident investigation; and aerospace human factors and system safety engineering. This includes 24 years of Headquarters, field and international experience with the DOE/National Nuclear Security Administration (NNSA). He was a qualified fissile material (plutonium) handler at the Los Alamos National Laboratory (LANL) Plutonium Facility (PF-4), with hands-on, operational MC&A experience in the PF-4 non-destructive assay laboratory and vault.

Mr. Cahalane is a DOE trained accident investigator, and served on a number of DOE accident/incident investigation committees while working at the Pantex Plant and LANL. This included serving as Chairman of a major ("Type B") DOE Incident Investigation Committee involving a radiologically contaminated shipment across multiple states. He was also a member of the NNSA Safety Culture Assessment Team led by Dr. Sonja Haber in 2013.

His prior positions/responsibilities include:

- Deputy Director for the Office of Nuclear Safety and Governance, NA-171, NNSA Headquarters

- Technical Lead for Authorization Basis, Office of the Chief of Defense Nuclear Safety, NA-2.1, NNSA Headquarters
- Technical Voting Member, LANL Contract Source Evaluation Board
- Senior Technical Advisor/Emergency Response Officer, Office of Emergency Operations, NA-40, NNSA Headquarters
- Director, Office of Nuclear Material Protection (Russian MPC&A Program), NA-252, NNSA Headquarters
- DOE Facility Representative/Team Leader, Plutonium Facility (PF-4) and Weapons Engineering Tritium Facility (WETF), LANL, Los Alamos, NM
- DOE Team Leader, Radiological Assistance Program (RAP) Team, Los Alamos, NM
- Senior Safety Engineer/Team Leader (nuclear safety and nuclear explosive safety), DOE Amarillo Area Office, Pantex Plant, Amarillo, TX
- Senior System Safety Engineer, General Dynamics Space Systems Division, San Diego, CA
- Captain/Engineer, U.S. Air Force, Air Force Operational Test and Evaluation Center, Kirtland, AFB, NM (served four years active duty and four years reserve duty)

Mr. Cahalane has a B.S. in Aerospace Engineering from the University of Virginia, Charlottesville (1983), and an M.S. in Industrial Engineering from Texas A&M University, College Station (1985). In 2012, he requalified as a Senior Technical Safety Manager (STSM), and completed Nuclear Executive Leadership Training (NELT).

**David George** currently serves the National Nuclear Security Administration (NNSA) as a Senior Facility Representative (FR) and the Los Alamos Field Office Nuclear Startup and Readiness Program Manager. As an FR, he is responsible for the day-to-day oversight and operational awareness for the Balance of Plant, which includes Nuclear Environmental Sites, Material Packing and Transportation, non-nuclear facilities, and utilities at the Los Alamos National Laboratory (LANL). Mr. George has over 33 years of professional engineering, leadership and management experience, including over 20 years with the U.S. Department of Energy. He has over 13 years of Facility Representative experience, having previously worked in this capacity at the Rocky Flats Plant, the Idaho National Engineering Laboratory, Brookhaven National Laboratory, and for Headquarters, DOE EM.

Dave also worked for over 7 years as a Project/Program Manager during the closure of Rocky Flats. As a Project/Program Manager, he supported DOE Headquarters and Rocky Flats management, performing reviews of Contractor data submittals, cost analysis, independent cost estimates, and scope validation.

Mr. George has participated on several DOE Readiness Assessment teams and has performed numerous Field Office and CDNS reviews. Mr. George has lead two site ISM annual assessments, at Rocky Flats and at the Office of River Protection. In addition, he has lead comprehensive laboratory wide assessments on safety basis and conduct of operations implementation at LANL and shadowed an arrangement of Contractor assessments (CRAs, IVRs). He has successfully lead multi-disciplinary teams during the reviews of project cost, baseline scope, and schedule validations. In his career, he has lead or participated in over 150 facility assessments, evaluating facility safety, security, environmental compliance, work control, readiness and conduct of operations.



His educational background includes a Bachelor of Science Degree in Engineering from the Colorado School of Mines and a Masters Degree in Environmental Management from the University of Denver. He is a graduate of the U.S. Army Command and General Staff College, a licensed Professional Engineer and a Registered Environmental Manager. He retired as a Lieutenant Colonel in the Army Corps of Engineers in 2006. Mr. George has been the recipient of over 50 military and civilian awards, including the Service to America Medal and the Department of Energy Secretary's Appreciation Award.

**Anika Khanna** is a General Engineer within the Office of Infrastructure and Operations and serves in an occupational safety role providing support to the Office of Environment, Safety and Health (NA-00-10). Ms. Khanna has over 10 years experience related to occupational safety and health. Prior to NA-00-10 Ms Khanna worked in the Office of Defense Programs, where she provided oversight and support to the NNSA site offices related to the DOE Worker Safety and Health Regulatory Program (10CFR851) and Chronic Beryllium Disease Prevention Program (10CFR850). Ms. Khanna has taken the DOE Accident Investigator training and is certified in Occupational Safety in the Technical Qualification Program. Prior to joining DOE, she worked as the lead Safety Officer at Sterigenics International, a national medical sterilization company at their location in Maryland. In her role at Sterigenics, she implemented a fully compliant Occupational Safety and Health (OSHA) program at the site and conducted training of all employees to maintain OSHA program requirements. Ms. Khanna has conducted several assessments both at Sterigenics and at DOE including operational readiness reviews, technical assist reviews, biennial reviews and quality assurance reviews. Ms. Khanna has a BS in Chemical Engineering from Stevens Institute of Technology, Hoboken, New Jersey.

**Dr. Kelli Markham** is the Chief of Nuclear Safety for the Office of Nuclear Energy (NE) where she advises the Assistant Secretary for NE and the Deputy Assistant Secretary for Nuclear Facilities Operations, in NE on nuclear safety. Prior to this, Kelli was a Director for the Environment, Safety and Health (ESH) Division for the Office of Science (SC), where she had headquarter-level ESH responsibilities for ten DOE-SC laboratories. Dr. Markham comes to DOE from the Nuclear Regulatory Commission where she was a Chemical Safety Reviewer and lead areas of the Mixed Oxide Fuel Fabrication Facility license application review. Also, she was the Project Manager and principal author of several white papers to the Commission on the development of regulations to license commercial reprocessing facilities. Kelli has a PhD in Organic Chemistry from the University of Iowa and prior to her civil service career, she was in academia as an Adjunct Faculty and an Assistant Professor, instructing at the graduate and undergraduate levels.

**Stephen J. Wallace** is a Senior Advisor with the National Nuclear Security Administration office of Safety and Health. In this capacity, he advises the Associate Administrator on various issues. He has participated in several safety assessments, and was the Executive Representative on the 2013 Nevada Enterprise Safety/Security Culture Assessment. Before joining NNSA, he held positions in the government as the Director of the Office of Environment, Safety, and Health at the Department of the Treasury and lead investigator with the United States Chemical Safety Board. During his tenure, Treasury received recognition by the Occupational Safety and Health Administration (OSHA) for having the lowest injury and illness rate in government and

was the only Department to receive green ratings from the Office of Management and Budget in all areas of environmental and energy performance. Before joining the government, Mr. Wallace held positions as a risk assessment consultant, production manager, safety and health manager, and process safety engineer in the chemical industry for facilities that were part of the OSHA Voluntary Protection Program, a program recognizing the safest facilities in the country. He also worked as a consultant on the DOE Performance Indicator program and developed reports for the Secretary of Energy related to the safety and environmental performance of facilities nationwide.

He has presented at numerous conferences, and has written several peer-reviewed journal articles on health, safety, and environmental issues, and the Best Practices book chapter for the Safety Professional's Handbook. He is a Certified Safety Professional, Professional Engineer registered in multiple states, and certified Senior Technical Safety Manager. He holds a B.S. in Chemical Engineering and a M.A. in Liberal Studies with a concentration in Social and Public Policy.