Operating Experience Summary

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On February 14, 2014, at 2314 hours MST (11:14 P.M.), an incident in the underground repository at the Department of Energy (DOE) Waste Isolation Pilot Plant (WIPP) resulted in the release of plutonium and americium from one or more transuranic (TRU) waste containers into the environment. Because access to the underground was restricted following the event, the decision was made to divide the Accident Investigation into two phases. Phase 1 focused on the radiological release to the atmosphere and the WIPP response to the resulting alarms, based on information available with access to the underground. Phase 2 was initiated after limited access to the underground was re-established and focused on the mechanism of release from the transuranic waste containers, waste treatment, sampling, forensics, and programmatic issues.

WIPP is a deep geologic repository, located approximately 27 miles east of Carlsbad, New Mexico, that was mined out of a thick bed of salt, for the disposal of defense TRU waste from the cleanup of DOE sites. The release was detected by an underground continuous air monitor (CAM), which monitors airborne radioactivity levels. Upon detection, the exhaust air flow was re-directed through high-efficiency particulate air (HEPA) filter banks located in the surface exhaust building. However, a measurable portion bypassed the HEPA via design leakage through two ventilation system dampers and was discharged directly to the environment from an exhaust duct. No personnel received external contamination, but 21 individuals tested positive for low levels of internal contamination. Trace amounts of plutonium and americium were also detected offsite. A Phase 1 Accident Investigation Board (Board) was appointed to determine the cause of the release. Based on the evidence gathered during this first phase of its investigation, the Board determined that the above-ground release was preventable. (ORPS Report EM-CBFO--NWP-WIPP-2014-0002)

Background, Management, and Regulatory

In December 1979, Public Law 96-164, *DOE National Nuclear Security and Military Applications of Nuclear Energy Authorization Act*, authorized DOE to provide a research and development facility to demonstrate the safe, permanent disposal of TRU wastes generated from national defense activities. Public Law 102-579, *WIPP Land Withdrawal Act*, authorized the disposal of 6.2 million ft^3 of defense TRU waste at a geologic repository mined within a bedded salt formation (i.e., WIPP). WIPP is 120 acres and 2,150 feet underground. The DOE Carlsbad Field Office (CBFO) is responsible for oversight of the WIPP management and operations (M&O) contract and the National TRU Program. In April 2012, DOE awarded the M&O contract to Nuclear Waste Partnership, LLC (NWP), a partnership between Utility Revenue Services (URS) Energy and Construction, Inc.; the Babcock & Wilcox Company; and Areva, Inc. Because the previous M&O (2000–2012) comprised URS and Weston Solutions, Inc., management did not undergo a substantial change when NWP took over the contract in the fall of 2012.

The WIPP facility operates in the four regulatory spheres described below.

- DOE has regulatory authority for safety of facility operations (including radiological operations) and must ensure WIPP is designed, operated and closed in a manner that complies with disposal regulations.
- The Environmental Protection Agency (EPA) is responsible for certifying DOE's determination that the radiological performance of the repository will comply with disposal regulations for the 10,000-year post-closure compliance period. DOE's determination and EPA's certification must be reaffirmed every five years until the decommissioning phase ends.
- The State of New Mexico Environment Department, through EPA delegation of the Resource Conservation and Recovery Act, issued a Hazardous Waste Facility Permit for the disposal of the hazardous waste component of the TRU waste.
- The Mine Safety and Health Administration is required, in accordance with the WIPP Land Withdrawal Act, to perform four inspections per year at WIPP.

Operations

The principal contact-handled (CH) waste operations performed at WIPP involve: (1) mining of underground rooms to provide space for waste emplacement; and (2) receipt and disposal/storage of TRU waste. The facility is designed for excavation of eight panels branching off the main drifts, or halls, using "just-in-time" excavation. Each panel contains storage rooms that are filled, back to front. Figure 1-1 shows the layout. This means that when a new room is needed for disposal, a new panel is excavated, so that the excavation-fill-closure process is performed in a time frame to minimize the potential for developing hazardous ground conditions. Excavation is performed by a mining machine with a rotary head. The mined-out salt is loaded onto trucks and hauled to a loading area, where a hoist

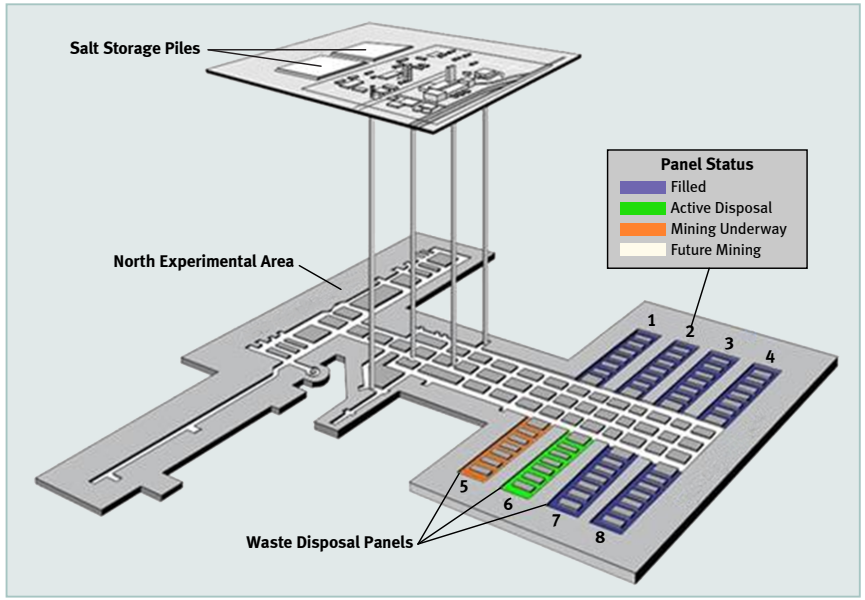

Figure 1-1. Panel and room layout in the underground

takes it to the surface. CH waste containers are then moved into the newly-created disposal rooms, and remote-handled (RH) waste is placed in boreholes in the walls (ribs) of the rooms. After limited access to the underground was reestablished, it was determined that the radiological release occurred in Panel 7, Room 7. CH and RH wastes were being placed into Panel 7 during January and February 2014 when the event occurred.

The Event — Work Location and Activity

No employees were working in the underground at the time the alarms sounded (2314 hours), but 11 people were working on the surface. After receiving the alarm, the Central Monitoring Room (CMR) operator made the proper notifications and disabled CAM 151, the only in-service CAM in the underground. Refer to the text box on the following page for background on recent CAM 151 activity.

Ventilation and CAM 151 after the February 5, 2014, Truck Fire

After the underground salt haul truck fire on February 5, 2014, underground ventilation was placed in maintenance bypass mode without HEPA filtration until February 10, when underground ventilation was placed back into HEPA filtration mode. That same day, the ventilation had to be placed in maintenance bypass mode to allow for testing of CAM 151. When CAM 151 failed the test, ventilation returned to HEPA filtration. On February 12, when the CAM was placed back into service, alternate ventilation was established.

On February 14, operations checks performed on CAM 151 at 1415 hours indicated that the CAM was satisfactory. Just before midnight, however, CAM 151 emitted a HI RAD alarm, and the ventilation system automatically shifted to HEPA filtration. Twenty minutes later, the CMR Operator disabled CAM 151 because of a malfunction indication. Because of its recent history, the assumption was made that CAM 151 malfunctioned when a radiological release had actually occurred. Conduct of Operations requires that operators believe their indicators and respond accordingly.

Ventilation continued to pass through the HEPA filters, and Radiological Control Technicians (RCT) collected filters from upstream and downstream effluent sampling stations. There were no other CAMs in the underground or on the surface monitoring the exhaust. The Board determined that there should have been additional CAMs operating, but since the CAMs currently in the underground possess the lowest functional safety classification (Balance of Plant) and can be taken out of service without prior DOE or NWP approval, the underground had been left with no real-time monitoring capability. The next morning when filters were counted at 0715 hours, preliminary data indicated the presence of TRU material, and filters "downstream" indicated both alpha and beta contamination. This was the first indication that there had been a release of contamination to the environment. At approximately 0934 hours, an announcement was made to shelter-in-place (153 working on the surface and none in the underground). The Alternate Emergency Operations Center in Carlsbad was partially activated at 1333 hours but not staffed and operational until 1449 hours. Approximately 1 hour later, two stations reported that filter analysis indicated the presence of plutonium and americium, but there was no release to the environment.

The emergency was terminated at 1917 hours on February 16. Bioassay was subsequently performed on 150 personnel to determine if there had been any intakes of airborne contamination. As of March 28, 2014, positive bioassay results had been received for 21 personnel.

Three days later, on February 19, radiological results from a volume air sampling station 0.6 miles northwest of WIPP were reported with levels indicating a small release of radioactive particles. (Station filters had been in place from February 11 to February 16.) On March 7 and 8, radiological and air quality instruments were lowered into the underground to check for airborne radioactivity. Preliminary sample results indicated no contamination. On March 18 – a full month after the initial alarms – a DOE press release reported that new air sample data indicated a small release had occurred on March 11. A series of workforce and public meetings was held after the February 14 event.

Findings and Recommendations

Based on the evidence gathered during its investigation, the Board determined that the unfiltered above-ground release was preventable. The Board concluded that a thorough and conservatively considered hazard analysis, coupled with a robust, tested, and well-maintained HEPA-filter capable exhaust ventilation system, could have prevented the unfiltered above-ground release.

The Board identified the *direct cause* as the breach of at least one TRU waste container in the underground, which resulted

in the airborne radioactivity escaping to the environment downstream of the HEPA filters. Because access to the underground was restricted, the exact mechanism of container failure, (i.e., back or rib fall; puncture by failed roof bolt) was unknown at the time of the Phase 1 report and needed to be determined after access to the underground was restored.

The Board identified the *root cause* as NWP and CBFO management's failure to fully understand, characterize, and control the radiological hazard. The cumulative effect of inadequacies in ventilation system design and operability, compounded by degradation of key safety management programs and the safety culture, resulted in the release of radioactive material and the delayed/ineffective recognition of and response to the release.

The Board identified eight contributing causes to the release or the resultant ineffective response. The four most pertinent to this article are described below.

- NWP did not have an effective Nuclear Safety Program in accordance with 10 Code of Federal Regulations 830, Subpart B, *Safety Basis Requirements*. For example, there had been a reduction in the conservatism in Documented Safety Analysis (DSA) hazard analysis and corresponding Technical Safety Requirement (TSR) controls over time, commencing in late 2009. The DSA and TSRs contained errors that indicated lack of rigorous internal and peer review, and TSR documentation was not controlled with the rigor usually associated with a Hazard Category 2 nuclear facility.
- NWP did not have an effective maintenance program. The condition of critical equipment and components, including CAMs, ventilation dampers, fans, and sensors, were degraded to the point where the cumulative impact on overall operational readiness and safety was not recognized or understood.
- The site safety culture did not fully embrace and implement the principles of DOE Guide 450.4-1C, *Integrated Safety Management Guide*, indicated by a lack of a questioning attitude, reluctance to bring up and document issues, and an acceptance and normalization of degraded equipment and conditions that indicated a chilled work environment. This was supported by results of the 2012 Safety Conscious Work Environment (SCWE) survey.
- Execution of DOE Headquarters and CBFO oversight was ineffective. CBFO failed to establish and implement adequate line management oversight programs and processes and hold personnel accountable. CBFO had insufficient nuclear safety management/staffing since the 2010 time frame when the Authorization Basis Senior Technical Advisor (STA) retired, and lacked adequate Nuclear Safety staff to perform reviews.

Primary Issues Identified by the Board — Conclusions and Judgments of Need

Based on the results of the investigation, the Board identified 31 Conclusions (CON) and 47 Judgments of Need (JON). CONs are derived from the analyses to determine what happened and why it happened; JONs are the managerial controls and safety measures necessary to prevent or minimize the probability of recurrence. The Board assigned CONs and JONs in eight areas: Nuclear Safety; Emergency Management; Safety Culture; Conduct of Operations; Maintenance; the NWP Contractor Assurance System; CBFO Oversight; and DOE-HQ Oversight. Discussion follows for four of the eight pertinent areas; more information is available in the Board's Phase 1 Report linked at the end of this article.

Nuclear Safety

The key focus of the Board's analysis of nuclear safety was to confirm that the WIPP DSA adequately evaluated hazards/accidents and established safety controls (as related to the February 14 release). The Board also sought to confirm whether the nuclear safety program ensured that the safety

basis was kept up to date and was subject to a thorough independent review.

The Board found that the DSA was missing evaluations of some hazards/accidents. Consequently, the DSA did not ensure a comprehensive evaluation of Safety-Significant, Safety Class, or other equipment important to safety. The descriptions of the underground and Panel 7, Room 7, where TRU waste was being emplaced were consistent with known conditions. Most scenarios could not be evaluated until more was known about the February 14 event and access to the underground was restored, so the Board could not make direct comparisons.

The DSA (Rev. 4) did not credit the CAM-initiated automatic transfer to HEPA filtration for the underground ventilation system. More importantly, the hazard analysis did not identify CAMs and HEPA filtration as an effective mitigative control. This was not consistent with DOE-STD-3009, *Preparation of Nonreactor Nuclear Facility Documented Safety Analysis*, regarding identification of all available preventive and mitigative controls so they can be evaluated. In general, the Board noted that Revisions 3 and 4 of the DSA resulted in a significant reduction in the level of conservatism. Examples include eliminating RH hot cell shielding as a Safety Significant Design feature; eliminating the Ground Control Program Control; eliminating underground design features that prevent explosions; eliminating waste hoist inspection controls; and eliminating 15 of 22 Design Basis Accidents without providing justifications for the change.

The Board also found that the exhaust HEPA filtration and bypass isolation valves were not credited in the safety basis documents because it was (incorrectly) believed that a large release would never occur. In 2005, the Confinement Ventilation System (CVS) was designated as Safety Significant because it would direct airflow away from workers in the underground. When the existing CH and RH TRU waste safety documents were combined in September 2008, however, the new DSA reduced the classification of the underground CVS to "Balance of Plant," meaning that it was no longer credited for worker protection. It is notable that among the bounding accidents in the 2008 DSA was a *roof fall accident in an active panel* that would result in low consequences to facility workers, high consequences to co-located workers, and moderate consequences to the public.

In addition, because only small releases from waste handling were believed to be credible, ground control program preventive controls were deemed sufficient and safety-related mitigative controls for the larger releases in the underground were deemed unnecessary. As a result, the HEPA ventilation system and its associated bypass isolation dampers were not designated as credited safety-related equipment, and the damper design was not required to meet requirements in the nuclear industry ventilation code, ASME AG-1-2012, *Code on Nuclear Air and Gas Treatment*. This decision resulted in the HEPA bypass isolation damper configuration not being equally efficient to the HEPA filters or suitable as a containment boundary, and resulted in the unfiltered release to the environment.

Maintenance

The Board found that equipment maintenance was not prioritized unless there was an immediate impact on the waste emplacement process. Without consideration for the cumulative impact of degraded equipment over time, critical pieces of equipment have not been maintained in a high state of operational readiness. Out-of-service equipment was tolerated or justified (e.g., lack of funding to fix it). Without a clear approach to prioritizing maintenance, many items have been out of service or in a reduced status for more than 6 months.

The WIPP underground presented a harsh environment for equipment even with the best maintenance schedule. The high dust environment exacerbated CAM problems because they were

designed to be used in a relatively dust-free environment. Instead of more frequent checks and maintenance, however, some of them had been out of service for extended periods. The underground also presented an atmosphere with humid, salty air that accelerated corrosion of components in the ventilation system that was enhanced by water intrusion below the surface in the exhaust shaft. Neither the water intrusion nor the corrosion was effectively evaluated and mitigated. Salt had built up on bypass dampers, reducing their effectiveness.

The 401 door from the air intake shaft and the 504 bulkhead door to the Salt Handling Shaft had been chained open for a long period and could not be operated remotely from the CMR in their chained condition. The BHR-707 bulkhead regulator remote control had been out of service for more than a year, even though it was required to be closed upon shifting to filtration. Manual closure was necessary and, as a compensatory measure, NWP had adopted a practice to close it "before the last occupant leaves the underground." All three 860 fan vortex dampers drifted closed during fan operation due to vibration. But instead of determining the cause and fixing the fans, NWP installed latches to prevent the vortexes from closing. Records did not demonstrate that required monthly functional testing was performed on sensors. Individuals stated in interviews that performance testing was sometimes delayed based on fear that the equipment would fail and, as a result, waste emplacement activities would have to be stopped.

Configuration management (CM) issues also complicated maintenance. CM is a disciplined process that establishes and documents design requirements and physical configuration to ensure they remain consistent with each other and the documentation. Adherence to a CM program ensures that changes and modifications are reviewed and documented. The Board found that the NWP engineering process was not effective in maintaining configuration control of key systems. Changes were not adequately justified; NWP lacked a clear approach to prioritizing maintenance activities; and there was no formal process to identify effective compensatory measures other than posting a fire watch.

Safety Culture

Production and prevention practices always compete in workers' minds, and it is normal for production behaviors to take precedence over prevention behaviors unless there is a strong safety culture nurtured by strong leadership. Visions, values, and beliefs must be clearly communicated and constantly reinforced with more than policies, procedures, or posted signs. Leaders must reinforce with observation and coaching at all levels of the organization, including walking around to observe operations first-hand. Within DOE, most serious events do not occur during complex or high hazard operations or when new facilities open or operations are performed for the first time. During those times, many people are involved, everyone is paying attention, things move slowly, and everyone is mindful. The leadership challenge is to establish and reinforce the safety culture so that workers are mindful during all operations, the daily and mundane, and ensure that workers are comfortable raising issues that involve their safety.

The Board reviewed results of the 2012 SCWE survey, which was completed in January 2013. That survey found that both NWP and CBFO personnel held a widespread aversion to reporting deficiencies and issues; that personnel felt there were weaknesses in clear expectations and accountability; and that there was a chilled work environment. Some specific examples cited in the report are listed below.

- Employees were reluctant to raise safety issues to management and cited examples of retribution against those who had raised issues.
- DOE had exacerbated the problems of non-reporting by using information provided by lessons learned systems, such as the

Occurrence Reporting and Processing System (ORPS), during contract bid evaluations and misrepresenting reporting as negative in order to give poor scores on award fee determinations. Such actions drive the contractor to a culture of non-disclosure and under-reporting.

- A lack of consideration for employee feedback and critical thinking resulted in weaknesses in teamwork, mutual respect, and participation in work planning and control.
- Eighteen emergency management drills and exercises were cancelled in 2013 because they would have impacted operations. This was a lost opportunity to advance organizational learning to identify and improve on issues related to the emergency management program.
- Contractor conducted management assessments focused on cost and schedule instead of organizational weaknesses and correcting issues in order to improve safety performance, sending the message that safety is not a priority.
- Based on a review of the entry logs, the Board found that NWP management and CBFO made very few entries into the underground, although the CBFO Manager made more entries than his staff.
- Recent revisions to the DSA have resulted in a significant reduction in the level of conservatism by *eliminating* the following elements: hot cell shielding as a safety significant design feature; ground control program specific administrative control; explosion-prevention features in the underground; waste hoist inspection; and 15 of 22 Design Basis Accidents without any justification.

The Board determined that weaknesses in the WIPP safety culture were apparent in the response to the radiological leak including the following: failure to recognize the release; failure to don proper Personal Protective Equipment at Sample Station B; failure to follow procedures in response to alarms; out-of-service equipment; and reluctance to document operational problems because "nothing ever changes."

Contractor and Federal Oversight: NWP (Contractor)

The Board found that NWP has numerous policies, procedures, and tools for conducting supervision and oversight of work. However, there had been no formal assessments of the DSA/TSR development process in the past few years by NWP or the previous contractor. This did not meet the expectation of the requirement for reviews and audits. The Board reviewed the NWP implementation and found issues that had not been corrected, including the five listed below.

- Multiple external reviews identified deficiencies in Work Planning & Control, Emergency Management, and Fire Protection, but the deficiencies had not been corrected or the corrective actions were insufficient.
- Post-drill emergency exercises did not identify deficiencies in the emergency response program, such as functionality of egress strobe lights and the public address system.
- Combustible material was allowed to exceed specified quantities in some areas of the underground.
- More than 30 emergency lights in the Waste Handling Building had been inoperable for as long as 2 years.
- Twelve of the 40 mine phones were found to be non-functional in a spot check performed by the Board during the initial investigation (between February 9 and 14) into the salt haul truck fire.

The Board found that overall, NWP expended considerable resources performing oversight activities, but most of those activities focus on waste management and Quality Assurance (QA) activities to ensure that permit requirements were met. Management assessments were ineffective and focused primarily on cost and schedule. No system provided assurance

to both NWP and DOE that work was performed compliantly, risks were being identified and managed, and control systems were effective and efficient. Corrective actions from previously identified assessments were not effective in preventing or minimizing recurrence.

Contractor and Federal Oversight: CBFO and HQ (Federal)

CBFO developed an annual Integrated Evaluation Plan (IEP) that was used to plan and track evaluations and assessments across many project-related areas. The Board reviewed several IEPs from previous years and interviewed CBFO management and oversight staff, whose backgrounds include Facility Representatives, systems engineering, underground operations, waste operations, work control, QA, and electrical safety, among others. Some IEPs had not been completed as scheduled, and other completed assessments provided no supporting documentation. The Board also reviewed records to determine how often the management and staff had entered the underground. Records for the past year indicated many of the technical/oversight staff had been in the underground only a few times, sometimes with a tour group, but not to perform oversight or assessments.

CBFO reports to the Office of Environmental Management at DOE Headquarters, but the managers there indicated that, although they have a role in influencing actions related to funding or other resources, few of them believed they were responsible for ensuring the adequacy of their actions related to project performance. In addition, declining budgets have affected support and assist visits to the site, and requests for additional full-time equivalent (FTE) employees have been turned down. The Board noted that it took more than a year to fill the Deputy Manager position. After reviewing budget requests and the budget process, the Board concluded that, given the problems with maintenance and configuration management, DOE should review its current budget process and determine whether improvements are necessary to ensure funding.

The CBFO organization has undergone several changes over the past few years, resulting in positions being "acting," detailed to other organizations, or abolished. Feedback from CBFO personnel indicated that the working environment was unpleasant, and results of the 2011 Employee Value Survey indicated that more than 71 percent of CBFO employees did not have a high level of respect for their leaders. In the recent SCWE survey, 59 percent of CBFO staff answered "somewhat" and "yes" to the existence of a chilled work environment. Others indicated that, although the current Manager and Deputy Manager are working to turn around the negative effects of the past, it is difficult to change old practices. For example, there was a strong perception that CBFO directors do not welcome negative findings. CBFO staff must follow-up on corrective actions from NWP individually, instead of getting timely responses in accordance with site corrective action processes, and there was no effective mechanism to convey documented issues to the contractor.

Since 2010, the CBFO individual responsible for overseeing nuclear safety was not nuclear-safety-qualified. That individual was reassigned in 2011, and since then, the CBFO Manager has relied on other CBFO staff to serve as the STA for case-by-case reviews of DSA/TSR changes. The Board noted that none of the staff assigned since 2011 has been nuclear-safety-qualified. As a result, there was a lack of robustness in the required CBFO technical review of DSA/TSR changes and annual updates.

The inability of the Board to access the underground following the incident prevented definitive determination of the physical cause of the breach/failure of the waste containers at the time of the investigation. NWP and CBFO implemented a detailed recovery plan to reenter the underground and determine cause(s).

Phase 2 Investigation

After access to the underground was possible, the Board commenced Phase 2 of its investigation and submitted its final report on March 31, 2015. Based on evidence gathered and analyzed during Phase 2 of the investigation, the Board determined that the release from the containers was preventable. If Los Alamos National Laboratory (LANL) had adequately developed and implemented repackaging and treatment procedures that incorporated suitable hazard controls and included a rigorous review and approval process, the release would not have occurred.

Among many processes and issues, the Board reviewed the LANL processes and procedures for packaging and waste characterization, the Unreviewed Safety Question process for new/proposed materials, and the levels of oversight that those processes received. The Board also reviewed and found deficiencies in the historical programs and processes that collected and brought materials to WIPP, including acceptable knowledge designation and record-keeping, and the Federal oversight. The Board reviewed programs including Radiological, Fire Protection, Integrated Safety Management, and Nuclear Safety. It also reviewed development and implementation of the Basis for Interim Operations, DSA, hazards analyses, and implementation of requirements, such as the Resource Conservation and Recovery Act.

Causes, CONs, and JONs

Based on additional information available during the Phase 2 investigation, the Board determined that the *direct cause* of the accident was an exothermic reaction of incompatible materials in the LANL waste drum that led to thermal runaway, which resulted in over-pressurization of the drum, breach of the drum, and release of a portion of the drum's contents (combustible gasses, wastes, and wheat-based absorbent) into the underground.

The Board determined that the local *root cause* was the failure of the contractor, Los Alamos National Security, LLC (LANS), to understand and effectively implement the LANL Hazardous Waste Facility Permit and the Carlsbad Field Office-directed controls. Specifically, LANL's use of organic, wheat-based absorbent instead of the directed inorganic absorbent such as kitty litter/zeolite clay in the glovebox operations procedure for nitrate salts resulted in the generation, shipment, and emplacement of a noncompliant, ignitable waste form. The systemic root cause was determined to be deficiencies in management.

The Board identified 12 *contributing causes*, including the four highlighted below.

- Failure of LANS to implement effective processes for effective procedure development, review and change control.
- Failure of the contractors and Federal Field Office to ensure that a strong safety culture existed.
- Failure of the Los Alamos Field Office to establish and implement adequate line management oversight of programs and processes.
- Failure of LANS to develop and implement adequate processes for hazard identification and control.

The Phase 2 report presented 24 CONs and 40 JONs.

More information about the event and the Board's Findings and Recommendations is available in the Board's Phase 1 and Phase 2 Accident Investigation reports, which can be accessed via the links below.

Phase 1: http://energy.gov/sites/prod/files/2014/04/f15/Final%20WIPP%20Rad%20Release%20Phase%201%2004%2022%202014_0.pdf

Phase 2: http://energy.gov/sites/prod/files/2015/04/f21/WIPP%20Rad%20Event%20Report%20Phase%202%2004.16.2015.pdf

KEYWORDS: Waste Isolation Pilot Plant, WIPP, transuranic waste, TRU waste, HEPA filters, underground, release, CBFO, Safety Conscious Work Environment, SCWE, maintenance, nuclear safety, safety culture, oversight, acceptable knowledge, waste characterization, absorbent, Unreviewed Safety Question, USQ, nitrate salts, thermal runaway, exothermic reaction

ISM CORE FUNCTIONS: Define the Scope of Work, Analyze the Hazards, Develop and Implement Hazard Controls, Perform Work within Controls, Provide Feedback and Improvement

The Office of Environment, Health, Safety and Security (AU), Office of Analysis publishes the *Operating Experience Summary* to promote safety throughout the Department of Energy (DOE) Complex by encouraging the exchange of lessons-learned information among DOE facilities.

To issue the Summary in a timely manner, AU relies on preliminary information such as daily operations reports, notification reports, and conversations with cognizant facility or DOE field office staff. If you have additional pertinent information or identify inaccurate statements in the Summary, please bring this to the attention of Ms. Ashley Ruocco, (301) 903-7010, or e-mail address ashley.ruocco@hq.doe.gov, so we may issue a correction. We would like to hear from you regarding how we can make our products better and more useful. Please forward any comments to Ms. Ruocco at the e-mail address above.