

**Office of Enterprise Assessments Review
of the
Waste Isolation Pilot Plant
Conduct of Maintenance Recovery Plan**



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**Office of Nuclear Safety and Environmental Assessments
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EXECUTIVE SUMMARY

The Office of Nuclear Safety and Environmental Assessments, within the U.S. Department of Energy's independent Office of Enterprise Assessments (EA), conducted a limited scope review of the current status of Waste Isolation Pilot Plant (WIPP) plans and activities outlined in the WIPP Recovery Plan in the area of Conduct of Maintenance and the associated planned maintenance program enhancements, including engineering support programs. The onsite portion of the review occurred during June 23-27 and July 21-25, 2014.

This review of Conduct of Maintenance is one step in a multi-phased comprehensive review of WIPP's and EM/CBFO's approach to corrective actions and recovery. EA has made it one of its highest priorities to provide the necessary independent oversight to ensure the recovery of WIPP is safely performed in accordance with existing requirements to ensure the health and safety of the workers, public and environment. As WIPP recovers and transitions to operational activities, EA's oversight will also include a comprehensive review of WIPP's operations, as requested by the Acting Assistant Secretary for Environmental Management, to ensure that WIPP has established and maintains the necessary safety management programs and infrastructure to safely conduct full operations.

WIPP, managed and operated by Nuclear Waste Partnership, LLC, (NWP) is the nation's only deep geologic repository for permanent disposal of defense generated transuranic waste, which is long-lived and must be isolated to protect public health and the environment. On February 5, 2014, an underground mine fire involving a salt haul truck occurred at the WIPP site. On February 14, 2014, WIPP experienced an underground radioactive release of americium and plutonium from one or more transuranic waste containers. The subsequent Accident Investigation Board reports identified a number of deficiencies in the WIPP maintenance program. In response, NWP developed two Corrective Action Plans and a resource loaded recovery schedule, all of which have been submitted to CBFO and are in various stages of approval and implementation.

Based on its review of its current status and progress to date, EA determined that the NWP plan for enhancing Conduct of Maintenance was adequately justified and appropriately scheduled, the required initial recovery activities effectively managed, early deliverables were provided on schedule, and the revised or new content generally satisfied the required corrective actions. Currently, the WIPP maintenance program is undergoing substantial revision in organization, processes, documentation, and required training to address the corrective actions. Further, timely implementation of normal maintenance program processes has been impacted by the need to focus on required event recovery activities. As a result, the adequacy of the WIPP Conduct of Maintenance Recovery effort cannot yet be fully assessed and will need to be reevaluated by EA after the program stabilizes and normal implementation processes resume.

Although the program is evolving, EA's limited review of aspects of the NWP maintenance and engineering programs identified two cases in which NWP did not fully meet requirements of DOE directives. Specifically, NWP had not performed an assessment of the maintenance program every three years as required and has not performed periodic assessments of all engineered safety systems. EA also identified opportunities for improvement for NWP consideration in such areas as predictive maintenance, documentation of annual system walkdowns, documentation of system health reports, and timely evaluation of impaired equipment.

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Acronyms

AIB	Accident Investigation Board
AR	Action Request
CBFO	Carlsbad Field Office
CE	Cognizant Engineer
CSE	Cognizant System Engineer
DOE	U.S. Department of Energy
EA	Office of Enterprise Assessments
EM	Office of Environmental Management
HEPA	High Efficiency Particulate Air
JHA	Job Hazard Analysis
JON	Judgment of Need
M&O	Management and Operations
NMMP	Nuclear Maintenance Management Program
NP	Noteworthy Practice
NWP	Nuclear Waste Partnership, LLC
OFI	Opportunity for Improvement
O&M	Operations and Maintenance
SMP	Safety Management Program
SSC	Structures, Systems and Components
TRU	Transuranic
VSS	Vital Safety System
WC	Work Control/Maintenance Programmatic Enhancement
WCD	Work Control Document
WIPP	Waste Isolation Pilot Plant

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1.0 PURPOSE

The U.S. Department of Energy (DOE) Office of Nuclear Safety and Environmental Assessments, within the independent Office of Enterprise Assessments (EA), conducted a review of the Waste Isolation Pilot Plant (WIPP) plans and activities outlined in the WIPP Recovery Plan-Conduct of Maintenance power point presentation and the associated planned maintenance program enhancements outlined in the WIPP Recovery Project-Preliminary Performance Measurement Baseline, Books 1 & 2. The Recovery Plan was developed to guide resolution of maintenance program related deficiencies and shortcomings identified in the February 5, 2014, Underground Salt Haul Truck Fire and February 14, 2014, Radiological Release Event Accident Investigation Board (AIB) reports; in the March 5, 2014, Carlsbad Field Office (CBFO) audit report of the Nuclear Waste Partnership, LLC (NWP) calibration program; and by NWP staff through self-identification. The purpose of this EA assessment effort was to evaluate the adequacy of the scope, content and initial implementation of the WIPP Conduct of Maintenance Recovery Plan to ensure that safety related structures, systems, and components (SSCs) continue to be maintained operable, reliable, available and in good material condition to perform their intended safety functions.

2.0 SCOPE

This EA review was limited to an assessment of the adequacy of the NWP plans to enhance Conduct of Maintenance and related engineering support, and their initial implementation activities to address resolution of program deficiencies and short-comings identified in the two 2014 WIPP AIB reports, the report of the 2014 Carlsbad Field Office (CBFO) audit of the NWP calibration program, and NWP self-identification.

3.0 BACKGROUND

WIPP is the nation's only deep geologic repository for permanent disposal of defense generated transuranic (TRU) waste, which is long-lived and must be isolated to protect public health and the environment. WIPP was constructed in the 1980s for disposal of TRU waste in rooms 2,150-feet underground mined from an existing 2,000 foot thick salt bed. WIPP has been the disposal site for legacy TRU waste since 1999, facilitating cleanup of 22 generator sites nationwide. The WIPP site is located in southeast New Mexico about 26 miles from Carlsbad and is managed and operated by NWP. The CBFO manages the DOE's National TRU Program Office and the WIPP program.

On February 5, 2014, an underground mine fire involving a salt haul truck occurred at the WIPP site. The fire is believed to have originated in the truck's engine compartment when hydraulic fluid and/or diesel fuel contacted hot surfaces on the truck, possibly the catalytic converter, and then ignited. The AIB identified the root cause of this accident as: (1) the failure of NWP and the previous management and operations (M&O) contractor to adequately recognize the hazard of a fire in the underground area and mitigate it by recognizing and removing the buildup of combustibles through inspections and conducting periodic preventative maintenance (e.g., cleaning), and (2) the decision to deactivate the automatic onboard salt haul truck fire suppression system.

On February 14, 2014, an underground radioactive release of americium and plutonium from one or more TRU waste containers was detected by an underground continuous air monitor, which triggered the mine exhaust system to be directed through high-efficiency particulate air (HEPA) filter banks located in the surface exhaust building. However, a measurable portion of the exhaust bypassed the HEPA filters via design leakage through two ventilation system dampers and was discharged directly to the environment through an exhaust duct. Trace amounts of americium and plutonium were detected off site. The AIB 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.

Together, the subsequent AIB reports identified a number of deficiencies in the NWP maintenance program, including:

- Inadequate expectations for performing rigorous equipment inspections and preventive maintenance in accordance with manufacturer recommendations; establishing technical requirements; taking corrective action; and trending deficiencies.
- Ineffective management of the quantity, duration, and integrated impact of out-of-service or degraded equipment.
- Inadequate process for ensuring comprehensive and timely evaluation of the cumulative impact on overall operational readiness and safety of impaired or out-of-service equipment and effectively prioritizing resolution.

This review of Conduct of Maintenance is one step in a multi-phased comprehensive review of WIPP's and the Office of Environmental Management (EM)/CBFO's approach to corrective actions and recovery. EA has made it one of its highest priorities to provide the necessary independent oversight to ensure the recovery of WIPP is safely performed in accordance with existing requirements to ensure the health and safety of the workers, public and environment. As WIPP recovers and transitions to operational activities, EA's oversight will also include a comprehensive review of WIPP's operations, as requested by the Acting Assistant Secretary for Environmental Management, to ensure that WIPP has established and maintains the necessary safety management programs and infrastructure to safely conduct full operations.

4.0 METHODOLOGY

EA assessed the needed scope of maintenance program enhancements and the adequacy of resolution plans and activities by reviewing the AIB reports for the underground salt haul truck fire and the radiological release, the CBFO audit report for the NWP calibration program, draft corrective action plans, and multiple revisions of the *Integrated Recovery Plan for WIPP Haul Truck and Radiological Release Events Schedule* (Integrated Recovery Plan Schedule). To understand the current state of the NWP maintenance program, EA also reviewed the DOE-approved WIPP Nuclear Maintenance Management Plan (NMMP) and selected current maintenance and engineering program procedures and documentation, and interviewed selected NWP maintenance and engineering and CBFO oversight personnel. Assessment of the adequacy of plan implementation was limited to interviews, observation of two pre-job briefings and a Senior Management Review Board, review of all revised and new maintenance program procedures, and observation of several interactive procedure reviews. The scope of this review did not include work observation because contamination of the underground mine has limited access to only essential personnel.

Selected objectives and criteria from the following sections of Criteria, Review and Approach Document 45-11, Revision 3, *Safety Systems Inspection Criteria, Approach, and Lines of Inquiry*, were used in performing this review:

- IV. Maintenance
- VII. Cognizant System Engineer and Safety System Oversight.

The members of the EA team are listed in Appendix A. A detailed list of the relevant documents reviewed, personnel interviewed, and observations made during this review is provided in Appendix B.

5.0 RESULTS

5.1 NWP Maintenance Program

The overall objective for the maintenance program is:

Objective: *Maintenance activities are properly planned, scheduled, and performed to ensure that safety systems can reliably perform intended safety functions when required.* (DOE Order 433.1B, Attachment 2, Paragraph 2.d).

The AIB reports on the salt haul truck fire and the radiological release clearly document that NWP maintenance activities were not sufficiently planned, scheduled, and performed to ensure that equipment remained operable and available to reliably perform their intended safety function when required. As a result, the WIPP maintenance program is undergoing substantial revision in organization, processes, documentation, and required training to address corrective actions for the deficiencies identified in the AIB reports and in previous program implementation assessments, such as the CBFO instrument calibration program audit discussed at the end of this section. Further, timely implementation of normal maintenance program processes for reviewing, prioritizing, planning, scheduling, coordinating, supervising, performing, and assessing the performance of corrective and preventive maintenance and calibration activities has been impacted by the need to focus organizational attention, effort, and time on the required event recovery activities. Therefore, the adequacy of the overall WIPP maintenance program cannot be fully assessed until the program stabilizes and normal implementation processes resume later this year.

Action Requests (ARs) are used to initiate processes for maintenance activities. If an AR is accepted by the Work Control Responsible Manager, the scope is developed, and the work window and planning level are assigned. The three work planning levels are minor maintenance, planned work, and expedited work. A planner or a planning team develops the Work Control Document (WCD) and Job Hazard Analysis (JHA). New and revised procedures were developed and are scheduled to be implemented later this year; if properly implemented; these procedures will substantially enhance the processes for developing JHAs and prioritizing planning, and scheduling maintenance. In addition, a Work Control Center was recently established on site as a central location for processing, storing, and distributing WCDs.

Recently, CBFO identified performance issues in effective implementation of the WIPP work control process for some high-hazard/high-risk work activities, including concerns related to the development, verification, validation, and review of WCDs. In response to direction from the Contracting Officer's Representative, NWP began implementing a new management directive, *Assignment of Work Activity Champions*, which assigns Champions to be responsible for facilitating the necessary discussions and interactions during the work control process for identified high-hazard/high-risk work activities to ensure that the hazards and controls are adequately identified and controlled. EA observed a pre-job briefing for a high-hazard/high-risk work activity and found that the assigned Champion was effective in ensuring needed interactions and discussions.

Criterion #1: *The Nuclear Maintenance Management Plan (NMMP) is compliant with DOE Order 433.1B. (DOE Order 433.1B, Attachment 2, Section 1).*

The WIPP NMMP was last approved in April 2011 and thus, in accordance with DOE Order 433.1B, was required to be updated and submitted for DOE review and approval by April 2014. The NWP maintenance program manager was developing this update when the fire and radiological release events occurred, forcing a postponement of that effort. NWP is currently operating under DOE/WIPP-06-3335, *Waste Isolation Pilot Plant Nuclear Maintenance Management Plan, Rev-3*, dated August 26, 2013, which was a contractually required revision of the 2011 approved NMMP reflecting the change in the WIPP M&O contractor. In response to NWP's request for an extension of the due date for the NMMP submittal, CBFO directed that the revised submittal schedule and timeline of needed corrective actions be included in the WIPP Recovery Plan. In response to an EA observation that the Integrated Recovery Plan Schedule did not include the required submittal of the updated WIPP NMMP, NWP revised the Integrated Recovery Plan to include this requirement.

DOE Order 433.1B, Attachment 2, Paragraph 1.g requires the contractor organization to assess the implementation of its NMMP at least every three years. Section 2.3 of the current WIPP NMMP committed to perform an assessment of the WIPP maintenance program using DOE Guide 433.1-1 to ensure that an acceptable approach has been used to implement requirements necessary to maintain DOE-owned government property. The WIPP NMMP indicated that the assessment was expected to start in the first quarter of fiscal year 2012. DOE Guide 433.1.1, Appendix B, NMMP Assessment Guidance, reiterates the guidance contained in DOE Order 433.1B, Paragraph 4.d, which states that "Assessments of NMMP implementation must be conducted, at least every three years or less frequent if directed by SO [Secretarial Officer] in accordance with DOE O 226.1B, to evaluate whether all CRD requirements are appropriately implemented." Some NMMP element assessments have been performed through quality assurance surveillance activities, and the WIPP Integrated Recovery Plan has been revised to schedule the required assessment(s) over the next several years to support updating the current NMMP. However, complete documentation of the required NMMP assessment(s) within the required three year period was not available. (See **Finding F-WIPP-1.**)

Criterion #2: *Maintenance processes for systems are in place for corrective, preventive, and predictive maintenance and to manage the maintenance backlog; and the processes are consistent with the systems' safety classification. (DOE Order 433.1B, Attachment 2, Paragraph 2.e)*

NWP does not currently conduct a predictive maintenance program to support appropriate prioritization of maintenance, modification, and replacement activities to minimize the potential for challenges to vital safety system (VSS) SSCs' operability, reliability, and availability. (See **OFI-WIPP-01.**)

EA found that the documentation of the 2014 CBFO audit of the NWP instrument calibration program clearly described needed improvements in the NWP calibration processes and performance, warranting inclusion of the needed corrective actions in the WIPP Integrated Recovery Plan, although not specifically called for in the two 2014 AIB reports. The Integrated Recovery Plan requires enhancements to the periodic maintenance program (that includes the calibration program). EA will verify in 2015 that the new and revised procedures developed as part of the Integrated Recovery Plan were sufficient to resolve the deficiencies identified in the CBFO audit.

5.2 System Engineering Support of Maintenance

Criterion #3: *CSEs [cognizant system engineers] provide technical support for operations and maintenance through the activities described in DOE Order 420.1 B, including review of design changes, ensuring effective configuration management, identifying trends in key system parameters from*

operations and surveillances, determining operability, performing analysis of problems, and initiating corrective actions. (DOE Order 433.1B, Attachment 2, Paragraph 2.d and DOE Order 420.1B, Attachment 2, Chapter 5, Section 3.c & 3.d)

The responsibilities assigned to NWP cognizant engineers (CEs)/alternate CEs in WP 09, Rev-36, *Conduct of Engineering*, Section 3.2.3, encompass the required technical support of operations and maintenance activities described in DOE Order 420.1B. These roles and responsibilities and their interface with NMMP requirements are further defined in maintenance program procedures, including WP 10-WC3011, *Work Control Process*; WP 10-WC3010, *Periodic Maintenance Administration and Controlled Document Processing*; WP 10-WC3014, *Periodic Maintenance Activity Screening Process*; and WP 10-WC3017, *Post Maintenance Testing*. Each of these listed procedures has also been appropriately enhanced as part of the WIPP Integrated Recovery Plan.

Criterion #4: *Systems are periodically inspected in accordance with maintenance requirements.* (DOE Order 433.1B, Attachment 2, Paragraphs 2.m & 2.p)

Criterion #5: *System assessments are detailed and comprehensive, including periodic reviews of system operability, reliability, and material condition.* (DOE Order 420.1B, Attachment 2, Chapter 5, Section 3.c.(5))

The NWP Conduct of Engineering procedure (WP 09, Revision 36) describes the NWP system engineer program and states in part, “In order to provide effective, ongoing maintenance and operation activities by ensuring continual evaluation of system performance and involvement in the identification and correction of equipment deficiencies, CEs and Alt CEs shall periodically monitor, review, or perform the following.” The set of required activities includes the performance of regular system assessments (walkdowns) in accordance with the NWP Annual System Health/Walkdown/ Requalification procedure (WP 09-CN3025), which states that walkdowns are performed to ascertain the operability, availability, reliability, and overall health of site systems. The procedure also requires documentation of each walkdown using the associated checklist, EA09CN3025-1-0.

DOE Order 420.1B, Attachment 2, Chapter 5, Section 3.c.(5) requires periodic reviews of system operability, reliability, and material condition, including assessment of the system’s ability to perform design and safety functions, physical configuration in comparison to system documentation, and system and component performance in comparison to established performance criteria. Neither procedure WP 09-CN3025 nor its associated checklist requires documented analysis supporting walkdown assessment report conclusions relative to the required review attributes. Further, although the June 2014 Safety Management Program (SMP)-14-002 *Engineering Programs & Design Process Review* report correctly concluded that the “NWP System Health Reports are not performed in a consistent manner and the examples provided do not contain analysis by the CSE and therefore do not meet the intent of DOE O420.1B,” the report incorrectly cites as a strength that “The use of the system walkdown checklist to provide consistent guidance to the cognizant engineer on the attributes to review as part of the walkdown.” The checklist guidance does not encompass the requirements of DOE Order 420.1B, Attachment 2, Chapter 5, Section 3.c.(5) for a periodic system assessment. (See **OFI-WIPP-2.**)

Further, the EA engineer’s review of the February 2014 walkdown checklist for the WIPP Underground Ventilation System Exhaust Fans and Filters (a VSS within the scope of the NWP system engineering program) determined that although the walkdown documentation included general statements on overall system capability, consistency of configuration, and performance, it did not: (See **Finding F-WIPP-2.**)

- Provide any documented analysis of whether the system was capable of performing all its design and safety functions despite the acknowledged need for major maintenance and examples of out-of-tolerance readings.
- Provide any documented analysis of whether the system physical configuration and related documentation was consistent and effectively managed.
- Provide any documented analysis of whether the system performance met established performance criteria (e.g., System Design Description specified performance criteria, such as flow rate).
- Address the checklist required review criteria for assessing the “shift to filtration controls,” which the checklist indicated was in the scope/boundaries of the walkdown.
- Address the checklist requirements of:
 - Section 4 to comment on the effect the Engineering Change Orders will have on the system.
 - Section 5 to comment on the condition of the drawings as compared to as-found field conditions.
 - Section 6.1 to assess outstanding Work Orders and comment on required actions.
 - Section 6.2 to assess preventive maintenance effectiveness and periodicity.
 - Section 12 to assess equipment deficiencies documented in the walkdown relative to equipment and component obsolescence and the remedial actions taken or planned to mitigate risk to availability, reliability, and operability.

Although currently required to meet DOE Order 420.1B, NWP Engineering is now performing a self-assessment of the engineering program against the requirements of DOE Order 420.1C.

NWP Engineering recently initiated an expectation that its CEs make presentations on their assigned systems’ health. Several presentations have already been made, but no document describing expectations for these presentations was available for review and feedback. The presentation on the system health reports for the HV00: Surface Ventilation System and the CA01: Surface Compressed Air System reviewed by EA demonstrated a better level of analysis of system conditions than provided by the current checklists, as well as conclusions that could help management better prioritize maintenance, modification, or replacement activities. To better support management decision making, these presentations could be enhanced by establishing procedural requirements for content and expectations; establishing expectations that the presentations will provide an assessment of trends in operability, reliability, availability, critical operating parameters (e.g., vibration, temperature), and open and closed maintenance work orders, engineering work orders, and corrective action reports); and providing a proposed prioritized listing of needed maintenance, modification, or replacement activities and a rationale for the list order. (See **OFI-WIPP-3**.)

5.3 WIPP Recovery Plan – Conduct of Maintenance

The objective of the WIPP Recovery plan for Conduct of Maintenance was presented as: *Complete an evaluation and take actions to strengthen the conduct of maintenance program to ensure that DOE Order 433.1 B, Maintenance Management Program for DOE Nuclear Facilities, objectives are met as part of the safety management program enhancements. Activities include:*

- *Program enhancements.*
- *Preventive maintenance/calibration program improvements.*
- *Performance of management assessment of maintenance management program requirements.*
- *System walkdowns to ensure that corrective maintenance actions have been identified to allow evaluation for impacts and planning based on the assigned priority.*

Criterion #6: *Maintenance activities associated with the system, including work control, post-maintenance testing, and control and calibration of test equipment, are formally controlled to ensure that changes are not inadvertently introduced, that the system fulfills its requirements, and that system performance is not compromised.* (DOE Order 433.1B, Attachment 2, Paragraphs 2.d, 2.h, 2.j, and 2.q)

To accomplish the objective and criterion listed above, the *Integrated Recovery Plan for WIPP Haul Truck and Radiological Release Event Schedule* includes multiple maintenance program-related judgments of need (JONs) and work control/maintenance programmatic enhancements (WCs). NWP has revised and created new procedures to address the requirements of the following JONs and WCs:

- **JON 16.2 & WC1120:** Revise the WP 10-WC3010; *Preventive Maintenance Controlled Document Processing*, to include a process for trending of deficiencies noted during performance of preventive maintenance and calibration activities. Completed 8/1/2014
- **JON 2.8, JON 16.1 & WC1040:** Revise the Work Control procedure WP 10-WC3011, *Work Control Process*, to include the following: Completed 8/1/2014
 - A prioritization process that requires a timely impact evaluation of impaired/out-of-service equipment.
 - A process for trending of deficiencies (corrective maintenance) reported on equipment.
 - A process to evaluate the aggregate effects of out-of-service equipment.
- **JON 14.3 & JON 18.3:** Complete procedure revisions to WP 10-WC3010 and WP 10-WC3011 to incorporate equipment trending, technical evaluations, and compensatory measures and their impact on the safety of the system, the workers, and the environment. Completed 8/1/2014
- **JON 13.3, JON 15.1 & WC1130:** Develop a new procedure to provide requirements and methodology for the selection and type of preventive maintenance and calibration activities (WP 10-WC3014, *Periodic Maintenance Activity Screening Process*). Completed 8/1/2014
- **WC1050:** Develop the Plan of the Month, Plan of the Week, Plan for Tomorrow, and Plan of the Day (WP 10-WC3015, *Scheduling and Work Authorization*).
- **WC1020:** Revise WP 10-WC3017, *Post-Maintenance Testing*, to remove direction to WC process. Restore the system to a desired safe as-left condition.
- **WC1000:** Revise WP 10-WC3013, *Work Control Document (WCD) User's Guide*, to remove the conflict in levels-of-use designation and place keeping.

Besides the required procedures revisions noted above, the following procedures and checklist were revised or developed:

- WP 12-IS3002, Rev-12, *Job Hazard Analysis Performance and Development*.
- EA12IS3002-3-0, Rev-0, *Job Hazard Analysis Checklist*.
- WP 10-WC3012, Rev-1, *Work Control Document Writer's Guide*.
- WP 04-AD3032, Rev-4, *Senior Management Review Board*.

The revision of WP 12-IS3002, *Job Hazard Analysis Performance and Development*, and the development of its new checklist provide a far more comprehensive approach to hazard identification and development of appropriate control measures than the previous revisions of this procedure. The revision

replaces the abbreviated Hazard Identification Summary form, removes generic prerequisites for implementation of any WCD from the listing of available hazard control measures (pre-job briefings, WCD, training and general hazard analysis), specifies required control measure concurrences for selected hazards, requires inclusion of supplemental information demonstrating the analysis performed that is the basis for the hazard review conclusions, and assigns specific responsibilities for development, review, and approval of the JHA.

Development of new procedure WP 10-WC3015, *Scheduling and Work Authorization*, provides implementation requirements for revolving work-week planning, scheduling, implementation, and critique that mimic some of the best commercial nuclear industry practices. Three Work Week Managers were recently appointed to support implementation of the new procedure.

The new WP 10-WC3014, *Periodic Maintenance Activity Screening Process*, is intended to provide a logical and consistent process for reviewing new and existing equipment to determine the need for periodic maintenance work activities and to determine the most appropriate and effective means of achieving overall plant maintenance objectives based on compliance, safety, mission impacts, and cost effectiveness. The process appropriately requires Engineering and Work Control staff to establish equipment periodic maintenance requirements reflecting manufacturer recommendations, modified as appropriate to reflect the WIPP environment in which the equipment must function based on regulatory requirements and the safety or mission risk if not performed, and whether the benefit of performance outweighs the cost. NWP's previous failure to establish and implement appropriate equipment periodic maintenance activities was noted as a contributor to the problems identified in both AIB reports.

Although the revised and new procedures, taken together, include significant enhancements to Conduct of Maintenance requirements, WP 10-WC3011 does not specifically address the Integrated Recovery Plan expectation for timely evaluation of the impact of impaired equipment (unless considered out of service), methods for implementing Attachment 2 of the prioritization process, and assessment of compensatory measures and their impact on the safety of the system, the workers, and the environment. (See **OFI-WIPP-4**.)

The Integrated Recovery Plan includes appropriate additional requirements for training the affected NWP staff on implementation of the new and revised procedures by the end of September 2014, the date when implementation is scheduled to begin. A training needs analysis and training material are in development. Given the level of NWP worker and supervisory staff participation observed by EA during two pre-job briefings, additional enhancements of these procedures are likely. Further, the Integrated Recovery Plan specifies additional necessary and appropriate actions to ensure or restore an adequate level of safety-related equipment operability, availability and reliability at WIPP, including:

- **JON 13.1, JON 14.4, JON 15.4, JON 34.4:** Engineering and Work Control will review preventive maintenance procedures for underground vehicles to ensure accurate migration of Operations and Maintenance (O&M) Manual equipment specification requirements. Changes or omission of recommended requirements will be evaluated and justified via an engineering evaluation. Reviews will include cleanliness and consideration of using higher flash point fluids for equipment. Preventive maintenance activities will be performed before vehicle use – ENG & WC – DUE Nov. 2014.
- **JON 13.2, JON 15.2 & JON 34.5:** Engineering and Work Control will review preventive maintenance procedures for surface vehicles to ensure accurate migration of O&M Manual equipment specification requirements. Changes or omission of recommended requirements will be evaluated and justified via an engineering evaluation. Reviews will include cleanliness and consideration of using higher flash point fluids for equipment – ENG & WC – DUE Nov. 2014.

- **JON 16.4:** Work Control/Operations will systematically conduct an impact evaluation to identify impaired or out-of-service equipment for site systems and equipment using the prioritization process developed in procedure WP 10-WC3011, *Work Control Process* – ENG – DUE Nov. 2014.
- **JON 16.5:** Work Control/Operations will prepare a prioritized list of impaired or out-of-service equipment in accordance with WP 1-WC3011, *Work Control Process*, for site systems and equipment and recommended corrective actions – ENG – DUE Nov. 2014.

Finally, the Integrated Recovery Plan appropriately lists and establishes due dates, where applicable, for the following required SMP enhancements:

- **WC1200:** Perform management assessment of seasonal facility preservation – DUE Sept. 2014.
- **WC1030:** Evaluate current standing automated JHAs for maintenance – DUE Dec. 2014.
- **WC****:** Perform DOE Order 433.1B required management assessments of the NWP NMMP at least every three years – OVERDUE.
- **WC****:** Submit to DOE for review and approval an updated NWP NMMP description at least every three years – OVERDUE.

Note: tracking numbers had not been assigned to the last two items above as of the end of the onsite portion of the review.

6.0 CONCLUSIONS

Based on a review of its current status and progress to date, the NWP plan for enhancing Conduct of Maintenance was found to be adequately justified and appropriately scheduled, the required initial recovery activities effectively managed, early deliverables were provided on schedule, and the revised or new content generally satisfied the required corrective actions. Currently, the WIPP maintenance program is undergoing substantial revision in organization, processes, documentation, and required training to address the corrective actions. Further, normal maintenance activities have been impacted by recovery actions. As a result, the adequacy of the WIPP Conduct of Maintenance Recovery effort cannot yet be fully assessed and will need to be reevaluated after the program stabilizes and normal maintenance processes resume.

Although the program is evolving, EA's limited review of aspects of the NWP maintenance and engineering programs identified concerns involving assessments that were not performed as required as well as a number of opportunities for improvement (OFIs). Specifically, NWP had not performed an assessment of the maintenance program every three years as required and has not performed periodic assessments of all engineered safety systems. EA also identified opportunities for improvement for NWP consideration in such areas as predictive maintenance, documentation of annuals system walkdowns, documentation of system health reports, and timely evaluation of impaired equipment.

7.0 FINDINGS

As defined in DOE Order 227.1, *Independent Oversight Program*, findings are significant deficiencies or safety issues that warrant a high level of attention from management. If left uncorrected, findings could adversely affect the DOE mission, the environment, the safety or health of workers and the public, or national security. Findings may identify aspects of a program that do not meet the intent of DOE policy or Federal regulation. Corrective action plans must be developed and implemented for EA appraisal findings. Cognizant DOE managers must use site- and program-specific issues management processes and systems developed in accordance with DOE Order 227.1 to manage these corrective action plans and track them to completion.

All findings pertain to NWP.

Finding F-WIPP-1: Contrary to the requirements of DOE Order 433.1B, NWP has not conducted the required assessment of implementation of its NMMP at least every three years.

Finding F-WIPP-2: Contrary to the requirements of DOE Order 420.1B, NWP has not conducted the full scope of required periodic system assessments of WIPP systems that management determined were within its system engineer program scope.

8.0 OPPORTUNITIES FOR IMPROVEMENT

This EA review identified four OFIs. These potential enhancements are not intended to be prescriptive or mandatory. Rather, they are suggestions offered by the EA review team that may assist site management in implementing best practices, or provide potential solutions to minor issues identified during the conduct of the review. In some cases, OFIs address areas where program or process improvements can be achieved through minimal effort. It is anticipated that these OFIs will be evaluated by the responsible line management organizations and accepted, rejected, or modified as appropriate, in accordance with site-specific program objectives and priorities.

All OFIs pertain to NWP.

OFI-WIPP-01: Consider re-establishing a predictive maintenance program involving thermography, vibration analysis, and oil analysis to promote early detection of equipment degradation to support appropriate prioritization of maintenance, modification, and replacement activities to minimize the potential for challenges to VSS SSCs operability, reliability, and availability.

OFI-WIPP-2: Consider enhancing EA09CN3025-1-0, *Annual System Health-Walkdown-Requalification Checklist*, to ensure that the provided performance guidance encompasses the requirements of DOE Order 420.1B, Attachment 2, Chapter 5, Section 3.c.(5), including the expected level of documented analysis to support the assessment conclusions.

OFI-WIPP-3: Consider enhancing the PowerPoint presentations of system health reports to better support management decision making by establishing procedural requirements for content and expectations; establishing expectations that the presentations will provide an assessment of trends in operability, reliability, availability, critical operating parameters (e.g., vibration, temperature), and open and closed maintenance work orders, engineering work orders, and corrective action reports; and providing a proposed prioritized listing of needed maintenance, modification, or replacement activities and a rationale for the list order.

OFI-WIPP-4: Consider further revising Work Control procedure WP 10-WC3011, *Work Control Process*, to address the Integrated Recovery Plan expectation for timely evaluation of the impact of impaired equipment (unless considered out of service), how to implement Attachment 2 of the prioritization process, and assessment of compensatory measures and their impact on the safety of the system, the workers, and the environment.

9.0 ITEMS FOR FOLLOW-UP

This Review of the Conduct of Maintenance Recovery Plan is the first in a series of maintenance and engineering programs reviews. Given the extensive remaining effort required by NWP to implement their planned enhancements to the WIPP Conduct of Maintenance program and to assess effectiveness, EA will consider:

- Periodic reviews of the status of the Conduct of Maintenance Recovery activities.
- Assessment of the overall adequacy of the WIPP NMMP to comply with DOE Order 433 and DOE Order 430 once the Recovery Plan is completed.
- Verification in 2015 that the new and revised procedures developed as part of the Integrated Recovery Plan were sufficient to resolve the deficiencies identified in the CBFO audit.

Given the deficiencies in the NWP system engineering program identified in a very limited EA review, EA will consider assessing the overall adequacy of the NWP system engineering program to comply with the requirements of DOE Order 420.

10.0 FUTURE ASSESSMENTS

Enterprise Assessments is shifting from a continuous on-site presence at WIPP to an activity-based oversight plan beginning in fiscal year 2015. This plan is based on NWP's recovery schedule. Based on key recovery activities, EA-31 has a draft oversight schedule that is currently being finalized, but will change as the recovery schedule changes. Federal and contactor subject matter experts will perform assessments in key areas such as radiological controls, engineering programs, fire safety, conduct of operations, and other areas key to safe and effective operations. The assessment activities will be a mix of Independent Review Reports and formal assessments.

**Appendix A
Supplemental Information**

Dates of Review

Onsite Review: June 23-27 and July 21-25, 2014

Office of Enterprise Assessments

Glenn S. Podonsky, Director, Office of Enterprise Assessments
William A. Eckroade, Deputy Director, Office of Enterprise Assessments
Thomas R. Staker, Director, Office of Environment, Safety and Health Assessments
William E. Miller, Director, Office of Nuclear Safety and Environmental Assessments

Quality Review Board

William Eckroade
Thomas Staker
William Miller
Michael Kilpatrick

Enterprise Assessments Site Lead

Jeff Snook

Enterprise Assessments Reviewers

Tim Martin

Appendix B Key Documents Reviewed, Interviews, and Observations

Documents Reviewed

- Accident Investigation Report, *Underground Salt Haul Truck Fire at the Waste Isolation Pilot Plant*, February 5, 2014
- Accident Investigation Report, Phase 1, *Radiological Release Event at the Waste Isolation Pilot Plant* on February 14, 2014
- DOE-WIPP-07-3372, *Waste Isolation Pilot Plant Documented Safety Analysis*
- DOE-WIPP-07-3373, *Waste Isolation Pilot Plant Technical Safety Requirements*
- DOE-WIPP-06-3335, Rev-3, *WIPP Nuclear Maintenance Management Plan*
- EA09CN3025-1-0, Rev-5, *Annual System Health/Walkdown/Requalification Checklist*
- EA10WC3011-30-0, Rev-0, *Trending Analysis*
- EA12IS3002-3-0, Rev-0, *Job Hazard Analysis Checklist*
- MP 1.20, Rev-12, *Management Assessments Policy*
- MP 6.5, Rev-6, *Maintenance Management Policy*
- SDD-HV00, *HEATING, VENTILATION AND AIR CONDITIONING SYSTEM DESIGN DESCRIPTION*, 11/20/2013
- WP 04-AD3032, Rev-4, *Senior Management Review Board*
- WP 09, Rev-36, *Conduct of Engineering*
- WP 09-CN3025, Rev-16, *Annual System Health/Walkdown/Requalification*
- WP 10-AD3028, Rev-11, *Calibration and Control of Measurement and Test Equipment*
- WP 10-AD3029, Rev-11, *Calibration and Control of Monitoring and Data Collection Equipment*
- WP 10-WC3010, Rev-23, *Preventive Maintenance/Calibration Administration and Controlled Document Processing*
- WP 10-WC3010, Rev-24, *Periodic Maintenance Administration and Controlled Document Processing*
- WP 10-WC3011, Rev-33, *Work Control Process*
- WP 10-WC3012, Rev-1, *Work Control Document Writer's Guide*
- WP 10-WC3013, Rev-1, *Work Control Document (WCD) User's Guide*
- WP 10-WC3014, Rev-0, *Periodic Maintenance Activity Screening Process*
- WP 10-WC3015, Rev-0, *Scheduling and Work Authorization*
- WP 10-WC3017, Rev-1, *Post-Maintenance Testing*
- WP 12-IS3002, Rev-12, *Job Hazard Analysis Performance and Development*
- WP 13-1, Rev-34, *NWP Quality Assurance Program Description*
- *WP 15-GM1000, Rev-8, Management Assessments*
- *WIPP Cognizant Engineer / Alternate cognizant Engineer System Assignment List, Rev-47*
- *WIPP Recovery Plan-Conduct of Maintenance Power Point Presentation*
- *WIPP Recovery Project, Preliminary Performance Measurement Baseline, Book 1 & 2*
- *NWP CAP, Haul Truck Fire Accident Investigation Board report, Rev-2*
- *NWP CAP, Phase 1 Radiological Release Event at the Waste Isolation Pilot Plant on February 14, 2014*
- *Integrated Recovery Plan for WIPP Haul Truck and Radiological Release Events Schedule, Multiple Revisions, July 21-24 & August 6, 2014*
- *HV00: Surface Ventilation Systems, System Health Report, Power Point Presentation, 07/16/2014*
- *CA01: Surface Compressed Air System, System Health Report, Power Point Presentation, 06/12/2014*
- Work Order 1309411, *VU01 ANN System Walkdown – VSS, dated 02/24/2014*
- A-14-07, *CBFO Audit Report, NWP Calibration Program, 03/04/2014*

- S13-27, *NWP QA Surveillance Report, Maintenance, 09/18/2013*
- S13-03, *NWP QA Surveillance Report, Maintenance, 03/11/2013*
- NWP QA Independent Assessment Schedule Excerpt, Maintenance Internal Surveillances, 06/05/2014
- CBFO Letter, Subject: *Contract DE-EM0001971, Nuclear Waste Partnership LLC – Extension Request for Contract Deliverable under C.3.1.5, Nuclear Maintenance Management Plan by the Department of Energy Order 433.1 B per NWP Letter C0:14:02938, dated April 30, 2014, 05/30/2014*
- PR000002, Rev-7, *Predictive Maintenance*

Interviews

- Maintenance Manager
- Former Maintenance Manager
- Work Control Manager
- Work Planners (2)
- Work Control Center Staff Member
- Deputy Engineering Manager
- Cognizant Engineer

Observations

- Shift Turnover Meetings (3)
- Plan of the Day Meetings (7)
- Senior Management Review Board Meeting
- Pre-Job Briefing Meetings (2)
- Procedure Interactive Review Meetings (3)