

EA Operational Awareness Record		Report Number: EA-WIPP-TPB-2016-04-05
Site: Waste Isolation Pilot Plant	Subject:	Observation of Emergency Management Technical Planning
Dates of Activity: 04/05/16 - 04/21/16	Report Preparer: Kurt Runge	
<p>Activity Description/Purpose:</p> <p>The U.S. Department of Energy (DOE) Office of Emergency Management Assessments, within the independent Office of Enterprise Assessments (EA) reviewed portions of the technical planning basis for the Waste Isolation Pilot Plant (WIPP) emergency management program. EA reviewed the WIPP documented safety analysis (DSA) for consistency with the emergency planning hazards assessment (EPHA), procedures for developing and maintaining hazards survey (HS) and EPHA documents, the HS, the EPHA, calculations supporting the EPHA, and implementation of EPHA results for developing emergency action levels (EALs) and the emergency planning zone (EPZ). EA periodically met with the operating contractor, Nuclear Waste Partnership, LLC (NWP), and DOE Carlsbad Field Office (CBFO) personnel to discuss the topics under review and to share EA's observations. This EA activity is part of a planned multi-phase review for assessing WIPP's emergency management program elements of technical basis, plans and procedures, training and drills, and exercises.</p> <p>NWP has been significantly revising the WIPP emergency management program since the shutdown of WIPP operations in February 2014 because of a vehicle fire in the mine and a subsequent and separate radiological material release in the mine caused by an exothermic reaction in a transuranic (TRU) waste drum. Accordingly, EA reviewed the works in progress, which were draft versions of the DSA, EPHA, EPHA calculations, HS and EPHA development and maintenance documents, and the EAL development procedure. EA also reviewed an approved HS.</p> <p>EA reviewed the WIPP emergency management technical basis documents for compliance/consistency with DOE Order 151.1C, <i>Comprehensive Emergency Management System</i>; DOE Emergency Guide 151.1-2, <i>Technical Planning Basis</i>; and official National Nuclear Security Administration Associate Administrator Office of Emergency Operations (NA-40) published interpretations of DOE Order 151.1C in the form of answers to frequently asked questions. The two relevant frequently asked questions are: (1) <i>Applicability of the TRU Standard Statistical Material-at Risk (MAR) Approach in EPHAs</i>, and (2) <i>The Selection of Airborne Release Fraction (ARF), Airborne Release Rate (ARR), or Respirable Fraction (RF) Values for EPHA Analysis</i>.</p>		
<p>ATTACHMENTS: None.</p>		
<p>Results:</p> <p>Hazards Survey</p> <p>NWP has developed an HS that incorporates the requirements of DOE Order 151.1C, the provisions of DOE Guide 151.1-2, and the provisions of the HS development and maintenance procedure. For example, the HS provides good technical descriptions of the WIPP facilities and areas; describes emergency events and conditions; screens hazardous material (HAZMAT) as directed by DOE Order 151.1C and DOE Guide 151.1-2; and lists HAZMAT for facilities of concern that are retained for further analysis in an EPHA. In addition, NWP is revising WP-12-11, <i>Development and Maintenance of an Emergency Planning Hazards Survey</i>, to include several offsite buildings and editorial changes for clarification. Additionally, NWP revised WP 12-RP.01, <i>Waste Isolation Pilot Plant Emergency Planning Hazards Survey</i>, in 2015 to include several offsite buildings, update hazardous material inventory, and address offsite hazards that may affect WIPP. Overall, NWP has adequately implemented the hazards screening process to ensure further analysis of HAZMAT in the EPHA.</p>		

EPHA

The draft EPHA is consistent with DOE Guide 151.1-2 and the draft DSA for establishing MAR quantities for the set of common analyzed scenarios. The MAR represents the amount of HAZMAT that could be dispersed if a stress is applied. NWP has recently reduced MAR quantities to attain more accurate EPHA calculations by replacing maximum allowable drum loading with the allowable statistical approach to drum loading, based on a published NA-40 interpretation of DOE Order 151.1C. The reduced MAR quantities improve planning for and execution of response to plausible events by eliminating overly cautious assumptions that could unnecessarily render response facilities, responder and evacuation routes, incident command posts, and staging areas unavailable. MAR quantities remain conservative and are established using a statistical analysis, historical records, physical design loading limits, and administrative requirements in accordance with DOE guidance. This approach results in well-founded, technically based MAR quantities.

The EPHA and DSA drafts are consistent in their formulas for establishing source terms, which represent the breathable component of HAZMAT (in this case radiological material) that people may receive as a chronic inhalation dose. The EPHA and DSA convert the TRU isotopes contained in waste drums into plutonium equivalent curies for ease of analysis and then apply a dose conversion factor to yield exposures in terms of rem, consistent with the units of protective action criteria (PAC) established in accepted publications.

The draft EPHA and DSA use different but appropriate dispersion modeling programs. The EPHA uses the HotSpot dispersion modeling program, while the DSA uses the MACCS2 dispersion modeling program for radiological HAZMAT release projections. Although these different programs may provide somewhat different results, both programs are acceptable for these applications.

The draft EPHA analyzes many scenarios under varying conditions. NWP analyzes each scenario postulating both filtered and unfiltered HAZMAT releases to reflect design features under working and failed conditions. Furthermore, NWP analyzes each scenario using both the 95th percentile adverse weather and the average weather for the WIPP site, consistent with DOE Guide 151-1-2.

The draft EPHA analyzes most scenarios that are in the DSA but omits the beyond design basis mine roof collapse.

The conclusions in the EPHA and DSA drafts differ significantly. The DSA conclusions identify a large pool fire in the mine shaft as the bounding scenario (identified as the DSA's design basis/evaluation accident), while the EPHA identifies a TRU waste drum deflagration in the mine in panel 6 or 7 as having the largest consequences. The draft DSA also identifies four beyond design basis accident scenarios that represent General Emergency conditions at WIPP, while the draft EPHA identifies no General Emergencies.

These significant differences between the draft EPHA and DSA results are caused primarily by the respirable release factor (RRF) used in the source term equation. The RRF represents the product of the fraction of MAR released in air (release fraction) and the fraction of the amount that is released in air and is respirable (the fraction of airborne particles expected to be less than 10 microns in size). NWP uses the more conservative bounding RRF value (2E-3) in the DSA calculations but uses the median RRF value (8E-5) in the EPHA calculations. The median RRF is reflected as experimental data in the DOE DSA development handbook (DOE-HDBK-3010-94, *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities*) that supports the derivation of the bounding RRF value. In response to frequently asked questions about the use of median RRF values for emergency response planning, NA-40 published conditions to allow their use for EPHA development. NA-40's stated conditions require additional experimental data or additional conservatism, justified by an analyst, elsewhere in the source term equation (such as the MAR, damage ratio, or leak path factor). Based on the NA-40 answer and DOE Guide 151.1-2, the contractor must provide the rationale for using an alternative method to the bounding value in the EPHA. However, NWP's draft EPHA does not currently reflect the source of the RRF in use or the rationale for its use. Using bounding or median RRF values significantly affects the results, as illustrated by the large pool fire underground scenario; the DSA results project 5.2 rem at the site boundary (2.9 km from the release point), whereas the EPHA concludes that 1 rem is not exceeded at any distance. At EA's request, NWP performed the same EPHA calculation using the bounding RRF. This calculation resulted in 1 rem exceeded at 9.4 km from the release point, which is a General Emergency classification at WIPP.

The TRU waste drum deflagration in panel 6 or 7 scenario yields the most significant consequences in the set of EPHA calculations, again primarily because of the RRF factor in the source term. NWP determined the RRF from empirical data (an estimated RRF of $2.05E-1$) gathered from the exothermic reaction that occurred in February 2014 and used that value for the source term calculation, instead of the bounding RRF ($2E-3$) or the median RRF ($8E-5$) value. Using the estimated RRF, the draft EPHA concludes that the 1 rem PAC is exceeded at 2.7 km from the release point, which is a Site Area Emergency classification at WIPP.

Overall, NWP is improving the WIPP technical planning basis by having more accurate source term calculations with more plausible MAR quantities, using 95th percentile weather, and more consistently analyzing DSA scenarios in the EPHA. NWP uses significantly different RRF values for the source term calculations in the draft DSA and EPHA analyses, resulting in DSA consequences that go well beyond current emergency management program planning. Furthermore, NWP has not yet included the rationale for using median RRF values in the draft EPHA, as stipulated in NA-40's policy interpretation allowing their use. Finally, an NWP RRF estimate from an actual radiological event indicates that the use of bounding RRF values is not always conservative, as established in DSA standards.

EALs and EPZ

The NWP EAL development process is consistent with DOE Guide 151.1-2, appropriately using the results of the EPHA for identifying event classifications and pre-planning protective actions. EA noted significant improvements in the emergency operating procedure, WP 12-ER3906, *Categorization and Classification*. The WIPP EPHA identifies and characterizes the hazards associated with the underground and Waste Handling Building facilities, determines the events and conditions that could lead to releases, and quantifies the potential onsite and offsite consequences of each postulated accident or emergency event/condition. The two steps within the EPHA process that provide the foundation for developing EALs and the corresponding event classifications are the development of accident and emergency event scenarios and the determination of the consequences at various distances from the event location. NWP used this information to determine the emergency class associated with analyzed release scenarios and implements the required actions in the facility-specific EALs found in WP 12-ER3906.

NWP further enhanced the EAL process by:

- Adding many new scenarios consistent with DOE/WIPP 08-3378, *WIPP EPHA* and DOE/WIPP 07-3372, *WIPP DSA*
- Adding source terms to the detailed Alert and Site Area Emergency EALs
- Adding Station C filter readings to EAL entry conditions.

NWP's methodology for determining the WIPP EPZ, an area within which special planning and preparedness efforts should take place, is consistent with the EMG. NWP has recently made several important improvements in the EPZ determination process:

- NWP determined the WIPP EPZ using the methodology defined in Appendix F of DOE Guide 151.1-2.
- NWP appropriately reduced the size of the EPZ from 8.5 km to 6.5 km based on the technical information in the draft DOE/WIPP 08-3378, Revision 5, *WIPP EPHA*.
- NWP and CBFO enlarged the WIPP site boundary from the property protection area boundary (300 meters) to the land withdrawal area (LWA) boundary (2900 meters), which is beyond the maximum PAC distance from any event; the worst case is 2700 meters (RD-UG-S11) resulting from an internal drum deflagration with fire in panel 6 or 7 in the underground.
- NWP plans to close the access gates at the LWA boundary and establish access control within about 1 hour of an emergency declaration.

Overall, NWP is improving the WIPP EAL development process and EPZ determination. NWP will need to adjust the EALs and EPZ determinations if they incorporate the bounding RRF values in the EPHAs, as derived from the DSA standards.

Recommendations:

- To finalize the draft EPHA, base the EPHA calculations on the DSA bounding value for RRF. As an alternative, document the source and rationale for using non-bounding RRF values within the EPHA.
- To further improve the EAL development process:
 - Provide EALs for all DSA bounding events and beyond design basis events.
 - Include projected dose consequences at onsite receptors of interest.
 - Establish evacuation dose levels for unprotected essential personnel at key receptors of interest (central monitoring room, fire department, emergency operations center, and secondary operations center).
- To further improve the EPZ determination process:
 - Provide distance to PAC determinations for all DSA bounding events and beyond design basis events.
 - As part of the WIPP exercise program, ensure verification of the plan/procedure to close the access gates at the LWA boundary and establish access control within about 1 hour of an emergency declaration.

EA Participants

1. Kurt Runge (lead)
2. Thomas Rogers
3. John Bolling
4. William Scheib

References**Documents Reviewed**

1. DOE/WIPP-07-3372, *WIPP Documented Safety Analysis*, Rev. 5, Draft
2. DOE/WIPP-08-3378, *Draft WIPP Emergency Planning Hazards Assessment*, Rev. 5, Draft
3. DOE/WIPP-08-3378, *WIPP Emergency Planning Hazards Assessment*, Calculation Outputs, Rev 5., Draft
4. WP 12-ER3906, *Categorization and Classification*, Rev. 16, Approved for Training
5. WP 12-9, *WIPP Emergency Management Plan*, Rev. 43, Draft
6. WP 12-11, *Development and Maintenance of an EPHS [Emergency Planning Hazards Survey]*, Rev. 6, Draft
7. WP 12-12, *Development and Maintenance of an EPHA*, Rev. 7, Draft
8. WP 12-13, *Development and Maintenance of EALs*, Rev. 5, 5/6/15
9. WP 12-RP.01 Revision 7. *Waste Isolation Pilot Plant Emergency Planning Hazards Survey*, 8/7/15

Interviewees

1. NWP Emergency Management and Security Department Manager
2. NWP Emergency Management Section Manager
3. NWP Emergency Management Technical Analyst
4. Emergency Planners

Were there any items for EA follow up? Yes No

EA Follow Up Items:

None.