

WIPP IS OPEN – HOW WE GOT THERE, WHAT WE HAVE DONE, AND WHERE WE ARE GOING

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ABSTRACT

Subsequent to the Operational Readiness Reviews (ORR) of the Waste Isolation Pilot Plant (WIPP), the Environmental Protection Agency (EPA) certification to dispose of non-mixed contact-handled TRU (CH-TRU) waste, the Secretary of Energy's approval, and a number of court actions, WIPP initiated its disposal operations in March 1999 by receiving non-mixed CH-TRU waste. Public hearings, court actions and final Department of Energy (DOE) and Defense Nuclear Facility Safety Board (DNFSB) reviews were successfully resolved before WIPP opened. As a result of having all the regulatory approvals required for the full operations of WIPP, a ramp-up of CH-TRU waste disposal operations, Panel 2 (the second underground disposal panel) mining activities, and remote-handled TRU (RH TRU) waste disposal preparations are underway.

INTRODUCTION

In the 1950s, the United States (U.S.) National Academy of Sciences (NAS) recommended radioactive waste disposal in stable geologic formations. Scientists further opined that salt would be an excellent medium for nuclear waste isolation. This was, and has shown to be, sound science. Most salt deposits are found in geologically stable areas with little tectonic activity. Likewise, ancient salt deposits demonstrate an absence of fresh, flowing water; otherwise, the salt would have dissolved long ago. Rock salt heals fractures as a viscoplastic response to stress, the same quality that causes salt formations to "creep" or move in slowly to fill in mined areas and safely seal waste from the environment. Moreover, rock salt deposits are relatively easy to mine and provide radiation shielding similar to concrete.

Accordingly, in the 1960s, U.S. scientists began searching for suitable nuclear waste sites. In the 1970s, their search concentrated on southeastern New Mexico. Comprehensive studies of the area eventually led Congress, in 1979, to authorize construction of the Waste Isolation Pilot Plant (WIPP), which is located 40 kilometers east of Carlsbad, New Mexico.

Approximately 230-million years ago, evaporation of the Permian Sea laid down thick salt deposits at what is now the WIPP site. The salt is about 610 meters thick, beginning 260 meters below the surface. At this depth, the salt will slowly encapsulate the buried waste. The salt's 230-million year history offers assurance that the site will remain sound for the comparatively short 250,000 years it will take the transuranic (TRU) waste emplaced underground at WIPP to decay to natural background radiation levels.

TRU waste comes from the U. S. Department of Energy (DOE) nuclear weapons production, dismantling, and research and developmental activities. This waste consists primarily of clothing, tools, rags, debris, residues, and other solid disposable items contaminated with trace or small amounts of radioactive isotopes-mostly plutonium.

Following a series of rigorous and disciplined technical reviews, in 1998, the DOE declared WIPP ready to begin operations. Westinghouse Government Services Group's Waste Isolation Division (WID), WIPP's management and operating contractor, accomplished its goal through careful planning, flexible scheduling, and thorough execution. The achievement required nearly 2 years of operational readiness preparations including resolution of 703 pre- and post-start issues. WID's successful closure and correction of those issues set the stage for the Environmental Protection Agency (EPA) to follow the DOE's operational readiness declaration with its own certification of compliance that the project meets all regulatory standards to protect public health and the environment.

READINESS PROCESS

In an earlier paper submitted to and presented at Waste Management Symposium 1998 [1], readiness preparations were discussed, which included a Line Management Assessment (LMA), Integrated Facility Checkout (IFC), and ended with a Performance Dry Run to position WID for Operational Readiness Review (ORR) examinations. The pragmatic 2-year readiness process began in July 1996, with the WID LMA. This formal review and assessment of contact-handled (CH) waste disposal and supporting operations was set against criteria developed from core requirements in DOE Order 425.1, Startup and Restart of Nuclear Facilities [2]. The preemptive review netted 452 pre-start findings and 197 post-start findings identified through 1,194 affidavit statements.

An IFC, the second hurdle of the LMA, placed WIPP in an operational mode to test waste disposal functions at real-time waste receipt rates using simulated waste packages. The IFC was conducted in two phases, allowing for incorporation of lessons learned between phases. The first phase of IFC began on April 1, 1997 and ended April 30, 1997. The second phase began May 12, 1997 and was completed June 30, 1997. The IFC resulted in significant improvement to operations performance and strengthened integration between operating and support organizations within WID. Site personnel, not directly involved in waste disposal operations, responded seamlessly to abnormal and emergency operations events following awareness training and participation in IFC drills and exercises.

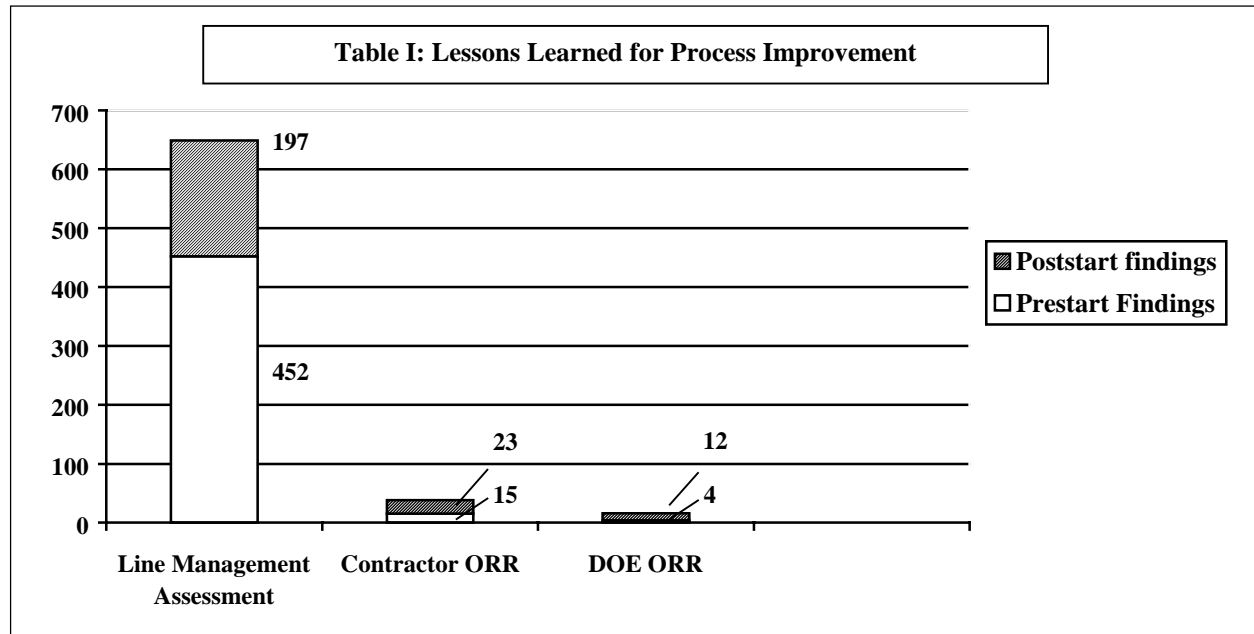
The WIPP Performance Dry Run was completed September 19, 1997. The Performance Dry Run consisted of a demonstration of the entire WIPP waste-handling cycle and three drills tied to the waste-handling cycle. The waste cycle for Westinghouse WID begins when the generator site has a fully characterized waste shipment with the data ready to load into the WIPP Waste Information System (WWIS) database program. The waste cycle ends when the WWIS is updated following placement of the waste in its final underground location with the appropriate backfill in place. A team comprised of both DOE Carlsbad Area Office (CAO) and WID personnel was established to evaluate each module of this Performance Dry Run.

The Performance Dry Run was additionally observed by three members of the DOE ORR team and a Defense Nuclear Facility Safety Board (DNFSB) staff member. The evaluation team found that all nine modules were completed satisfactorily and a grade of "pass" was assigned to each module.

The WID general manager issued his memorandum of readiness on December 12, 1997. This action triggered commencement of the WID (contractor) ORR on January 12, 1998. A WID ORR team, led by WID's Manager of Facility Readiness, verified that WID's ability to safely dispose of TRU waste had been achieved. During a 2 week span, the team observed and evaluated waste-handling drills and supporting processes; interviewed key facility personnel; and reviewed policies, plans, procedures, and process documentation. The ORR team identified 15 pre-start and 23 post-start findings, concluding that "waste emplacement activities could be safely performed upon correction of the pre-start findings." Six significant strengths were also reported by the team; most importantly, a "positive attitude and formality in Conduct of Operations demonstrated by personnel at all levels in the [WID] organization."

Following completion of the corrective actions from the contractor ORR pre-start findings, the DOE initiated its ORR on March 2, 1998. The team, led by a DOE representative of the DOE Savannah River Operations Office, conducted similar reviews identifying four pre-start and 12 post-start findings. On March 10th, the DOE ORR team determined that “upon correction of the identified pre-start findings, CH-TRU waste-handling operations can be safely started.” Sixteen days later, all corrective actions from the DOE ORR pre-start findings were completed. Added endorsements came from the NAS and DNFSB. Finally, on March 26, 1998, the CAO manager declared WIPP “ready” to dispose of CH-TRU waste.

Table I demonstrates the effectiveness of using Lessons Learned for Process Improvements.



In May 1998, the EPA gave WIPP certification to operate a deep geological repository for non-mixed TRU waste. With that, former Energy Secretary Federico Peña proudly declared WIPP open for waste disposal operations. However, 10 months would pass as compelling legal debate ensued. The delay posed a unique challenge to WIPP’s readiness posture.

Steps were directed to ensure that the facility maintained peak readiness. Five Transuranic Package Transporters (TRUPACTs: Nuclear Regulatory Commission-certified containers) of simulated waste were unloaded and emplaced underground every other week; key operational areas were targeted for quality assurance assessments; monthly radiological drills were conducted; a performance dry run of trucking simulated waste from Los Alamos National Laboratory (LANL) validated shipping, tracking, and handling readiness; and preventive maintenance programs ensured equipment availability.

Safety continued to be WIPP’s primary focus during the interim. WIPP completed two significant safety program reviews, receiving Voluntary Protection Program (VPP) Star Status recertification in August 1998. In September 1998, a review of the WIPP’s Integrated Safety Management System (ISMS) earned ISMS certification, making WIPP the first site to complete the “Triple Crown of Safety” (ISO 14000, VPP Star, and ISMS).

Due to the length of time between the readiness reviews and the anticipated March 1999 legal decision that would clear the way for opening WIPP for non-mixed TRU waste disposal, both Westinghouse and the CAO conducted additional readiness assessments of WIPP's operational processes. The CAO readiness assessment was completed 2 weeks prior to the anticipated opening date and, once again, concluded that the facility remained ready to begin CH-TRU waste disposal operations for non-mixed waste. This done, the facility was poised for its long-awaited opening.

Simultaneously, the New Mexico Environment Department (NMED) was evaluating and holding public hearings on the WIPP Resource Conservation and Recovery Act (RCRA) permit application. The CAO had submitted its disposal phase RCRA permit application for disposal of hazardous waste at WIPP to the State of New Mexico in May 1995. The hearings continued from February 22, 1999, through March 26, 1999—ironically, the day WIPP opened for business. The hearings, in Santa Fe and Carlsbad, included technical and non-technical testimony and covered all aspects of facility site selection, construction, operation, closure, waste characterization, and waste transportation.

During the final week of the hearings, two significant legal challenges came to a head. First, Judge Garrett Penn ruled in District of Columbia (D.C.) District Court that a 1991 injunction barring waste shipments to WIPP should be lifted, clearing the way for the first shipment of waste. He also gave WIPP interim status as a hazardous waste disposal facility. Capping that, an eleventh hour attempt in Federal Court in Santa Fe to legally block the first shipment of waste to WIPP from LANL failed. The die was cast. Table II provides the events of the readiness process in chronological order.

Time Line	1996	1997		1998				1999			2000
Activity	Line Management Assessment	Integrated Facility Checkout	Performance Dry Run	Contractor ORR	DOE ORR	Cert. by EPA	Sec. of Energy Declares Readiness	First Non-mixed Waste Receipt	Grand Opening	RCRA Permit	First Mixed Waste Receipt
Non-mixed CH	July	May	December	January	March	March	May	March	April		
Mixed CH	July	May	December	January	March					October	TBD

CONTACT-HANDLED OPERATIONAL ACTIVITIES

Fog delayed the first scheduled waste shipment from the LANL in northern New Mexico by 20 hours. But on March 26, 1999, at approximately 4 a.m., the historic first shipment of non-mixed TRU waste arrived at WIPP after completing the 435 kilometers (270-mile) journey.

The truck carried 1,325 kilograms (600 pounds) of non-mixed, plutonium-contaminated disposable items that included clothing, gloves, booties, coveralls, plastic covers, and metal cans. Non-mixed TRU waste is defined as TRU contaminated disposable items “not” contaminated with chemicals, like cleaning solvents or lead that would cause it to be regulated under RCRA. The waste was packed in carbon steel boxes and loaded into the specially designed stainless steel TRUPACT containers. Each TRUPACT is about 2.5 meters (8-feet) wide and 3 meters (10-feet) high.

April 17, 1999 was a red-letter day for the WIPP. After 25 years of good science and political debate, WIPP officially opened with congratulatory speeches by DOE Secretary Bill Richardson, U.S. Senators Pete Domenici and Jeff Bingaman, and Congressman Joe Skeen. Local, national, and international

dignitaries were on hand for opening day events that included guided tours of surface facilities, photographic sessions for the media and public, and interviews with early Carlsbad leaders who helped bring the WIPP to southeastern New Mexico.

To date, two additional DOE sites, Idaho National Engineering & Environmental Laboratory (INEEL) in Idaho and the Rocky Flats Environmental Technology Site (RFETS) in Colorado, have shipped non-mixed TRU radioactive waste to WIPP. Over the next 30 to 35 years, WIPP will receive approximately 37,000 shipments of waste from 23 storage sites nationwide. Final destination for this waste is a repository situated 650 meters (2,150-feet) below the surface. Underground waste disposal rooms are arranged in sets of seven each. A set of seven rooms is called a panel. Each disposal room is 91 meters (300-feet) long, 10 meters (33-feet) wide, and 4 meters (13-feet) high. A disposal room will hold the equivalent of 7,500 to 8,000 145-liter (55-gallon) drums. The underground rooms currently in use for waste disposal (Panel 1) were mined in the late 1980s. Extensive monitoring and control features are in place to ensure that Panel 1 will remain safe for disposal operations.

Mining activities restarted in July 1999 to extend several drifts (tunnels) underground for the next set of rooms (Panel 2). These drifts provide pathways and ventilation for workers and machinery. Panel 2 will be commissioned after WIPP has finished its use of Panel 1 and additional underground disposal rooms are required for the disposal of mixed waste.

The hazardous waste permit, authorizing WIPP to dispose of TRU mixed waste, was finally issued in October 1999; however, it stipulated a change (e.g. increase generator site initial visual examination rate from 2% to 11%) to the characterization process that had been in place prior to issuance of the permit. The hazardous waste permit became effective November 26, 1999. In accordance with environmental regulations, waste continued to be accepted at WIPP using the previous characterization method until November 26 1999. Prior to that date, WIPP had received a total of 44 shipments from three sites: LANL, RFETS, and INEEL. There were no further shipments to WIPP in 1999 while shipping sites came into compliance with the new characterization requirements.

Plans for waste receipt in the year 2000 will necessitate recertifying each shipping site once they comply with the new RCRA characterization requirements. Shipments will then resume from each site as they become certified. WIPP also anticipates increasing the shipping fleet and certifying two new generator sites, Hanford in Washington and Savannah River Site in South Carolina.

DOE has contracted with two firms to provide additional TRUPACT containers to increase the receipt rate. These firms will provide 12 additional TRUPACT containers, expanding receipt rate from 1999's maximum of five shipments per week to 8-10 shipments per week in 2000. Added TRUPACT containers beyond 2000 will continue to increase the receipt rate to the currently projected amount of 17. A ramp-up in shipments will be needed to service new sites coming on-line as well as to meet legal obligations and accelerated cleanup schedules committed to by the DOE.

PLANNED REMOTE-HANDLED ACTIVITIES

Remote-handled TRU (RH-TRU) waste is the second type of TRU waste to be disposed at WIPP. RH-TRU waste has a surface dose rate greater than or equal to 2 mSv/hr (200 mR/hr). Less than five percent of WIPP's total waste inventory will be RH-TRU. A memorandum of agreement with the State of New Mexico and the congressional Land Withdrawal Act of 1992 placed limits on the RH TRU waste.

The hazardous waste permit prohibits the disposal of RH-TRU mixed waste at WIPP. The only distinction between CH-TRU mixed waste and RH-TRU mixed waste is the radioactive dose rate at the surface of the waste container. There are no distinctions regarding the types or amount of hazardous

constituents in these two categories of radioactive wastes. However, to satisfy concerns of the NMED regarding the DOE's ability to adequately characterize RH-TRU mixed waste, the WIPP is preparing a request to modify the permit to allow receipt and disposal of RH-TRU waste. The Class 3 modification request will contain a waste analysis plan that specifically addresses characterization of RH-TRU mixed waste and documentation (facility drawings and inspection procedures) for WIPP facility upgrades necessary for the receipt of RH-TRU waste.

Since it is a Class 3 modification request, a public hearing must be held, public comment solicited, and the NMED must approve the request before RH-TRU mixed waste can be disposed of at WIPP. The current schedule anticipated for RH-TRU waste permitting activities includes a July 2000 submittal of modification request to the NMED and an August 2001 date for the permit modification approval.

RH-TRU waste will be placed in boreholes drilled into disposal room walls prior to emplacement of CH-TRU waste. The RH-TRU waste will be contained in carbon steel canisters approximately 60 centimeters (2-feet) in diameter and 3 meters (10-feet) in length. Because of the greater surface dose rate of these canisters, RH-TRU waste will be handled in a remote, shielded condition to avoid exposure to workers and the environment.

Preparations for receipt of RH-TRU waste are currently underway at WIPP. Existing RH-TRU waste-handling equipment and facilities, constructed in 1988, are being refurbished. In addition, modifications to the waste-handling process will be incorporated into the rework. Reengineering the process will increase throughput capacity for canister handling from 156 canisters per year to 250, or 60%, and eliminate the need for an RH-TRU waste-handling hot cell. An innovative system will bypass the laborious material-handling path through the hot cell using, instead, the existing canister transfer system and the hot cell building with minor modifications.

All RH-TRU waste handling improvements are scheduled for completion in April 2001, followed by a mid-January 2002 ORR. The first RH-TRU waste from LANL is expected at the end of January 2002.

SUMMARY

The DOE and EPA are now in agreement: the WIPP complies with all standards for safe management and disposal of TRU waste and actual disposal operations. This view is shared by other agencies that provide independent oversight and analysis of WIPP activities including the DNFSB, NAS, and U.S. Interior Department's Mine Safety and Health Administration. Moreover, New Mexico's independent WIPP oversight agency, the Environmental Evaluation Group, agrees that the WIPP will safely contain and isolate the emplaced TRU waste.

Operating the WIPP will allow the U.S. to complete an essential step toward the safe and environmentally sound cleanup of its former nuclear weapons sites. Secretary of Energy Bill Richardson, in a January 17, 1999 Albuquerque Journal guest editorial, said:

"...After years of review by EPA and other independent organizations and more that 20 years of solid engineering and sound science, I see no reason to further delay opening WIPP. I believe we are ready to open and operate WIPP safely—and to take a major step forward in meeting our national commitment to a safe and healthy environment."

Commenting at the March 26, 1999 WIPP opening, Secretary Richardson stated, "This is truly an historic moment—for the DOE, and the nation. This shipment to WIPP represents the beginning of fulfilling the long-overdue promise to all Americans to safely clean up the nation's Cold War legacy of nuclear waste and protect the generations to come."

Representatives of the international community are already using WIPP as a benchmark for the development of nuclear disposal facilities. Many have visited WIPP over the years and have watched the DOE, WID, and Sandia National Laboratories work together with regulators and stakeholders to resolve questions, clarify standards, and garner public support. The WIPP is not only a demonstration of technical excellence; it is also proof of our national commitment to the world community and the environment.

REFERENCES

- 1.** Oral paper, Waste Management 98, *Ready Set...A Process for Operational Readiness at the WIPP.*
- 2.** DOE Order 425.1, Startup and Restart of Nuclear Facilities, September 1995.