UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
AIR AND RADIATION

NOV 23 2011

Mr. Ed Ziemianski
Carlsbad Field Office
U.S. Department of Energy
P.O. Box 3090
Carlsbad, New Mexico 88221-3090

Dear Mr. Ziemianski:

During the week of May 9, 2011, the U.S. Environmental Protection Agency performed inspections of the Waste Isolation Pilot Plant (WIPP) waste management and storage operations, emplacement activities, and the monitoring program (Docket: A-98-49, II-B3-116). These inspections were performed under the authorities of 40 CFR 194.21 and 40 CFR Part 191, Subpart A.

As a result of the inspection, the Agency determined that the activities related to emissions monitoring during waste management and storage continue to comply with the requirements of 40 CFR Part 191, Subpart A. We also determined that the U.S. Department of Energy continues to adequately monitor the ten parameters that are important to the long-term containment of waste, as identified in EPA's 1998 Certification Decision. The EPA also determined that waste is presently emplaced adequately.

Copies of these inspection reports are enclosed with this letter and will be placed in the EPA's public dockets. If you have any questions regarding the enclosed reports, please contact Jonathan Walsh at (202) 343-9238.

Sincerely,

Jonathan Edwards, Director
Radiation Protection Division

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Enclosure

cc: Russ Patterson, DOE/CBFO
George Basabilvaso, DOE/WIPP
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EPA WIPP Team
EPA Docket

DOCKET NO: A-98-49
Item: II-B3-116

2011 - Subpart A Inspection Report

EPA INSPECTION No. EPA-WIPP-5.11-10a
OF THE
WASTE ISOLATION PILOT PLANT
May 10 – May 12, 2011

U. S. ENVIRONMENTAL PROTECTION AGENCY
Office of Radiation and Indoor Air
Center for Waste Management and Federal Regulation
1200 Pennsylvania Avenue, NW
Washington, DC 20460

August 2011

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1.0 Executive Summary

The U.S. Environmental Protection Agency (EPA) conducted an annual inspection of the Department of Energy (DOE) Waste Isolation Pilot Plant (WIPP) May 10 to 12, 2011 as part of its continued oversight program. This inspection was conducted under the authority of 40 CFR 191, Subpart A. The purpose of this inspection was to verify that DOE was in continued compliance with the dose release standard found at 40 CFR 191.03, Subpart A.

EPA reviewed DOE's ability to monitor radioactive releases to the public due to normal waste disposal operations and any unplanned or accidental releases that might occur during disposal operations. EPA reexamined DOE's continued moisture problems and salt loading at the Station A sampling location in the air exhaust shaft. EPA inspectors examined WIPP's emission control devices and methods used to estimate radiation doses to the public. In addition, EPA inspected radiation sample locations and equipment, sample processing, and reviewed the computational methods used to estimate dose. EPA observed filter changes, probe pulls, and probe replacement at Station A.

EPA found that DOE continued to improve its air monitoring program during the past year. EPA verified that DOE continues to increase probe cleaning frequency to weekly as needed and continued to work toward an understanding of this persistent salt occlusion problems at Station A. DOE continues to have an effective radiation sampling program because of the continued diligence of site staff and can calculate both yearly and accidental dose estimates

adequately. EPA did not have any findings or concerns.

2.0 Inspection Scope

The scope of this inspection was to verify that WIPP continues to effectively capture, measure, and calculate radiation doses to members of the public during waste disposal operations. Inspection activities included an examination of monitoring and sampling equipment. This inspection was conducted under the authority of 40 CFR 191, Subpart A.

During this inspection the Agency examined the ability of DOE to produce representative samples at Station A through changes in meteorological and operational conditions which impact salt loading on the sampling probes. EPA reviewed the operation of Station B, Station C, and the RADOS CAMs used at the air exhaust of the active waste emplacement panel in the underground. EPA also addressed the site's ability to characterize a radiological release during an emergency, and the tracking of samples and analytical results through the WIPP laboratory.

EPA had no findings or concerns during the inspection. EPA observed that probe A-1 failed due to salt occlusion, after only a week in place. Failure due to occlusion has been a persistent problem for A-1, and because the problem has not been as significant for A-2 and A-3, EPA prefers the use of those probes whenever possible. As more mining takes place in the vicinity of the exhaust shaft, EPA may stipulate weekly probe changes if A-1 is being used as a backup.

3.0 Inspection Team, Observers, and Participants

The inspection team consisted of five EPA staff. Thomas Kesterson and Julia Marple of the State of New Mexico Environmental Department observed the inspection.

Inspection Team Member	Position	Affiliation
Tom Peake	Inspection Lead	EPA ORIA
Kathleen Economy	Inspector	EPA ORIA
Shankar Ghose	Inspector	EPA ORIA
Nick Stone	Inspector	EPA Region 6
Jonathan Walsh	Inspector	EPA ORIA

Numerous DOE staff and contractors participated in the inspection; below is a partial list.

Participant or Observer	Participant or Observer
Mike Gross	Art Chavez
Jacqueline Davis	Larry Madl
Mansour Akbarzadeh	Dave Speed
Jennifer Hendrickson	Tom Goff
Dan Ferguson	David Squires

4.0 Performance of the Inspection

The inspection began on Tuesday, May 10, 2011, with an opening meeting that included presentations on changes in air monitoring and WIPP laboratory activities. Site staff discussed changes in the program since the last EPA inspection in July 2010. These presentations included the following updates and changes to the program:

- PM 364001, revised in 2010 to stipulate more frequent probe pulls at Station A, was followed. With a maximum probe pull interval of two weeks, there were no failures of the primary probe during the past year. As noted previously, skid A-1 has failed while it was in use as the backup skid.

- A two-week probe pull interval for Station A skids A-2 and A-3 did not result in a negative impact on probe occlusion.

- Heavy mining during WIPP's maintenance outage, particularly in the E-400 exhaust drift,

impacted the Station A skids, requiring increased maintenance.

- Station C was upgraded beginning in January 2011. Flow control and backup power were upgraded, however, parts were selected so that the isokinetic sampler continues to adhere to the ANSI N13.1-1969 standard to which it was designed.

- Underground RADOS continuous air monitors (CAMs) continue to function without filter cartridge jamming issues.

- Work on planned remote electronic access to underground RADOS CAMs has been delayed because planned system did not meet computer security requirements.

- Emergency Consequence Assessment procedure 12-ER4916, Rev. 16 has been updated, simplifying the procedure and allowing many inputs to be made to the Hotspot code upon arrival in the EOC, before specific information about a given event is available.

- Study by Mike Gross, "Representative of Samples by Shrouded Probes in the Exhaust Shaft at the WIPP", examining the current ability of Station A to collect representative samples, remains in final draft form.

The EPA inspection team reviewed procedures, interviewed site staff, and observed activities such as filter and probe changes to verify the effective implementation of procedures relevant to Subpart A. These activities are described in detail below.

4.1 Overall Inspection Activities

The inspection team observed shrouded probe pulls and sample filter changes and at Station A, examined the weekly shrouded probe changes, reviewed the underground RADOS CAMs, walked through an emergency response scenario with consequence assessment staff, and examined procedures guiding the processing of samples at the WIPP radiochemistry laboratory.

4.2 Stations A, B, and C

Station A, which samples unfiltered air exhausted from the WIPP underground, has been a focus of EPA in several past inspections, due to the tendency of salt to occlude the sampling probes, with the potential to render aerosol samples unrepresentative. This has been a particular problem for Skid A-1, which is nearest to the influx of water to the exhaust shaft. On May 10, the inspection team observed the routine probe pulls and filter changes at Station A. Because Skid A-2 was down for maintenance of its sample transport line, Skid A-3 was the sampler of record, and Skid A-1 was collecting back-up samples. As mentioned above, despite having been in place only one week, probe A-1 failed due to excessive salt occlusion. Each fixed air sampler (FAS) was calibrated and flow rates were appropriate. The inspection team visited Station B and the newly-refurbished Station C to verify calibration dates and flow rates.

4.2 Consequence Analysis

On the afternoon of May 10, EPA inspectors met with Consequence Assessment staff in the Emergency Operations Center. EPA requested that a consequence assessment drill be conducted for a ten-drum overpack (TDOP) of waste falling down the waste-handling shaft. Site staff used current meteorological data and procedure WP 12-ER4916, Rev. 16 to perform the dose calculation first using HOTSPOT (JPW-20110510-03) and then NARAC (JPW-20110510-04, JPW-20110510-05.)

4.3 Underground Sampling

During the underground tour on May 11, inspectors observed the continuous air monitors (CAMs) placed at the exhaust of Panel 6 (the active waste panel) and at Station D, at the bottom of the exhaust shaft. Each CAM was operating with air flow and pressure differentials within the acceptable range. Station D's calibration sticker was valid until 4/7/2011, however, the site was able to produce documentation showing that the CAM had been recalibrated (JPW-20110511-06), even though the sticker had not been changed.

4.4 WIPP Laboratory

EPA also toured the WIPP laboratory, which supports annual National Emissions Standards for Hazardous Air Pollutants (NESHAP) reporting and emergency response activities at WIPP. Inspectors toured the laboratory itself and were given a presentation of the laboratory's analytical services. The laboratory quality assurance manager presented the inspection team with a data package dated April 20, 2011 and a monthly NESHAP report for February, 2011. Inspectors verified that the proper QA and chain-of-custody forms had been used; that signatures were in place for data entry, review, and finalization; and that sample tracking logs were adequate. Specifically, samples were collected using forms found in WP 12-HP3500, Rev. 18, and laboratory QA was carried out using the forms and procedures found in WP 12-RL3002, Rev. 8.

5.0 Summary of Findings

During the inspection EPA examined DOE's activities over the past year. DOE and site staff continues to be aggressive monitoring Station A probe conditions. EPA agrees that biweekly probe changes are appropriate during the summer and when skids A-2 and A-3 are used as the skid of record. As indicated during the last inspection report, EPA feels that the draft report prepared by Mike Gross (DOE/WIPP-10-3450) provides a valuable analysis DOE's to collect representative samples under current conditions. EPA recommends that this report be finalized.

The inspection activities served to verify that DOE is correctly implementing procedures which allow it to accurately monitor and calculate possible radiation doses to members of the public

due to WIPP site operation. The inspection checklist included as Attachment A specifically documents DOE's compliance with each reporting expectation set forth in EPA's WIPP Subpart A Guidance (402-R-97-001). Based on the inspection activities documented in this report, EPA concludes that DOE continues to adequately implement a radiological monitoring and sampling program for WIPP disposal operations in which it collects representative samples and appropriately performs calculations to estimate potential releases to the public. The results of this program, documented in the Annual Periodic Confirmatory Measurement Compliance Report for Calendar Year 2010 (RES 11-579) show that "the effective dose equivalent (EDE) value to the maximally exposed individual resulting from normal operations conducted at this facility is less than 1.91×10^{-05} millirem (mrem) per year." Thus, DOE remains compliant with the Subpart A dose limits of 25 millirem to the whole body and 75 millirem to any other critical organ set forth in 40 CFR 191.03(b). EPA reviewed DOE's calculations to verify that they are accurate (see Attachment A, Subpart A Checklist, for more detail). EPA does not have any findings or concerns.

Attachment A: Inspection Plan and Checklist

WIPP Inspection Plan* - 40 CFR 191, Subpart A *for the year 2011

Purpose:
EPA will verify that the Department of Energy (DOE) has accurately monitored and calculated possible radiation doses to members of the public, due either to normal operations or to any accidental releases that may have occurred during the last reporting period. This inspection is conducted under the authority of 40 CFR 191, Subpart A. This inspection is part of EPA's continued oversight to ensure that WIPP can, during the operational phase of management and storage of radioactive waste, comply with the limits expressed in 40 CFR 191.03.

Scope:
The scope of this inspection includes all activities performed by DOE at WIPP to measure and calculate any actual or potential radiation dose to members of the public during management and storage of radioactive waste, specifically during the past year of site operation. Inspection activities will include an examination of monitoring procedures and sampling equipment both on and off site, and in the underground.

The purpose of this inspection is to verify and confirm that DOE at WIPP has complied with the "Compliance reporting" expectations of EPA's GUIDANCE FOR THE IMPLEMENTATION OF EPA's STANDARDS FOR MANAGEMENT AND STORAGE OF TRANSURANIC WASTE (40 CFR Part 191, Subpart A) at the WASTE ISOLATION PILOT PLANT (402-R-97-001), Section 4.2, Page 15.

Focal Areas for this Years Inspection:

- What changes have taken place in air sampling since last year's inspection?
- What potential changes to air sampling would result from the development of a new experimental area?
- During past years a number of potential changes were discussed to evaluate and address salt occlusion on Station A probes. What is the status of these activities?
- With continued moisture in the exhaust shaft air flow, what have been the conditions of the sample filters? Have the filters had salt buildup or samples washed off as in the past?
- Verify that the underground CAMs operate as expected.
- How are composite samples handled and processed, measurement accuracy, and implications of laboratory standards used?
- Provide a presentation of the process and procedures used to calculate off-normal potential release during operations. Describe the process used to respond to off-normal situations from start to finish.
- Bottom-line: If required, how would DOE prove to independent examiners that samples taken at Station A are representative samples?

Location: This inspection will be held at the WIPP facility located twenty-six miles south east

of Carlsbad, New Mexico and the surrounding vicinity as needed.

Duration: The EPA expects to complete its inspection in three days. Each day will begin with an opening meeting at 8:00 a.m. and end before 5:00 p.m. with a closeout session.

Date: May 10-12, 2011.

Information Requested: Provide documentation and procedures related to Subpart A compliance activities as in past years. Before the inspection, provide information that describes how measurements are taken, and complete documentation that shows how compliance calculations are performed with an explanation of all input parameters and their derivation. As soon as it becomes available, please provide to EPA the 2010 Annual Safety Analysis Report.

#	CHECKLIST QUESTION	May 2011	40 CFR 191.03 Subpart A Sat. = Satisfactory NA = Not Applicable	
	40 CFR 191.03 Compliance Standard	**EPA Citation**	**Comment (Objective Evidence)**	**Result**
	Does DOE "...provide reasonable assurance that the combined annual dose equivalent to any member of the public in the general environment resulting from discharges of radioactive material and direct radiation from such management and storage shall not exceed 25 millirems to the whole body and 75 millirems to any other critical organ." 40 CFR 191.03(b)	40 CFR 191.03 Subpart A - Environmental Standards for Management and Storage	DOE has demonstrated that they can capture, measure, and calculate releases to assure that they are and remain below these limits	Sat.
	Scope of activities considered in determining compliance			
1	Does DOE demonstrate that all activities at the WIPP up until the point of disposal are considered in determining compliance? Activities include those at "all WIPP facilities, both at above-ground locations and in the underground disposal system" and those related to "arrival or receipt of waste, inspections of containers, unloading, and waste movement."	EPA 402-R-97-001 Section 2.3, Page 4	The Annual Site Environmental Report for 2009 (DOE/WIPP 09-2225) Executive Summary documents DOE's efforts to consider all activities that impact compliance. The Annual Periodic Confirmatory Measurement Compliance Report for Calendar Year 2010 (RES 11-579, hereafter referred to as the annual NESHAP report) and inspection activities confirm that all waste handling activities are considered in determining compliance.	Sat.

2	Does DOE demonstrate that radiation doses to the public due to 1) actual normal operation and 2) any unplanned or accidental releases are examined?	EPA 402-R-97-001 Section 2.3, Page 5	Section 3.0 of the Implementation Plan for Subpart A (DOE/WIPP 00-3121, Rev. 3) documents how this requirement is met, both for normal operation and accidental releases. Annual NESHAP report (RES 11-579) demonstrates that normal operations are fully examined. CH Waste Documented Safety Analysis (DOE/WIPP 95-2065, Rev. 10) and RH Waste DSA (DOE/WIPP 06-3174, Rev. 0) documents DOE's review of potential accidents at WIPP. Procedure Emergency Radiological Control Response (WP 12-HP4000, Rev. 6) and Consequence Assessment Dose Projection (WP 12-ER4916, Rev 16) document radiological emergency response activities, including an initial assessment of possible dose to the public.	Sat.
	Media considered in determining compliance			
3	Does DOE demonstrate that the air pathway is the credible release pathway?	EPA 402-R-97-001 Section 2.4, Page 5	Section 2.1 of the Implementation Plan for Subpart A describes the process by which the air pathway was established as the credible release pathway, and the use of environmental monitoring of other exposure pathways to confirm that this remains the case.(DOE/WIPP-00-3121, Rev. 3, p.7)	Sat.
4	Does DOE demonstrate that other exposure mechanisms from an air release could include inhalation of contaminated air, immersion in a plume of radioactive particles, ingestion of soil on which contaminated particles have been deposited, swimming in ponds in which radionuclides have been deposited are considered?	EPA 402-R-97-001 Section 2.4, Page 5	Sections 2.1 and 3.5 of the Implementation Plan for Subpart A documents methods for measuring these potential exposure pathways (DOE/WIPP 00-3121, Rev. 3). Section 4.8.4 of the ASER documents the consideration of dose from these pathways (DOE/WIPP-10-2225). Annual NESHAP report (RES 11-579) confirms that these exposure mechanisms are included in dose calculations.	Sat.

5	Is DOE monitoring the expected air exhaust pathway and performing environmental monitoring of other release points and exposure pathways to confirm air exhaust as the only release pathway?	EPA 402-R-97-001 Section 2.4, Page 5 and page 6.	Yes. Section 2.1 of the Implementation Plan for Subpart A explains DOE's plan to fulfill this requirement(DOE/WIPP-00-3121, Rev. 3). Annual Site Environmental Report Chapter 4 demonstrates that DOE implements groundwater surveillance, biota sampling and off-site air monitoring programs (DOE/WIPP-10-2225).	Sat.
	Boundary of compliance			
6	Does DOE demonstrate compliance at the "exclusive use area" boundary? If not, does DOE justify changing this boundary?	EPA 402-R-97-001 Section 2.5, Page 6. EPA 402-R-97-001 Section 2.5, Page 7	Section 3.1 of DOE/WIPP-00-3121 Rev. 3 states that the "Exclusive Use Area" will be used as the boundary for 40 CFR 191 Subpart A compliance.	Sat.
	Location of maximally exposed individual			
7	Does DOE examine radiation doses to individuals at any offsite point where there is a residence, school, business, or office? (Such as grazing, mining, or oil drilling in the vicinity.) "The location of the maximally exposed individual is the location where an actual individual lives or works who receives the maximum annual radiation dose from the source."	EPA 402-R-97-001 Section 2.6.1, Page 8	For Subpart A, DOE assumes that the member of the public resides, "… year-round at the fence line in the northwest sector" (DOE/WIPP-10-2225, Section 4.8.4.3). Section 1.3.2 of the ASER demonstrates that DOE considers doses at appropriate offsite points, such as Smith Ranch located 7.5 km away in the WNW sector (DOE/WIPP 09-2225, p. 36). The Annual Periodic Confirmatory Measurement Compliance Report for the DOE WIPP for Calendar Year 2010 (RES 11-579), or "2010 NESHAP Report," identifies Smith Ranch as the location of the maximally exposed individual. The nearest farms, dairies, and beef ranching activities are also considered.	Sat.
8	Does DOE "analyze potential exposure pathways and examine demographic information and conduct field investigations to identify the location of actual individual who could be exposed via those pathways?"	EPA 402-R-97-001 Section 2.6.1, Page 8	Yes. See checklist Item 7.	Sat.

9	Does DOE "conduct separate analyses of potential dose received from each exposure pathway?" Then does DOE "assume that a member of the public resides at the single geographic point on the surface where the maximum dose would be received?"	EPA 402-R-97-001 Section 2.6.1, Page 8	Yes. See checklist Item 7.	Sat.
	Personal parameters	**EPA Citation**	**Comments (Objective Evidence)**	**Result**
10	Does DOE assume that the individual exhibits personal characteristics of the "reference man" when evaluating radiation dose to the maximally exposed individual?	EPA 402-R-97-001 Section 2.6.2, Page 8	Section 3.2 of the Implementation Plan for Subpart A describes the "reference man" parameters as described in the CAP88-PC computer code (DOE/WIPP 00-3121, Rev. 3). These parameters are confirmed (on p. 16) of the CAP-88 output file included in the 2010 NESHAP report (RES 11-579).	Sat.
	Calculation of dose - Modeling – Parameters			
11	Does DOE provide both whole body radiation dose and critical organ radiation dose for the maximally exposed individual (or a hypothetical individual conservatively located at a point of higher exposure)?	EPA 402-R-97-001 Section 2.7.1, Page 8	Yes. The effective dose equivalent and table of organ dose equivalents is included in the 2010 annual NESHAP report (RES 11-579, CAP-88 output file, p.2)	Sat.
12	Does DOE calculate radiation doses including all release points and reflecting evaluation of all exposure pathways?	EPA 402-R-97-001 Section 2.7.1, Page 8	Section 2.1 of DOE/WIPP-00-3121, Rev. 3 states that the air pathway is the most credible, but that other exposure pathways are monitored to confirm the air pathway. Annual NESHAP report (RES 11-579) demonstrates that all release points are evaluated.	Sat.
13	Does DOE use computer modeling to calculate radiation doses for compliance with the Subpart A standard?	EPA 402-R-97-001 Section 2.7.2, Page 9	Section 3.2 of DOE/WIPP-00-3121, Rev. 3 states that computer models will be used to calculate radiation doses during both routine operation and accidental releases.	Sat
14	Does DOE use CAP88-PC to perform dose calculations?	EPA 402-R-97-001 Section 2.7.2, Page 9	CAP88-PC is used for dose calculations for routine operations (DOE/WIPP-00-3121 Rev 3, Section 3.2). Annual NESHAP report demonstrates that DOE is using CAP88-PC.	Sat.

15	Does DOE use an alternate model for calculating radiation doses? If so, does DOE justify such usage?	EPA 402-R-97-001 Section 2.7.2, Page 10	DOE uses an atmospheric dispersion code (HOTSPOT) to estimate potential radiation due to accidental releases (DOE/WIPP-00-3121 Rev 3, Section 3.2). WP 12-ER4916 Rev. 16 states that HOTSPOT is used for accidental release calculations. During the inspection, EPA requested an example dose projection using HOTSPOT (JPW-20110510-02, -03). DOE has demonstrated that HOTSPOT is a reasonable choice for emergency dose calculations.	Sat.
16	Does DOE adequately support exposure parameters used in dose calculations?	EPA 402-R-97-001 Section 2.7.3, Page 10	Annual NESHAP report (RES 11-579) includes CAP-88 output file, demonstrating that DOE is using appropriate parameters in dose calculations. Also see checklist items 7-10.	Sat.
	Calculation of dose - Modeling - Parameters	**EPA Citation**	**Comments (Objective Evidence)**	**Result**
17	Does DOE document that "conservative simplifying assumptions" are used in the radiation dose calculations?	EPA 402-R-97-001 Section 2.7.3, Page 10	DOE uses conservative assumptions to estimate worst-case dose to a maximally-exposed offsite individual (DOE/WIPP 00-3121, Rev. 3, Section 3.2).	Sat.

18	Are DOE's exposure parameters as conservative as the following? For a maximally exposed individual located at a residence, assumed continuous exposure (24 hours per day). For a maximally exposed individual located at a business, office, or school, assume exposure of 8 hours per day. Assume individuals consume 2 liters per day of drinking water from an underground source of drinking water. Assume inhalation rate for air to be $9x10^5$ cm^3/hr. Assume ingestion rate of meat to be 85 kg/yr. Assume ingestion rate of leafy vegetables to be 18 kg/yr. Assume ingestion of milk to be 112 liter/yr. Assume ingestion rate of produce to be 176 kg/yr	EPA 402-R-97-001 Section 2.7.3, Page 10	DOE uses these exact values as exposure parameters (DOE/WIPP 00-3121, Rev. 3, Section 3.2). The Annual NESHAP report CAP-88 output file (p.16) demonstrates that DOE is using these parameters in dose calculations (RES 11-579).	Sat.
	Emissions and Environmental Monitoring - Air	**EPA Citation**	**Comments (Objective Evidence)**	**Result**
19	Does DOE demonstrate that effluent flow rate measurements are made using Reference Method 2 of Appendix A to 40 CFR Part 60 to determine velocity and volumetric flow rate for stacks and large vents?	EPA 402-R-97-001 Section 3.1, Page 11, (1(i))	Stations A and B use alternate methods approved by the Administrator, per Section 3.3(3) of this rule (Nichols 1994). See checklist items 25, 27. Station C sampling was designed based on ANSI N.12-1969, Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities from which Method 2 was derived (WP 12-RC.01, Rev. 9). DOE/WIPP 89-028, Section 1.3 confirms that "guidance was taken from . . . the CFR Title 40, Part 60, Appendix A, Reference Methods" and describes testing to establish the velocity profile for Station C.	Sat.

20	Does DOE demonstrate that effluent flow rate measurements are made using Reference Method 2a of Appendix A to 40 CFR 60 to measure flow rates through pipes and small vents?	EPA 402-R-97-001 Section 3.1, Page 11, (1(ii))	Not applicable at WIPP. Duct diameter associated with WIPP exhaust point exceeds the 40 CFR 60 requirements.	NA
21	Does DOE demonstrate that the frequency of flow rate measurements depend on the variability of the effluent flow rate? **Note:** For variable flow rates, continuous or frequent flow rate measurements are expected to be made. For relatively constant flow rates, only periodic measurements are expected.	EPA 402-R-97-001 Section 3.1, Page 11, (1(iii))	DOE has implemented continuous air monitoring at WIPP, and does not need to consider this requirement. (DOE/WIPP-00-3121, Rev. 3, Section 3.3, 3.3.1)	NA
22	Does DOE demonstrate that radionuclides to be directly monitored or extracted, collected and measured using Reference Method 1 of Appendix A to 40 CFR Part 60 for selected monitoring or sampling sites?	EPA 402-R-97-001 Section 3.1, Page 11, (2(i))	Stations A and B use alternate methods approved by the Administrator, per Section 3.3(3) of this rule (Nichols 1994). See checklist items 25, 27. Station C sampling was designed based on ANSI N.12-1969, Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities from which Method 2 was derived (WP 12-RC.01, Rev. 9). DOE/WIPP 89-028, Section 1.3 confirms that "guidance was taken from . . . the CFR Title 40, Part 60, Appendix A, Reference Methods."	Sat.
	Emissions and Environmental Monitoring - Air	**EPA Citation**	**Comments (Objective Evidence)**	**Result**

23a	Does DOE demonstrate that the effluent stream is either "directly monitored continuously with an in-line detector capable of distinguishing relevant radionuclides," or alternately "continuously sampled such that analysis of filters or other collectors will provide an accurate estimate of emissions from a known flow rate during a fixed sampling time?"	EPA 402-R-97-001 Section 3.1, Page 11, (2(ii))	DOE implemented the latter sampling option, and continually collects samples and flow rate data to demonstrate compliance with 40 CFR 191 Subpart A. All sample filters are screened to determine that alpha and beta activity fall below set action levels, and are then submitted for analysis. As described in Section 3.3.3 of the Implementation Plan for Subpart A, DOE then uses periodic confirmatory measurements to demonstrate compliance with dose standards. Sections 3.5 and 3.3.5 document relevant radionuclides at WIPP. (DOE/WIPP 00-3121, Rev. 3)	NA
23b	Does DOE demonstrate that representative samples of the effluent stream are withdrawn from the sampling site? "…The need for continuous sampling is applicable to batch processes when the unit is in operation. Periodic sampling (grab samples) may be used in lieu of continuous sampling only with EPA's prior approval. Such approval may be granted in cases where continuous sampling is not practical and radionuclide emission rates are relatively constant. In such cases, EPA expects grab samples to be collected with sufficient frequency so as to provide a representative sample of the emissions."	EPA 402-R-97-001 Section 3.1, Page 11, (2(ii))	As stated in checklist item 23a, DOE samples continuously. After they are found to be below screening levels, all samples found to be representative are composited for periodic measurements (typically monthly for Station A, and quarterly for Stations B and C). This process is described by DOE/WIPP 97-2238, Rev. 8. The procedure Periodic Confirmatory Analysis, Reporting, and Compliance Activities (WP 12-RE3004, Rev. 3) describes the criteria for confirming that a filter sample is representative, and documents how to report and handle a sample which does not meet these requirements.	Sat.
24	Does DOE demonstrate that radionuclides are collected and measured using procedures based on the principles of measurement described in Appendix B, Method 114 of 40 CFR 61? If not, does DOE demonstrate that the Administrator has approved the method used?	EPA 402-R-97-001 Section 3.1, Page 12, (2(iii))	Attachment 1 to the QAPP for Sampling Emissions (WP 12-RC.01, Rev. 9) documents both the requirements of Method 114, and where WIPP documentation reflects these principles.	Sat

25	If DOE is using the "Shrouded Probe", does DOE demonstrate that this alternative method is being used according to the guidance provide in "An Explanation of Particle Sampling in a Moving Gas Stream Within a Duct Using an Unshrouded and Shrouded Probe"?	EPA 402-R-97-001 Section 3.1, Page 12, (2(iii)(a))	An Assessment of the WIPP Shrouded Probe Against EPA Approval Criteria for Use of Single Point Sampling with the Shrouded Probe HA:98:0100 (Included in August 2000 Inspection Report, A-98-49, II-B3-12, EPA's Approval letter (Nichols 1994) documents DOE's evaluation of the Shrouded Probe and its compliance with the EPA criteria. Single Point Representative Sampling with Shrouded Probes (LA-12612-MS) documents how the shrouded probe was qualified for use at WIPP.	Sat.
	Emissions and Environmental Monitoring - Air	**EPA Citation**	**Comments (Objective Evidence)**	**Result**
26	Does DOE's quality assurance program meet the performance requirements described in Appendix B, Method 114 of 40 CFR Part 61?	EPA 402-R-97-001 Section 3.1, Page 12, (2(iv))	QAPP for Sampling Emissions (WP 12-RC.01, Rev. 9) Section 1.0 documents DOE quality assurance requirements. These meet the requirements of 40 CFR 61. See Checklist Item 24.	Sat.
27	If it is impractical to measure the effluent flow rate in accordance with the method(s) in Section 3.1(1) or to monitor or sample extraction according to methods in Section 3.1(2) has DOE demonstrated that the use of alternative effluent flow rate measurement or site selection and sample extraction are appropriate and that the alternate method are used provided the following: (i) DOE shows that methods in Section 3.1(1) or (2) are impractical; (ii) DOE shows the alternative procedure will not significantly underestimate the emissions; (iii) DOE shows the alternative procedure is fully documented; and (iv) DOE has received prior approval from EPA.	EPA 402-R-97-001 Section 3.1(3)(i) to (3)(iv), Page 12	At Stations A and B, DOE uses alternate methods per Section 3.3(3) of the Subpart A Guidance (402-R-97-001). See checklist items 25 and 27. Single Point Representative Sampling with Shrouded Probes (LA-12612-MS) documents how the shrouded probe was technically qualified for use at WIPP. EPA's Approval letter (Nichols 1994) documents DOE's compliance with these criteria, and EPA's approval.	NA.

28	Does DOE demonstrate that radionuclide emission measurements are in conformance with the methods in Section 3.1(1) and (2) to be made at all release points which have a potential to discharge radionuclides into the air in quantities which could cause a combined annual dose equivalent in excess of 1% of the dose limit in Subpart A?	EPA 402-R-97-001 Section 3.1, Page 12 and page 13, (4(i))	DOE/WIPP 00-3121, Rev. 3., Section 3.2 documents DOE's compliance with this requirement. All areas of a potential discharge are continuously sampled, although even in a worst-case accident scenario, 1% of the Subpart A dose limit is not expected to be reached. This requirement is also discussed in Sections 1.0 and 2.0 of DOE/WIPP 97-2238, Rev. 8.	Sat.
29	Does DOE demonstrate that all radionuclides which could contribute greater than 10% of the combined annual dose equivalent for a release point are being measured?	EPA 402-R-97-001 Section 3.1, Page 13, (4(i))	Section 3.3 of the Periodic Confirmatory Measurement Protocol (DOE/WIPP 97-2238, Rev. 8) states that the selected analytes "constitute approximately 98% of the dose due to the average source term for CH and RH wastes."	Sat.
	Emissions and Environmental Monitoring - Air	**EPA Citation**	**Comments (Objective Evidence)**	**Result**
30	If DOE uses alternative procedures to determine emissions, does DOE demonstrate that they have prior EPA approval?	EPA 402-R-97-001 Section 3.1, Page 13, (4(i))	DOE uses the shrouded sampling probe as an alternative method. EPA has formally approved this alternative method (Nichols, 1994).	NA
31	Does DOE demonstrate that for other release points which have a potential to release radionuclides into the air it has performed periodic confirmatory measurements to verify the low emissions?	EPA 402-R-97-001 Section 3.1, Page 13, (4(i))	DOE has no other points with a potential to release radionuclides. CH (DOE/WIPP-95-2065,Rev. 10) and RH (DOE/WIPP-06-3174, Rev. 0) Waste Documented Safety Analysis document these conclusions.	NA
32	Does DOE demonstrate that an evaluation has been done to evaluate the potential for radionuclide emissions for a release point?	EPA 402-R-97-001 Section 3.1, Page 13, (4(ii))	Yes. See checklist item 28	NA
33	Does DOE demonstrate that in evaluating whether emissions must be measured for a given release point, estimated radionuclide release rates are based on discharge of effluent stream that would result if all pollution control equipment did not exist, but the facilities operations were otherwise normal?	EPA 402-R-97-001 Section 3.1, Page 13, (4(ii))	Stations B and C use pollution control equipment. However, because DOE has chosen to sample continuously at these locations, this requirement is not applicable.	Sat.
	Environmental Measurements	**EPA Citation**	**Comments (Objective Evidence)**	**Result**

34	Does DOE demonstrate that environmental measurements of concentrations of radionuclides in air at the critical receptor locations are used as an alternative to air dispersion calculations in demonstrating compliance with the standard?	EPA 402-R-97-001 Section 3.1, Page 13, (5)	DOE does not use environmental monitoring as an alternative to comply with 40 CFR 191.03 Subpart A. DOE samples at release points.	NA
35	Does DOE demonstrate that air at the point of measurement is continuously sampled for collection of radionuclides if environmental measurements are used?	EPA 402-R-97-001 Section 3.1, Page 13, (5(i))	Section 3.1(5) of EPA 402-R-97-001 is not applicable. See checklist item 34.	NA
36	Does DOE demonstrate that the environmental measurement program is appropriately designed to collect and measure specifically those radionuclides which are major contributors to the annual radiation dose from the facility?	EPA 402-R-97-001 Section 3.1, Page 13, (5(ii))	Section 3.1(5) of EPA 402-R-97-001 is not applicable. See checklist item 34.	NA
37	Does DOE demonstrate that radionuclide concentrations which would cause an annual dose equivalent of 10% of the standard are readily detectable and distinguishable from background?	EPA 402-R-97-001 Section 3.1, Page 13, (5(iii))	Section 3.1(5) of EPA 402-R-97-001 is not applicable. See checklist item 34.	NA
38	Does DOE demonstrate that a quality assurance program that meets the performance requirements described in 40 CFR Part 61, Appendix B, Method 114 is conducted for environmental measurements?	EPA 402-R-97-001 Section 3.1, Page 13, (5(iv))	Section 3.1(5) of EPA 402-R-97-001 is not applicable. See checklist item 34.	NA
39	Does DOE demonstrate that EPA has granted prior approval for the use of environmental measurements to demonstrate compliance with the standard?	EPA 402-R-97-001 Section 3.1, Page 13, (5(v))	DOE has not requested approval to use environmental measurements.	NA
	Emissions and Environmental Monitoring - Other Media			

40	Does DOE demonstrate that environmental monitoring of other release points or critical receptor locations to confirm air exhaust as the only release pathway?	EPA 402-R-97-001 Section 3.2, Page 14.	Implementation Plan for Subpart A, Section 2.1 states; "However, to confirm that the air pathway is the only credible pathway for radiological releases, WIPP implements a radiological ground water surveillance program, biota sampling program and off-site radiological air monitoring program" (DOE/WIPP00-3121, Rev. 3). ASER Chapter 4 demonstrates that DOE's environmental program monitors other release points and critical receptor locations(DOE-WIPP 10-2225).	Sat.
	Compliance Reporting	**EPA Citation**	**Comments (Objective Evidence)**	**Result**
41	Does DOE demonstrate compliance with the Subpart A standard by showing that the annual radiation dose to any member of the public in the general environment falls below the regulatory limits?	EPA 402-R-97-001 Section 4.2, Page 15.	The Annual NESHAP report demonstrates that DOE reports results yearly, and that those results fall below regulatory limits. For calendar year 2010, the calculated effective dose equivalent to the maximally exposed individual of the public was less than 1.91×10^{-5} mrem (RES 11-579).	Sat.
42	Does DOE report results of monitoring and the dose calculations for each reporting period?	EPA 402-R-97-001 Section 4.2, Page 15	Section 5.0 of DOE/WIPP 00-3121 documents that DOE's plans to report annual results. The Annual NESHAP Report demonstrates that DOE reports results of monitoring and dose results yearly – see checklist item 41.	Sat.
43	Does DOE demonstrate that monitoring is performed each calendar year of facility operation, and that radiation doses are calculated after the end of each year?	EPA 402-R-97-001 Section 4.2, Page 15	Yes. See checklist item 42.	Sat.
	Notification of construction or modification.			
44	Does DOE demonstrate that they have provided the EPA written notification of any planned construction or modification to the WIPP facility, prior to commencing any such activity, if it results in an increase in the rate of emissions of radionuclides during operation?	EPA 402-R-97-001 Section 4.3, Page 16.	The Annual NESHAP Report includes a description of construction and modifications during each reporting period. None requiring advanced notice took place during 2010 (RES 11-579).	Sat.

45	Does DOE demonstrate that advanced notification was not needed for construction and modification if the radiation dose caused by all the emissions from the new construction or modification is less than 1% of the Subpart A dose limits?	EPA 402-R-97-001 Section 4.3, Page 16 and page 17.	Yes, this is accomplished by the Annual NESHAP Report. See checklist item 44.	Sat.
	Record Keeping			
46	Does DOE demonstrate documentation is sufficient to allow the Agency to verify the correctness of the determination made concerning the WIPP's compliance with Subpart A?	EPA 402-R-97-001 Section 4.4, Page 17.	Through its various documents, Subpart A implementation plan, its Annual NESHAP Report, and many procedures that support Subpart A activities, DOE demonstrates that documentation is sufficient to allow EPA to verify compliance with Subpart A.	Sat.

Attachment B

Table of Documents Reviewed

	Documents Reviewed and Copies Received During Inspection	191.03 Subpart A Inspection May 2011	
Citation	**Document Title**	**Subject Matter**	**Source**
	Legal and Technical Reference Documents		
EPA 402-R-97-001	Guidance For The Implementation of EPA's Standards For Management And Storage of Transuranic Waste (40 CFR Part 191, Subpart A) at the Waste Isolation Pilot Plant. EPA 402-R-97-001, January 1997	"WIPP Subpart A Guidance,"	EPA
A-92-56, II-C-2	Memorandum of understanding between EPA and DOE, September 29, 1994	Agreement states that although not required, DOE will implement NESHAPs Subpart H regulations at the WIPP site until closure.	DOE/WIPP
DOE/WIPP 93-043	Effects of Salt Loading and Flow Blockage on the WIPP Shrouded Probe, by Chandra, Ortiz, McFarland, August 1993, DOE/WIPP 93-043	Report discusses the impact of salt loading on shrouded probe performance.	DOE/WIPP
DOE/WIPP 89-027	Evaluation Of The Station B Effluent Monitoring System In The Underground Exhaust Ventilation System At The WIPP, Sept 1990, DOE/WIPP 89-027	Documents testing at WIPP to evaluate the ability of Station B to collect representative samples.	DOE/WIPP
EEG-60	The Influence of Salt Aerosol On Alpha Radiation Detection By WIPP Continuous Air Monitors, by Bartlett and Walker, Jan 1996, EEG-60, DOE/AL/58309-60	Reports impact of salt deposits on monitor efficiency.	DOE/WIPP
DOE/WIPP 89-026	Evaluation Of The Station A Effluent Monitoring System In The Underground Exhaust Ventilation System At The WIPP, DOE/WIPP 89-026, Sept 1990	Documents testing at WIPP to evaluate the ability of Station A to collect representative samples.	DOE/WIPP
Rodgers et al., 1994	Single Point Aerosol Sampling: Evaluation of Mixing and Probe Performance In A Nuclear Stack, by Rodgers, Fairchild, Wood, Ortiz, Muyshondt, McFarland, July 1994	Compares performance of ANSI isokinetic with shrouded probes at DOE faculties.	DOE/WIPP
PNL-10816	Generic Air Sampler Probe Test, by Glissmeyer and Ligotke, Nov 1995, PNL-10816	Test of isokinetic and shrouded probes at Hanford. Tests show that shrouded probes deliver samples with significantly less particle-size bias.	DOE/WIPP
PNL-10148	Functional Requirements Document For Measuring Emissions Of Airborne Radioactive Materials, by Glissmeyer, Alvarez, Hoover, McFarland, Newton, Rodgers, Nov 1994, PNL-10148	States general functional requirements for system and procedures for measuring emissions.	DOE/WIPP

	Documents Reviewed and Copies Received During Inspection	191.03 Subpart A Inspection May 2011	
Citation	**Document Title**	**Subject Matter**	**Source**
PNL-SA-25532	Changing Methodology For Measuring Airborne Radioactivity Discharges From Nuclear Facilities, by Glissmeyer and Ligotke, May 1995, PNL-SA-25532	Tests show single-point sampling (shrouded) probes are superior to ANSI style multiple-point probes.	DOE/WIPP
Nichols, 1994	EPA Shrouded Probe Approval. Letter from Mary Nichols to Raymond Pelletier, dated November 21, 1994.	Allows DOE to use the shrouded probe as an alternative measuring procedure.	DOE/WIPP
LA-12612-MS	Single-Point Representative Sampling with Shrouded Probes by McFarland and Rodgers, LA-12612-MS, August 1993	Describes shrouded probe testing requirements and test performed to qualify probe for use at WIPP.	DOE OSTI Document website.
McFarland, 1993	Air Sampling With Shrouded Probes At The WIPP Site, by McFarland, Sept 1993	Paper discussing the use of the shrouded probe at WIPP. Benefits of the shrouded probe are discussed.	DOE/WIPP
	DOE Procedural Documents		
WP 12-2, Rev 15	WIPP ALARA Program Manual, WP 12-2, Revision 15, 06/03/10	Describes organization and responsibilities of ALARA committee and coordinator.	DOE/WIPP
12-RL.01, Revision 17	Radiochemistry Quality Assurance Plan, 12-RL.01, Revision 17, 04/06/11	Describes the management policy and organizational structure, and QA requirement for radiochemical analysis.	DOE/WIPP
DOE/WIPP 00-3121, Revision 3	Implementation Plan for 40 CFR 191, Subpart A DOE/WIPP 00-3121, Revision 3, January 2010	Outlines program at WIPP to show compliance with 40 CFR 191, Subpart A.	DOE/WIPP
DOE/WIPP 09-2225	Waste Isolation Pilot Plant Annual Site Environmental Report for 2009, DOE/WIPP 09-2225, September 2010	Results of the environmental monitoring program, in particular radiological measurements.	DOE/WIPP
DOE/WIPP 97-2238	Periodic Confirmatory Measurement Protocol for the Waste Isolation Pilot Plant, DOE/WIPP 97-2238, Revision 8, August 2008	Used to explain the protocol used to perform periodic confirmatory measurements.	DOE/WIPP
DOE/WIPP 99-2194, Rev 5	Waste Isolation Pilot Plant Environmental Monitoring Plan. DOE/WIPP 99-219, Rev 5, December 2010.	DOE environmental monitoring plans at the WIPP site. Of particular interest: Section 4.0, Dose Calculations, and 5.0, Environmental Monitoring Program.	DOE/WIPP
DOE/WIPP 99-3119, Rev 6	Compliance Monitoring Implementation Plan for 40 CFR 194.14(b), Assurance Requirement, DOE/WIPP 99-3119, Rev 6, 05/10	Outlines monitoring activities at WIPP to demonstrate compliance with 40 CFR 191 and 40 CFR 194.	DOE/WIPP
DOE/WIPP-06-3174 Rev 0, 03/06	WIPP RH Waste Documented Safety Analysis, Section 3.4.1.4. DOE/WIPP-06-3174 Rev 0, 03/06	This selection verifies that the air pathway is the only pathway of concern at the WIPP for RH waste.	DOE/WIPP.

	Documents Reviewed and Copies Received During Inspection	191.03 Subpart A Inspection May 2011	
Citation	**Document Title**	**Subject Matter**	**Source**
DOE/WIPP-95-2065 Rev. 10, 11/06	WIPP CH Waste Documented Safety Analysis, Section 3.4.1.4. DOE/WIPP-95-2065 Rev. 10, 11/06	This selection verifies that the air pathway is the only pathway of concern at the WIPP for CH waste.	DOE/WIPP.
IC041072, Rev 9	Calibration of Effluent Monitoring Skids A1, A2, A3, B1 and B2 Flow Instrumentation, Maintenance Procedure, IC041072, Revision 9	Instructions for calibration of FAS skids A1, A2, A3, B1 and B2 flow instrumentation.	DOE/WIPP
IC041097, Rev 2	Calibration of Station C Flow Instrumentation, Maintenance Procedure IC041097, Revision 2	Instructions for calibration of Station C flow instrumentation.	DOE/WIPP
IC041098, Revision 5	U/G Exhaust Mass Flow Measurement System for Fans 700A, B & C, Maintenance Procedure, IC041098, Revision 5	Documents calibration verification test and alignment of U/G exhaust.	DOE/WIPP
IC413000, Revision 5	Station B Mass Flow Measurement System, Loop 41A001W2001, Maintenance Procedure, IC413000, Revision 5	Documents calibration of Station B mass flow measurement system.	DOE/WIPP
PM364001, Revision 1	Predictive Maintenance to Determine Station A Probe Pull Frequency, Maintenance Procedure PM364001, Revision 1	Determine recommended frequency of Station A probe inspections based on meteorological data.	DOE/WIPP
PM364005, Revision 10	Inspection and Cleaning of Station “A” Sample Probes Bldg. 364, Maintenance Procedure, PM364005, Revision 10	Documents steps to inspect and clean Station A probes. Section 8.3 notes that salt buildup "at the probe inlet should be no more than 2/3 of the area" and "blocking the shroud exhaust should be limited to no more than 1/3 of that area".	DOE/WIPP
RES 11-579-a, -b, -c	Annual Periodic Confirmatory Measurement Compliance Report for the DOE WIPP for Calendar Year 2010, submitted 6/28/2011	Annual NESHAP report. Includes cover letter, report, and CAP88-PC Version 3.0 output file. Documents annual results.	DOE/WIPP
WP 12-ER4903, Rev 14	Radiological Event Response, Emergency Response Procedure, WP 12-ER4903, Revision 14, 7/19/10	Procedure documents actions to be taken by CMRO, FSO, and Radcon if a potential or actual radioactive release takes place.	DOE/WIPP
WP 12-ER4916	Consequence Assessment Dose Projection, Technical Procedure, Rev 16, 4/7/11	Procedure for estimating the potential dose consequence from a release or suspected release of radioactive material, using Hotspot, NARAC, or hand calculations.	

	Documents Reviewed and Copies Received During Inspection	191.03 Subpart A Inspection May 2011	
Citation	**Document Title**	**Subject Matter**	**Source**
WP 12-ER4916	Consequence Assessment Dose Projection, Technical Procedure WP 12-ER4916, Revision 15, 11/16/09	Documents procedure for estimating the potential dose consequence from a release or suspected release of radioactive material. Reviewed for consistency with Rev.16	DOE/WIPP
WP 12-ER4916, Revision 13	Consequence Assessment Dose Projection, Technical Procedure WP 12-ER4916, Revision 13, 06/24/09	Documents procedure for estimating the potential dose consequence from a release or suspected release of radioactive material.	DOE/WIPP
WP 12-HP1305, Rev 9	Fixed Air Monitoring Equipment, Technical Procedure WP 12-HP1305, Revision 9, 07/06/10	Instructions for the operation of fixed air monitoring equipment. Attachment 2 documents flow rates and alarm set points.	DOE/WIPP
WP 12-HP1306, Rev 8	Canberra Alpha Sentry Continuous Air Monitor, Technical Procedure WP 12-HP1306, Revision 8, 3/21/10	Instructions for operating the Canberra continuous air monitor equipment at waste revieving bays. Includes daily check sheets.	DOE/WIPP
WP 12-HP1307, Rev 10	Portable Instrument and Portal Monitor Operability Checks, Technical Procedure, WP 12-HP1307, Revision 10, 05/14/09	Instructions for operational checks of portable contamination instruments.	DOE/WIPP
WP 12-HP1308, Revision 4	Portable Alpha-6 Continuous Air Monitors, Technical Procedure WP 12-HP1308, Revision 4, 3/28/11	Instructions for operation of Portable Alpha-6 continuous air monitor.	DOE/WIPP
WP 12-HP1500	Radiological Posting and Access Control		
WP 12-HP3500, Revision 18	Airborne Radioactivity - Technical Procedure WP 12-HP3500, Revision 18, 05/07/10	Technical procedure. Provides instructions for analyzing, reporting, and trending results of air samples. Att. 5 contains Guide for Station A Filter Counting for Re-Entry into the U/G.	DOE/WIPP
WP 12-HP3700, Rev 4	Radiological Event Reporting, Management Control Procedure WP 12-HP3700, Revision 4, 8/18/10	Documents the first estimate of a possible release.	DOE/WIPP
WP 12-HP4000, Revision 6	Emergency Radiological Control Responses, Emergency and Alarm Response Procedure, WP 12-HP4000, Revision 6, 05/27/10	Addresses radiological contamination events which require an immediate stop work order.	DOE/WIPP
WP 12-RC.01, Rev 9	Quality Assurance Program Plan for Sampling Emissions of Radionuclides to the Ambient Air at the Waste Isolation Pilot Plant, WP 12-RC.01, Revision 9, 04/26/10	QA program for sampling air emissions at WIPP. Contains useful background information regarding the design and qualification of sampling systems at Stations A-D.	DOE/WIPP

	Documents Reviewed and Copies Received During Inspection	191.03 Subpart A Inspection May 2011	
Citation	**Document Title**	**Subject Matter**	**Source**
WP 12-RE3002, Rev 3	Radiological Engineering Off-site Air Sampling - Technical Procedure WP 12-RE3002, Revision 3, 12/13/10	Instructions for collecting and documenting Low-Volume filter retrieval in response to a potential release.	DOE/WIPP
WP 12-RE3003, Revision 4	Radiological Release of Potentially Contaminated Materials, Waste, and Items - Management Control Procedure, WP 12-RE3003, Revision 4, 10/27/09	Instructions for evaluating materials, waste, and items which are to be released from the WIPP as non-radioactive material.	DOE/WIPP
WP 12-RE3004, Rev 3	Periodic Confirmatory Sampling, Reporting, and Compliance Activities, Management Control Procedure, WP 12-RE3004, Rev 3, 11/12/09	This procedure provides instructions for Radiological Engineers of the Radiological Controls Department to fulfill the requirements of NESHAPs.	DOE/WIPP
WP 12-RL1001	Sample Tracking and Custody, Technical Procedure, WP 12-RL1001, Revision 9, 02/11/09	Instructions for documenting receipt and storage of samples in WIPP laboratory.	DOE/WIPP
WP 12-RL1002, Rev 9	Alpha Spectroscopy System Operation, Technical Procedure, WP 12-RL1002, Revision 9, 10/05/09	Direction for calibrating and operating the Canberra Alpha Spectroscopy System as interfaced with the Genie 2000.	DOE/WIPP
WP 12-RL1008, Rev 7	Establishing Gross Alpha and Gross Beta Self-Absorption Curves, Technical Procedure, WP 12-RL1008, Revision 7, 11/17/09	Instructions for preparing samples of known activity and known weight to generate self-absorption curves for each of the gas proportional counters.	DOE/WIPP
WP 12-RL1009, Rev 4	Gross Alpha and Gross Beta Activity in Air Filter, Soil, Water, Sludge, and Biota, Technical Procedure, WP 12-RL1009, Revision 4, 10/22/07	Guidance for rapidly performing a variety of screening matrices for both high and low activity Radionuclides.	DOE/WIPP
WP 12-RL1010, Rev 10	Sample Preparation, Technical Procedure, WP 12-RL1010, Revision 10, 7/22/10	Directions for preparing samples to determine activity of radionuclides.	DOE/WIPP
WP 12-RL1011, Rev 11	Elemental Separation - Strontium 90, Technical Procedure, WP 12-RL1011, Revision 11, 09/13/07	Directions for performing elemental separation of strontium from samples.	DOE/WIPP
WP 12-RL1012, Rev 8	Elemental Separation - Transuranic Products, Technical Procedure, WP 12-RL1012, Revision 8, 10/31/06	Describes method for elemental separation and purification of actinide isotopes in samples.	DOE/WIPP
WP 12-RL1013, Rev 7	Sample Mounting, Technical Procedure, WP 12-RL1013, Revision 7, 09/12/07	Directions for electrodeposition sample mounting and neodymium fluoride coprecipitation sample mounting of actinides in preparation for alpha spectroscopy counting.	DOE/WIPP
WP 12-RL1014, Rev 6	Routine Laboratory Operations, Technical Procedure, WP 12-RL1014, Revision 6, 11/05/08	Instructions for routine laboratory operation.	DOE/WIPP

	Documents Reviewed and Copies Received During Inspection	191.03 Subpart A Inspection May 2011	
Citation	**Document Title**	**Subject Matter**	**Source**
WP 12-RL1015, Rev 16	Canberra Alpha Analyst System Operation, Technical Procedure, WP 12-RL1015, Revision 16, 9/09/10	Directions for calibrating and operating the Canberra Alpha Analyst 32-chamber alpha spectroscopy system.	DOE/WIPP
WP 12-RL1016, Rev	Operation of the Oxford Series 5 Gas Proportional Counter, Technical Procedure, WP 12-RL1016, Revision 11, 8/31/10	Guidance for the operation of the Oxford Series 5 Gas Proportional Counter. Editoial changes and instructions for a power outage made since 2010 inspection	DOE/WIPP
WP 12-RL1200, Revision 0	Plutonium-241 Analysis, Technical Procedure, WP 12-RL1200, Revision 0, 11/26/03	Provides method for the analysis of Pu 241 in any matrix after preparation of the sample in accordance with WP 12-RL1012 and WP 12-RL1015.	DOE/WIPP
WP 12-RL1400, Rev 9	Radiochemistry Laboratory Waste Management, Technical Procedure, WP 12-RL1400, Revision 9, 04/02/09	Instructions for handling, management, and disposal of laboratory waste.	DOE/WIPP
WP 12-RL1550, Revision 11	Control of Radioactive Standards, Technical Procedure, WP 12-RL1550, Revision 11, 10/22/09	Instructions for labeling, maintaining inventory, dilution of standards, completing standard logbook for new standards received, expired standards, depleted standards, and recertification or standards.	DOE/WIPP
WP 12-RL3002, Revision 8	Radiochemistry Laboratory Data Validation and Verification, Technical Procedure, WP 12-RL3002, Revision 8, 8/27/2010	Instructions for performing radiochemistry analytical data verification and validation by radiochemistry staff.	DOE/WIPP
WP 12-RL3003, Rev. 8	Data Reduction and Reporting, Technical Procedure, WP 12-RL3003, Revision 8, 2/7/11	Instructions for processing laboratory data from the time of sample receipt to the reporting of final results.	DOE/WIPP
WP 13-1, Rev 30	Washington TRU Solutions LLC Quality Assurance Program Description, WP 13-1, Revision 30, 11/15/10	Identifies Federal and industry quality standards, and sets standards for WIPP QA programs.	DOE/WIPP
WP12-5, Rev 13	WIPP Radiation Safety Manual, WP12-5, Rev 13, 05/20/10	States radiological control policy and practices, defines dosimetry terms.	DOE/WIPP
WP12-EM1012	Airborne Particulate Sampling, Rev 9, 06/07/07	Provides steps for environmental monitoring personnel to install and collect air filters and maintain records.	DOE/WIPP
WP12-HP2001, Rev 4	Abnormal Radiological Conditions, WP12-HP2001, Rev 4, 06/24/09	Instructions for radiological control technicians when responding to abnormal conditions.	DOE/WIPP
WP12-HP3000, Rev 15	Radiological Control Administration, WP12-HP3000, Rev 15, 11/11/10	Instructions for performing radiological control.	DOE/WIPP

	Documents Reviewed and Copies Received During Inspection	191.03 Subpart A Inspection May 2011	
Citation	**Document Title**	**Subject Matter**	**Source**
WP12-HP3200, Rev 12	Radioactive Material Control, WP12-HP3200, Rev 12, 4/04/11	Instructions for controlling radioactive items	DOE/WIPP
WP12-HP3300, Rev 2	Radiation Exposure Control, WP12-HP3300, Rev 2, 08/17/05	Guidance for keeping radiation exposure ALARA.	DOE/WIPP
WP12-HP3400, Rev 8	Contamination Control, WP12-HP3400, Rev 8, 02/20/09	Management Control Procedure. Guidance and forms for radiological surveys and decontamination.	DOE/WIPP
	Documents Generated During Inspection		
JPW-20110510-01	Underground Escape Map, effective date 3/2/2011	Marked with locations of inspection activities	DOE/WIPP
JPW-20110510-02	WP 12-ER4916, Attachment 1 - Dose Projection S	Completed during 5/10 accidental release drill	DOE/WIPP
JPW-20110510-03	Hotspot Output Table, generated 5/10/2011		DOE/WIPP
JPW-20110510-04	NARAC Report, generated 5/10/2011		DOE/WIPP
JPW-20110510-05	NARAC Plot of Total Effective Dose Equivalent		DOE/WIPP
JPW-20110511-06	Station D1 calibration report, 3/21/2011		DOE/WIPP
JPW-20110511-07	Photographs and pixel counts of Station A shroud occlusion, 5/10/2011, 5 pp.		DOE/WIPP
JPW-20110511-08	Convergence graph S2750-W0093		DOE/WIPP
JPW-20110511-09	Convergence graph E300-S2180		DOE/WIPP
JPW-20110511-10	Extensiometer graph 51X-GE-00389, W390-S3480		DOE/WIPP
JPW-20110511-11	DIGILEV output file, 3pp.		DOE/WIPP

DOCKET NO: A-98-49
Item: II-B3-116

2011 - Monitoring Inspection Report

EPA INSPECTION No. EPA-WIPP-5.11-10b
OF THE
WASTE ISOLATION PILOT PLANT
May 10 – May 12, 2011

U. S. ENVIRONMENTAL PROTECTION AGENCY
Office of Radiation and Indoor Air
Center for Waste Management and Federal Regulation
1200 Pennsylvania Avenue, NW
Washington, DC 20460

October 2011

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Table 2 Geomechanical Parameters and Values Measured to Confirm Them

1.0 Executive Summary

The U.S. Environmental Protection Agency (EPA) conducted an inspection of the Department of Energy's (DOE) Waste Isolation Pilot Plant (WIPP) from May 10 to May 12, 2011 as part of EPA's continuing WIPP oversight program. The purpose of this inspection was to verify that DOE continues to adequately monitor ten parameters listed in the Compliance Certification Application (CCA), Volume 1, Section 7.0, in particular Table 7-7 (See Table 1, EPA INSPECTION IDM2010-1). Attachment A of this inspection report contains the inspection plan and the checklist used by the EPA inspectors, and Attachment B lists documents reviewed by the EPA.

The inspection examined the implementation of monitoring for geomechanical, hydrological, waste activity, drilling related, and subsidence parameters. EPA inspectors toured locations where measurements are taken, reviewed parameter databases, and reviewed documents and procedures directing these monitoring activities.

The EPA found that DOE continues to effectively implement the monitoring programs at WIPP for all areas reviewed. EPA did not have any findings or concerns. The inspectors also confirmed that the results of DOE monitoring programs are reported annually.

2.0 Scope

The EPA WIPP Compliance Criteria (40 CFR Part 194.42(a)) require DOE to "conduct an analysis of the effects of disposal system parameters on the containment of waste in the disposal system." The results of these analyses were included in the 1996 Compliance Certification Application (CCA), confirmed in the most recent Compliance Recertification Application (CRA), and were used to develop pre-closure and post-closure monitoring requirements.

Volume 1, Section 7.0, of the CCA documents DOE's analysis of monitoring parameters. Table 7-7 of the CCA lists the ten parameters that DOE determined may affect the disposal system. These parameters are grouped into major categories and listed in Table 1. EPA accepted these ten monitoring parameters in the 1998 Certification Decision and confirmed them in the 2010 Recertification Decision.

Table 1. Monitored Parameters

Parameter Categories	Parameter
Geomechanical	Creep closure Extent of deformation Initiation of brittle deformation Displacement of deformation features
Hydrological	Culebra groundwater composition Change in Culebra groundwater flow direction
Subsidence	Subsidence measurements
Drilling Related	Drilling rate Probability of encountering a Castile brine reservoir

Waste Activity	Waste activity

This inspection was performed under the authority of 40 CFR 194.21, which authorizes EPA to verify the continued effectiveness of the parameter monitoring program at WIPP. Inspection activities included an examination of monitoring and sampling equipment both on and off site, and in the underground. EPA also reviewed numerous sampling procedures and measurement techniques and verified implementation of an effective quality assurance program (see the document list in Attachment B of this report).

3.0 Inspection Team, Observers, and Participants

The inspection team consisted of five EPA staff listed in Table 1. Others observing the inspection were Thomas Kesterson and Julia Marple of the State of New Mexico Environmental Department .

Table 2. WIPP Inspection Team

Inspection Team Member	Role	Affiliation
Tom Peake	Inspection Leader	EPA ORIA
Nick Stone	Inspector	EPA Region 6
Jonathan Walsh	Inspector	EPA ORIA
Shankar Ghose	Inspector	EPA ORIA
Kathleen Economy	Inspector	EPA ORIA

4.0 Inspection Schedule

The inspection began on Tuesday, May 10, 2011, with an opening meeting where site staff presented changes in the monitoring programs since the previous inspection. On May 11 the inspection continued with interviews and demonstrations of various aspects of each parameter monitoring area. The collection of geomechanical measurements in the underground and the collection of Culebra water samples in the field were both inspected on May 11th. On May 12 the EPA inspectors examined the database(s) used to store Delaware Basin parameters and the WIPP Waste Data System (WDS formally WWIS) waste computer database system. The inspection closeout meeting was held on May 12, 2011 in Carlsbad New Mexico

EPA inspectors reviewed three fundamental areas to verify continued implementation of the DOE parameter monitoring program during the pre-closure phase: 1) written plans and procedures, 2) quality assurance procedures and records, and 3) results of the monitoring program in the form of raw data, intermediate reports, and final annual reports, if appropriate. The inspection checklist in Attachment A provides details of these inspection activities.

4.1 Monitoring of Geomechanical Parameters

DOE committed to measure four geomechanical parameters in the CCA: creep closure, extent of deformation, initiation of brittle deformation, and displacement of deformation features. These parameters are monitored through convergence monitoring, deformation monitoring, fracture mapping and stratigraphic and fracture mapping, respectively. WIPP has four programs that supply information for these four parameters: the geomechanical monitoring program, the geosciences program, the ground control program, and the rock mechanics program. These programs are documented in WP 07-1, WIPP Geotechnical Engineering Program Plan. The status of geomechanical monitoring procedures, with respect to changes and revisions, is provided below.

- WP 07- EU1301, Manually Acquired Geomechanical Instrument Data – No change
- WP 07-EU1304, Installing Convergence Reference Points – No change
- WP 07-EU1306, Installing Rock Bolt Load Cells – No change
- WP07-EU1308, Installing Wire Extensometers – No change
- WP 07-EU1001, Geologic and Fracture Mapping of Facility Horizon Drifts – Revision 3 (07/21/11)
- WP 07-EU1303, Geomechanical Instrument Data Processing - Revision 4 (05/03/11)

In addition to reviewing procedures, EPA inspectors examined monitoring and measurement techniques, manually and remotely acquired instrument data and the storage, accuracy and consistency of the reported data in DOE WIPP Reports. Inspection personnel interviewed WIPP geotechnical engineering personnel to discuss any programmatic changes, observed manual convergence measurements and fracture mapping, examined data from stratigraphic mapping and remotely measured extensiometers, compared staff practices to written procedures, and reviewed the annual WIPP Geotechnical Analysis Report for July 2009 to June 2010 (DOE/WIPP 11-3177, March 2011).

EPA met with staff from the WIPP Geotechnical Engineering Program and asked about programmatic changes, observed manual data collection processes and examined the Geomechanical Instrument Data Processing technical procedure (WP 07-EU1303, Rev 4). While in the underground on the morning of May 11, WIPP geomechanical staff manually measured the convergence in Panel 6 at S2750- W93. The inspector examined the process followed and found it to be in concurrence with the process documented in WP 07-EU1303. The measured value was 13 feet and 2 inches from floor to the roof at this point. Underground fracture mapping is also an integral part of the monitoring program. Fractures in the underground waste panels are typically less than ¼ inch wide, and in the main drifts, which are open for longer period, fractures are typically 2 to 3 inches wide, and are addressed by rock bolting in a regular pattern.

During the afternoon of May 11, inspectors visited the geomechanical engineering department offices. The electronic entry of the morning's convergence data from the handwritten sheet was verified. DOE concluded on the basis of measurements that the rate of deformation is consistent and predictable. The deformation mechanism remains unchanged and the effects of RH boreholes in Rooms 6 and 7 of Panel 7 are consistent with the predicted values. DOE also indicated that with the advancement in mining, the monitoring stations are being relocated. Panel 4 is no longer being monitored and the measurements are taken in Panel 5 and 6. Instruments are being installed in Panel 7. EPA reviewed all convergence data for S2750- W93 and E300-S2180 (JPW-20110511-08, -09) and data from the remotely monitored wire extensometer 51X-GE-00389 placed at W390-S3480 (JPW-20110511-10).

Based on these inspection activities, EPA concluded that the procedures are adequate for proper measurements and did not identify any concerns or findings.

4.2 Monitoring of Hydrological Parameters

DOE committed to measure two hydrological parameters in the CCA: Culebra groundwater composition, and changes in the Culebra groundwater flow direction (as indicated by Culebra fresh water heads). Culebra groundwater chemistry and potentiometric head measurements are performed by members of the WIPP environmental monitoring program. Programmatic functions and responsibilities are outlined in the *WIPP Groundwater Monitoring Program Plan, WP 02-1 Revision 10* (EPA Inspection ID: KME-M2011-GW09). Results of this program are published in the annual *WIPP Site Environmental Report for 2009, DOE/WIPP-10-2225* (EPA Inspection ID: KME-M2011-GW10) denoted herein as the ASER. The ASER describes and presents environmental programmatic data which the groundwater monitoring program falls under.

Culebra Groundwater Composition

Changes in the Culebra groundwater composition monitoring program since EPA's July 2010 inspection were presented by Rick Salness, (WRES) WIPP's Ground Water Monitoring Program lead staff member, during the May 10th opening presentation (EPA INSPECTION ID: KME-M2011-GW14). The following changes or soon to be implemented changes are:

1. Well WQSP-6A is no longer used as part of the semi-annual monitoring program, therefore there is one less water quality sampling well used since the 2010 inspection.

2. Basic water quality chemistry testing is now performed only on Magenta wells H-2b2, H-4c, H-6c, and H-9c.
3. The program is in the process of modifying the hazardous waste facility permit to reduce the number of required serial sampling parameters.

On the morning of May 11th, the EPA inspector arrived at well WQSP-5. The field team consisted of Robin Spoon and Richie Jimenez. Rick Salness also was in attendance. The field team was on the third day of taking groundwater serial samples for this well and in the process of taking end measurements, collecting final groundwater samples, and packing samples for shipment to an offsite laboratory. The EPA inspector observed the field team collecting groundwater serial samples and performing total alkalinity, anion/cation balances per the following technical procedures:

> Groundwater Serial Sample Analysis (WP 02-EM1005 Rev 7, Inspection ID: KME-M2011-GW11)
> Serial and Final Sample Analysis (WP 02-EM1006 Revision 8, Inspection ID: KME-M2011-GW12)

The inspector observed the team collecting 'final' serial samples per procedure WP 02-EM1006. The inspector compared observed activities to procedures specified in WP 02-EM1006, Sections 1.0 thru 1.28—Collection of Serial Groundwater Samples and Sections 2.0 through 2.1—Preserving Final Groundwater Samples. The procedure provides explicit steps for sample collection, labeling, preservation and filling out sample documentation and chain of custody forms. During this inspection the EPA inspector observed staff following the procedure and completing appropriate steps for sample collection, labeling, preservation and documentation.

The EPA inspector observed the field team measuring groundwater pH, alkalinity and divalent cations, and dissolved iron as specified in WP 02-EM1005 Rev 7 pages 61, 63, and 64. The team followed protocols as described below:

The inspector observed the final alkalinity titration, reported on page 61 of WP 02-EM1005 Rev 7, and examined Excel spreadsheet formulae (EPA Inspection ID: KME-M2011-GW03, page 1) for alkalinity against those specified in pages 33-37 of WP 02-EM1005 Rev 7. The inspector cross-checked total alkalinity as calculated by the formula given in procedure WP 02-EM1005 Revision 7 (Step 6.6.8, page 36) against Excel calculations (EPA Inspection ID: KME-M2011-GW03, page 2), Serial Sampling ALK Calc Sheet). The field team accurately followed subject protocol to determine total alkalinity; spreadsheet formulas calculate alkalinity as specified in procedure.

The inspector observed the measurement of divalent cation (Ca and Mg) concentrations in water samples per WP 02-EM1005 Rev 7, Section 8, pages 40-46. The inspector cross-checked the total divalent cation concentration formula given in procedure WP 02 EM-1005 Revision 7 (Step 8.15, page 44) against Excel calculations (EPA Inspection ID: KME-M2011-GW04, pages 2 &3 Serial Sampling ALK Calc Sheet). The field team accurately measured and calculated divalent cation concentrations as specified in the procedure.

The inspector cross-checked the total iron formula given in procedure Step 9.19, WP 02 EM-1005 Revision 7 (Step 9.1.9, page 51) against Excel calculations (EPA Inspection ID: KME-M2011-GW05, Serial Sampling Fe Calc Sheet). The inspector determined that the iron concentration formula specified in procedure is accurately represented in the spreadsheet.

During the inspection, EPA noted that the probe rinse water accumulated in beakers and could easily result in the probe tip becoming immersed during repeated rinses. EPA suggested procedure WP 02-EM1005 Rev 7, *Groundwater Serial Sample Analysis*, be modified to direct staff to discard rinse water after each rinse. Rick Salness agreed to this revision.

In summary, the EPA inspector found that the field team followed and implemented proper procedures for testing groundwater chemistry.

Review of Culebra Groundwater Flow

During the 2011 inspection, the EPA inspector requested information about changes in the program over the past year. In the May 10th opening presentation Rick Salness, (WRES) WIPP's Ground Water Monitoring Program lead staff member, reported the following changes in WIPP monitoring wells since the 2010 inspection (EPA INSPECTION ID: KME-M2011-GW14). These are summarized below:

- Well H-9b was plugged in September 2010
- H-9bR—a replacement well for H-9b—was drilled and completed in September.
- Well H-9c was reconfigured, in September 2010, to monitor only the Magenta formation.

The current well monitoring network consists of the following wells:

Formation	**Number of Wells**	**Change since July 2010**
Culebra	47	+1
Magenta	11	0
Magenta/Culebra (dual completion)	1	-1
Dewey Lake	1	0
Bell Canyon	2	0
Santa Rosa/Dewey Lake contact	20	0

The EPA Inspector reviewed the *Waste Isolation and Pilot Plant Site Environmental Report for 2009, DOE/WIPP-10-2225*, flow direction maps, well location maps, water level measurements, and water chemistry data (EPA Inspection ID: KME-M2011-GW10). The EPA inspector compared the differences between the 2008 and 2009 Culebra potentiometric maps [*DOE/WIPP-09-2225*, pages 6-20 & 6-21, Inspection ID: COB-M2010-S18) and DOE/WIPP-10-2225, pages 162 and 163 (EPA Inspection ID: KME-M2011-GW10-C6)]. The reported groundwater contours, flow direction, and particle travel-time to the WIPP land withdrawal boundary are relatively unchanged. The minor differences in estimated travel times are attributed to the normal and cyclical variability in freshwater heads, a general decrease in heads (now in a quiescent phase 'settling' from the transient perturbation created by WIPP-site drilling and testing activities), and other regional anthropogenic activities affecting the Culebra water table

(e.g., mining, drilling, and borehole exploration activities). Of note, the hydrographs in the 2009 annual report appear to be the same as those given in the 2008 report and this issue was brought up in a discussion with Rick Salness. Rick Salness acknowledged this was an editorial error. An errata to the 2009 ASER will be issued to include the updated hydrographs.

The EPA inspector reviewed *Construction of the Potentiometric Surface Map for the Annual Site Environmental Report and Shallow SubSurface Water* (WP 02-EM1025, Revision 2; EPA INSPECTION ID: KME-M2011-GW13) which is designated as the default procedure used to generate the Culebra potentiometric map for the ASER. After some discussion with the staff the inspector realized the actual procedure used to generate the Culebra map for the ASER is produced and followed by Sandia National Laboratories. The Inspector reviewed Sandia National Laboratories (SNL) Activity/Project Specific Procedure (Kuhlman, K. 2009. Sandia National Laboratories, SNL SP 9-9), *Preparation of Culebra Potentiometric Surface Contour Map*, Revision 0 (EPA INSPECTION ID: KME-M2011-GW14), used to generate the Culebra freshwater heads and particle tracking reported in the annual ASER document. The procedure was reviewed and cross-checked against the potentiometric map and water level elevation data, both presented in Figure 6.12 and Table 6.3, respectively, of the ASER report (DOE/WIPP-10-2225 , Figure 6.12 *Model-Generated June 2009 Freshwater Head Contours (5-Foot Contour Interval) in the WIPP Vicinity with Blue Water Particle Track From Waste Handling Shaft to WIPP LWB* and Table 6.3, *Water Elevation for the June 2009 Potentiometric Surface Calibration, Culebra Hydraulic Unit*). To do this comparison it was first necessary to convert the freshwater head values from feet to meters. Freshwater head values for each well corresponded with the potentiometric contour lines at the map location of each well.

The EPA inspector found that it was unclear which procedure is used to create the Culebra potentiometric map used in the ASER. The review of WP 02-EM1002 and found it to have 'dead-end' directions. While this is not a breach in the monitoring and recording of Culebra groundwater flow direction, it is difficult to trace when the steps of this procedure are invoked, and clarification of some 'dead-end' steps required additional discussion among DOE staff. EPA suggests DOE modify procedure WP 02-EM1025 to reflect its actual use, clarify potential dead-end directions, and direct the reader to the specific procedure used to generate the annual Culebra potentiometric map reported in the ASER.

4.3 Monitoring of Waste Activity Parameters

In the CCA, DOE committed to monitor the total radioactivity of waste emplaced in WIPP, so that total activity and materials do not violate limits set by the WIPP Land Withdrawal Act and the most recent compliant performance assessment. Waste activity deposited in the WIPP repository is part of the data collected for each container shipped to WIPP and stored in the *WIPP Waste Data System* (WDS). . The WDS is a database system used to track total activity and waste components (e.g., ferrous and non-ferrous metals, organic materials and MgO) emplaced in WIPP and is used to generate reports on the transuranic (TRU) waste sent to WIPP. The requirements for the WDS are discussed in the *WIPP Waste Data System Program and Data Management Plan*, WP 08-NT.01 Revision 22 (EPA INSPECTION ID: KME-M2011-WACT07). DOE reports annual waste activity information and is given in the *Annual Change Repor*t 2009/2010, Table 3 (DOE/WTS November 15, 2010. EPA INSPECTION ID: KME-M2011-WACT14).

On May 11, 2011, while in the waste handling room, EPA Inspectors observed RH waste container number AE0085 (Figure 1, EPA INSPECTION ID: KME-M2011-WACT07) undergoing the remote tracking and scanning process in preparation for repository placement within the next 24 hours. During the May 12, 2010 inspection of the WDS database EPA inspectors queried the WDS to see when this canister was emplaced in the repository. The database query report (EPA INSPECTION ID: KME-M2011-WACT04) indicates RH container AE0085 waste was emplaced in the repository on May 12, 2011 as appropriate.

The WDS system tracking CH/RH waste activity emplaced in the repository was spot-checked. Inspectors queried the data base for time periods when waste was received in Panel 4, then cross checked this activity with a query bookending this timeframe. EPA Inspectors requested a query for waste activity in Panel 4 during the time period 01/01/1999 through 12/31/2009 (EPA INSPECTION ID: KME-M2011-WACT03), to assure consistency in reported waste activity in

Figure 1 - Monitor Picture of RH Canister In Waste Handling Room Undergoing Final Check Before Repository Placement (EPA Inspection ID: KME-M2011-WACT07)

Panel 4 over different time frames. Using the generated query (EPA INSPECTION ID: KME-M2011-WACT03), a cross-check of reported WDS activity was performed by running additional queries of waste activity for different time frame. These query reports are listed below:

- 01/01/1999 thru 12/31/2009 (EPA INSPECTION ID: KME-M2011-WACT01)
- 01/01/2009 thru 12/31/2009 (EPA INSPECTION ID: KME-M2011-WACT02)
- 01/01/ 2009 thru 05/12/2011 (EPA INSPECTION ID: KME-M2011-WACT05)

The EPA inspector reviewed activities reported for waste received in Panel 4 Rooms 1 through 7 over the queried time-frames to assure that reported activities for each time span were in agreement and corroborate one another. The four report queries corroborate consistent values for the given time-frames. From this spot-check it is concluded that the WDS appears to adequately report for the activity emplaced in the rooms and panels.

4.4 Monitoring of Drilling Related Parameters

DOE committed to measure two drilling related parameters in the CCA: the drilling rate and the probability of encountering a Castile brine reservoir. These parameters are measured as part of the *Delaware Basin Drilling Surveillance Plan*, WP 02-PC.02 Revision 3 (EPA INSPECTION ID: KME-M2011–DB08). The surveillance program measures and records many parameters related to drilling activities around the WIPP site. The results of the surveillance program are documented quarterly and combined in the annual report *Delaware Basin Monitoring Annual Report, December 2010*, DOE/WIPP-10-2308 (EPA Inspection ID: KME-M2011–DB01). The annual report provides data covering the period from September 1, 2009 to August 31, 2010. Drilling data is collected using procedure WP 02-EC3002 Rev 4, *Delaware Basin Drilling Database Upgrade Program* (EPA INSPECTION ID: KME-M2011-DB10).

An update and summary of Delaware Basin drilling activities was presented during the May 10th, 2011 opening briefing (EPA Inspection ID: KME-M2011-DB07). EPA Inspectors reviewed the information provided in the *Delaware Basin Annual Monitoring Report* (DOE-WIPP-10-2308, EPA Inspection ID: KME-M2011-DB13) and *Delaware Basin Monitoring Quarterly Report* (EPA Inspection ID: KME-M2011-DB11). EPA inspectors observed how the database is updated to track weekly drilling activities in the basin using the procedure *Delaware Basin Drilling Database Upgrade Process* WP 02-EC3002 Rev 4 (EPA INSPECTION ID: KME-M2011–DB10). The procedure is used to step through the process to update databases with information from various commercial and state sources. Additionally, EPA reviewed the drilling surveillance database and examined changes in drilling rates, permitted wells, and active injection wells. The inspectors reviewed Texas and New Mexico reports, well database listings and maps of oil and gas wells around WIPP (EPA Inspection ID: KME-M2011-DB02, KME-M2011-DB03, KME-M2011-DB04, KME-M2011-DB05, and KME-M2011-DB06). During staff interviews and demonstrations of the Delaware Basin database, EPA inspectors verified that DOE adequately tracks drilling rates and Castile brine encounters near WIPP, and reports results annually and quarterly.

4.5 Monitoring of Subsidence Parameters

DOE committed to measure surface subsidence at the WIPP site. This parameter is documented

as part of the *WIPP Underground and Surface Surveying Program*, WP 09-ES.01 Revision 5 (EPA INSPECTION ID: KME-M2011-SUB03). DOE performs subsidence leveling surveys at the site annually during pre-closure operations. Nine vertical survey control loops using 48 subsidence marker monuments are completed each year to determine the degree of subsidence above the repository footprint. The results of this program are reported annually in the *WIPP Subsidence Monument Leveling Survey 2010*, DOE/WIPP 11-2293 (EPA INSPECTION ID: KME-M2011-SUB01).

Subsidence staff demonstrated the steps followed in procedure *Subsidence Survey Data Acquisition Report*, WP 09-ES4001, Revision 1, Section 2 (EPA INSPECTION ID: KME-M2011-SUB02) used to process raw field survey loop data, download the data from the survey module to the computer, and convert to readable surface elevations (JPW20110511-11). The surface elevations are reported in the annual *WIPP Subsidence Monument Leveling Survey 2010*, DOE/WIPP 11-2293(EPA INSPECTION ID KME-M2011-SUB01). DOE demonstrated that the subsidence parameters area measured adequately and results are reported yearly.

5.0 Summary of Results

Based on program documents, interviews, and field demonstrations during the inspection, EPA concludes that the monitoring program covers the ten monitoring parameters required by EPA's 1998 Certification Decision. This inspection determined that monitoring sample collection, and sample/data analysis procedures were complete and appropriate; that staff were adequately trained and implemented the procedures adequately; and that appropriate quality assurance measures are applied. EPA continues to find that DOE has maintained adequate parameter monitoring during the past year and has appropriate procedures and requirements in place. EPA has no findings or concerns.

Attachment A: Inspection Plan and Checklist

***WIPP Monitoring Inspection Plan* 40 CFR 194.42 for the year 2011**

Purpose:
Verify that the Department of Energy (DOE) can demonstrate that the Waste Isolation Pilot Plant (WIPP) is monitoring the parameter commitments made in the documentation to support the EPA's certification decision, in particular CCA, Volume 1, Section 7.2, Table 7.7 and Appendix MON. This inspection is conducted under the authority of 40 CFR 194, Section 21.

This inspection is part of EPA's continued oversight to ensure that WIPP can, in fact, monitor the performance of significant parameters of the disposal system.

Scope:
Inspection activities will include an examination of monitoring and sampling equipment both on and off site, and in the underground. A review of sampling procedures and measurement techniques may be conducted. Quality assurance procedures and documentation for each of these activities will also be reviewed.

Focal Areas of This Year's Inspection:

- What has changed in the monitoring program this past year?
- What documentation and procedures have changes?
- Update the monitoring program and results for the past year.
- Have any monitoring parameters changed, and have any action limits been achieved?

Location: This inspection will be held at the WIPP facility location twenty-six miles south east of Carlsbad, New Mexico and the surrounding vicinity as needed.

Duration: The EPA expects to complete its inspection in two days. Each day will begin with an opening meeting at 8:00 a.m. and end before 5:00 p.m. with a closeout session.

Expected Date: Week of May 13, 2011.

Documents For Review: The latest versions of any documentation and/or procedures related to the DOE monitoring program.

2010 Monitoring Inspection Checklist

Checklist for Geotechnical Monitoring Commitments – May 2011			
	Monitoring Commitments – May 2011	**Geotechnical Parameters**	
#	**Question**	**Comment (Objective Evidence)**	**Result**
1	Does DOE demonstrate that they have implemented plans/programs/procedures to measure - a) Creep Closure; b) Extent of Deformation; c) Initiation of Brittle Deformation and d) Displacement of Deformation Features during the pre-closure phase of operations as specified in the CCA part of the geomechanical monitoring system? (CCA, Volume 1, Table 7-7; App MON, Table MON-1) 40 CFR 194.42 (c) and (e)	Objective evidence given reviewing the following procedures and reports – *Preparation of 2010 Culebra Potentiometric Surface Contour Map*, Revision 2, Task Number:1.4.2.3, Report Date: 4/6/2011, (ERMS555318) *Waste Isolation Pilot Plant Annual Site Environmental Report* for 2009 (DOE/WIPP-10-2225) *Construction of the Potentiometric Surface Map for the Annual Site Environmental Report and Shallow SubSurface Water*, Revision 2, WP 02-EM1025, 08/03/10 (while this is not a quality affecting observation, this procedure should be revised. EPA suggests DOE revise procedure to provide clarity as what parties generate the ASER Culebra Potentiometric map) Results are documented annually in the DOE/WIPP 10-2225 and Figure 6.12, and Appendix F.	SAT
	Does DOE demonstrate that they have implemented an effective quality assurance program for item 1 above? 40 CFR 194.22	During the 2011 inspection the EPA inspector evaluated the quality assurance program and found it to be adequate.	SAT
3	Does DOE demonstrate that the results of the geotechnical investigations are reported annually? (CCA, App. MON, Page MON-10)	WP 07-01, Section 3.2 requires that analysis be performed annually and results are published in the annual geotechnical analysis report (DOE/WIPP 09-3177).	SAT

Checklist for Hydrologic Monitoring Commitments – May 2011			
	Monitoring Commitments – May 2011	**Hydrological Parameters**	
#	**Question**	**Comment (Objective Evidence)**	**Result**
1	Does DOE demonstrate that they have implemented plans/programs/procedures to measure – a) Culebra Groundwater Composition; (CCA, Volume 1, Table 7-7; App MON, Table MON-1) 40 CFR 194.42 (c) and (e)	Objective evidence given reviewing the following procedures and reports: *Groundwater Serial Sample Analysis* (WP 02-EM1005 Rev 7) *Serial and Final Sample Analysis* (WP 02-EM1006 Rev 8) The inspector observed the collection of groundwater serial samples and determining groundwater constituents per above procedures. Given this spot check, the EPA finds that DOE follows and implements adequate procedures and programs for testing groundwater chemistry.	SAT
	b) Change in Culebra Groundwater Flow Direction during the pre-closure phase of operations as specified in the CCA part of WIPP's groundwater monitoring plan? (CCA, Volume 1, Table 7-7; App MON, Table MON-1) 40 CFR 194.42 (c) and (e)	Objective evidence given reviewing the following procedures and reports – *Preparation of 2010 Culebra Potentiometric Surface Contour Map*, Revision 2, Task Number:1.4.2.3, Report Date: 4/6/2011, (ERMS555318) *Waste Isolation Pilot Plant Annual Site Environmental Report* for 2009 (DOE/WIPP-10-2225) *Construction of the Potentiometric Surface Map for the Annual Site Environmental Report and Shallow SubSurface Water*, Revision 2, WP 02-EM1025, 08/03/10 (while this is not a quality affecting observation, this procedure should be revised. EPA suggests DOE revise procedure to provide clarity as what parties generate the ASER Culebra Potentiometric map) Results are documented annually in the DOE/WIPP 10-2225 and Figure 6.12, and Appendix F.	

2	Does DOE demonstrate that they have implemented an effective quality assurance program for item 1 above? (CCA, App MON, Page MON-22) 40 CFR 194.22	During the 2011 inspection the EPA inspector evaluated the quality assurance program and found it to be adequate.	SAT
3	Does DOE demonstrate that the results of the groundwater monitoring program are reported annually? (CCA, App. MON, Page MON-22)	Objective evidence given in the *Waste Isolation Pilot Plant Annual Site Environmental Report* for 2009, DOE/WIPP-10-2225, (ASER). The document provides annual groundwater elevations for 47 wells completed in the Culebra and used this well data to create the Culebra regional and local potentiometric maps around the WIPP LWB.	SAT

Checklist for Waste Activity Monitoring Commitments – May 2011			
	Monitoring Commitments – June 2011	**Waste Activity Parameters**	
#	**Question**	**Comment (Objective Evidence)**	**Result**
1	Does DOE demonstrate that they have implemented plans/programs/procedures to measure - a) Waste Activity? (CCA, Volume 1, Table 7-7; App MON, Table MON-1) 40 CFR 194.42 (c) and (e)	The *WIPP Waste Data System Program and Data Management Plan,* WP 08-NT.01 Rev22 Section 6.0 (EPA INSPECTION ID: KME-M2011-WACT07) describes how the WDS is used to measure and store waste activity information. WWIS User's manual, DOE/WIPP 09-3427 Rev 2 (EPA INSPECTION ID: KME-M2011-WACT12) documents procedures used to gather, store, and process waste activity information. WDS (WWIS) staff demonstrated the use of the WDS and generated numerous waste related reports (EPA INSPECTION IDS: KME-M2011-WACT01, KME-M2011-WACT02, KME-M2011-WACT03, KME-M2011-WACT04, KME-M2011-WACT05). These activities demonstrate that waste activity is adequately monitored.	SAT
2	Does DOE demonstrate that they have implemented an effective quality assurance program for item 1? (CCA, App WAP, page C-30) 40 CFR 194.22	The EPA inspector evaluated the quality assurance process and found it to be adequate.	SAT
3	Does DOE demonstrate that the results of the waste activity parameters are reported annually? (CCA Volume, Section 7.2.4 Reporting)	The *WIPP Waste Data System Program and Data Management Plan,* WP 08-NT.01 Rev22 Section 6.0 (EPA INSPECTION ID: KME-M2011-WACT07) specifies that waste activities area reported annually. Table 3 in the *Annual Change Report 2009/2010* (EPA INSPECTION ID: KME-M2011-WACT14) provides objective evidence that the waste activity parameters are reported.	SAT

Checklist for Drilling Rate Monitoring Commitments – May 2011			
	Monitoring Commitments – June 2011	**Drilling Related Parameters**	
#	**Question**	**Comment (Objective Evidence)**	**Result**
1	Does DOE demonstrate that they have implemented plans/programs/procedures to measure - a) Drilling Rate; and b) Probability of Encountering a Castile Brine Reservoir? (CCA, Volume 1, Table 7-7; App MON, Table MON-1) 40 CFR 194.42 (c) and (e)	The *Delaware Basin Drilling Surveillance Plan*, WP 02-PC.02 Rev 3 (EPA INSPECTION ID: KME-M2011–DB08), documents the program to measure, record, report, and the QA requirements for these activities. Quality assurance requirements are documented in Section 7.0 of WP 02-PC.02 Rev 3. The *Delaware Basin Drilling Database Upgrade Process* WP 02-EC3002 Rev 4 (EPA INSPECTION ID: KME-M2011–DB10) documents the process used to update databases with information from various commercial and state sources. Drilling rate and Castile brine encounter data are reported annually in the *Delaware Basin Monitoring Annual Report* DOE/WIPP 10-2308 (EPA INSPECTION ID: KME-M2011–DB01) in Sections 2.5 and 2.6. WIPP staff discussed changes during the past year (KME-M2011-DB07). DB staff reported on brine encounters, drilling rate calculations, and provided maps of drilling activities near WIPP (KME-M2011-DB02, KME-M2011-DB03 and KME-M2011-DB04). Staff also provided the latest listing of the New Mexico and Texas well databases (KME-M2011-DB05, KME-M2011-DB06). They demonstrated that DOE is adequately monitoring these parameters through the Delaware Basin monitoring program.	SAT

2	Does DOE demonstrate that they have implemented an effective quality assurance program for item 1 above? (CCA, App DMP, page DMP-9) 40 CFR 194.22	During this inspection the EPA inspector evaluated the quality assurance program and found it to be adequate.	SAT
3	Does DOE demonstrate that the results of the drilling related parameters are reported annually? (CCA Volume, Section 7.2.4 Reporting; App DMP, page DMP-9)	*Delaware Basin Monitoring Annual Report, December 2010*, DOE/WIPP-10-2308 Section 6.0 documents that results are reported annually. DOE/WIPP 08-2308 verifies that these parameters are updated and reported annually.	SAT

Checklist for Subsidence Monitoring Commitments – May 2011			
	Monitoring Commitments – June 2011	**Subsidence Monitoring Parameters**	
#	**Question**	**Comment (Objective Evidence)**	**Result**
1	Does DOE demonstrate that they have implemented plans/programs/procedures to measure - a) Subsidence measurements? (CCA, Volume 1, Table 7-7; App MON, Table MON-1) 40 CFR 194.42 (c) and (e)	*WIPP Underground and Surface Surveying Program* WP 09-ES.01 Rev 05(KME-M2011-SUB03) documents the program used to measure, record, document, report subsidence monitoring; the technical program description is given in Section 3.3, QA requirements for these activities are provided in Section 4.0. The *Subsidence Survey Data Acquisition Report*, WP 09-ES4001 Rev 1 (KME-M2011-SUB02) documents the process for acquiring subsidence data (Section 1.0); updating the database and publishing the annual subsidence report (Section 2.0). The *WIPP Subsidence Monument Leveling Survey - 2010* DOE/WIPP 11-2293 (KME-M2011-SUB01) provides objective evidence that DOE annually reports this parameter and results of this program (Section 5.0). Site staff demonstrated that procedures are adequately implemented, how raw field survey data is reduced to useful survey data. DOE has demonstrated that subsidence is adequately monitored at the site.	SAT
2	Does DOE demonstrate that they have implemented an effective quality assurance program for item 1? 40 CFR 194.22	During this inspection the EPA inspector evaluated the quality assurance program and found it to be adequate.	SAT
3	Does DOE demonstrate that the results of the subsidence measurements are reported annually? (CCA Volume, Section 7.2.4 Reporting)	The DOE report *WIPP Subsidence Monument Leveling Survey 2010*, DOE/WIPP 11-2293 (KME-M2011-SUB01) demonstrates that subsidence results are published annually.	SAT

Attachment B: Documents Reviewed

	Documents Received and Reviewed During Inspection	194.42 Monitoring Inspection May 2011	
EPA Inspection ID#	**Document Title**	**DOE ID#**	**Source**
	Hydrologic Documents		
KME-M2011-GW09	WIPP Groundwater Monitoring Program Plan	WP 02-1 Revision 10	DOE/WIPP
KME-M2011-GW10	WIPP Site Environmental Report for 2009	DOE/WIPP-10-2225	DOE/WIPP
KME-M2011-GW14	Oral Presentation by Rick Salness	N/A	DOE/WIPP
KME-M2011-GW11	Groundwater Serial Sample Analysis	WP 02-EM1005 Rev 7	DOE/WIPP
KME-M2011-GW12	Serial and Final Sample Analysis	WP 02-EM1006 Rev 8	DOE/WIPP
KME-M2011-GW3	p. 61, Groundwater Serial Sample Analysis	WP 02-EM1005 Rev 7	DOE/WIPP
KME-M2011-GW04	Attachment 7: Serial Sampling Field Laboratory Report for Alkalinity	WP 02-EM1005 Rev 7, Att. 7, p. 61	DOE/WIPP
KME-M2011-GW13	Construction of the Potentiometric Surface Map for the Annual Site Environmental Report and Shallow SubSurface Water	WP 02-EM1025, Rev 2	DOE/WIPP
KME-M2011-GW14	Preparation of Culebra Potentiometric Surface Contour Map SNL SP 9-9, Revision 0	Kuhlman, K. 2009. SNL SP 9-9	DOE/SNL
	Monitoring of Waste Activities		
KME-M2011-WACT07	WIPP Waste Data System Program and Data Management Plan	WP 08-NT.01 Revision 22	DOE/WIPP
KME-M2011-WACT14	Annual Change Report 2009/2010, Table 3		DOE/WIPP
KME-M2011-WACT07	Figure 1 - Monitor Picture of RH Canister In Waste Handling Room	N/A	DOE/WIPP
KME-M2011-WACT04	The database query report	N/A	DOE/WIPP
KME-M2011-WACT03	WDR - Waste Data System, Emplacment History Overview Report Panel 4 (waste activity query period 01/01/1999 - 12/31/2009)	N/A	DOE/WIPP
KME-M2011-WACT01	Waste Isolation Pilot Plant Nuclide Report Generated on May 12, 2011 11.25 AM (Selection Criteria, Start Date: 01/01/1999 End Date: 12/31/2009)	N/A	DOE/WIPP
KME-M2011-WACT02	Waste Isolation Pilot Plant Nuclide Report Generated on May 12, 2011 11.28 AM [Selection Criteria, Start Date: 01/01/2009 End Date: 12/31/2009]	N/A	DOE/WIPP

			DOE/WIPP
KME-M2011-WACT05	Waste Isolation Pilot Plant Nuclide Report Generated on May 12, 2011 11.39 AM [Selection Criteria, Start Date: 01/01/1999 End Date: 05/12/2011]	N/A	
KME-M2011-DB02	Delaware Basin Annual Monitoring Report	DOE-WIPP-10-2308	DOE/WIPP
KME-M2011-DB11	Delaware Basin Monitoring Quarterly Report	N/A	DOE/WIPP
	Delware Basin Documents		
KME-M2011–DB08	Delaware Basin Drilling Surveillance Plan	WP 02-PC.02 Rev 3	DOE/WIPP
KME-M2011–DB01	Delaware Basin Monitoring Annual Report, December 2010	DOE/WIPP-10-2308	DOE/WIPP
KME-M2011-DB10	Delaware Basin Drilling Database Upgrade Program	WP 02-EC3002 Rev 4	DOE/WIPP
KME-M2011-DB07	DOE presentation: Delaware Basin drilling activities	N/A	DOE/WIPP
KME-M2011-DB02	Delaware Basin Annual Monitoring Report	DOE-WIPP-10-2308	DOE/WIPP
KME-M2011-DB11	Delaware Basin Monitoring Quarterly Report	N/A	DOE/WIPP
	Subsidence Documents		DOE/WIPP
KME-M2011-SUB03	WIPP Underground and Surface Surveying Program	WP 09-ES.01 Rev 5	DOE/WIPP
KME-M2011-SUB01	WIPP Subsidence Monument Leveling Survey 2010	DOE/WIPP 11-2293	DOE/WIPP
KME-M2011-SUB02	Subsidence Survey Data Acquisition Report,	WP 09-ES4001, Rev 1	DOE/WIPP
JPW-20110511-11	DIGILEV output file, 3pp.		
	Geotechnical		
N/A	Geotechnical Analysis Report for July 2009 - June 2010, DOE/WIPP 10-3177, Volumes One and Two (Support Data)	DOE/WIPP 10-3177, Vol. I and II	DOE/WIPP
N/A	Manually Acquired Geomechanical Instrumentation Data, Technical Procedure, WP 07-EU1301, Revision 6, 03/19/08	WP 07-EU1301	DOE/WIPP
N/A	Geomechanical Instrument Data Processing, Technical Procedure, WP 07-EU1303, Revision 3, 06/18/08	WP 07-EU1303, Rev 3	DOE/WIPP
N/A	Installing Convergence Reference Points, WP 07-EU1304, Technical Procedure, Revision 5, 10/19/09	WP 07-EU1304, Rev 5	DOE/WIPP
N/A	Installing Rock Bolt Load Cells, Technical Procedure, WP 07-EU1306, Revision 4, 10/19/09	WP 07-EU1306, Rev 4	DOE/WIPP
N/A	Installing Wire Extensometers, Technical Procedure, WP 07-EU1308, Rev 2, 10/19/09	WP 07-EU1308, Rev 2	DOE/WIPP
N/A	Geologic and Fracture Mapping Of Facility Horizon Drifts, Technical Procedure, WP 07-EU1001, Revision 3, 7/21/10	WP 07-EU1001, Rev 3	DOE/WIPP
JPW-20110511-08	Convergence graph S2750-W0093	N/A	DOE/WIPP
JPW-20110511-09	Convergence graph E300-S2180	N/A	DOE/WIPP
JPW-20110511-10	Extensiometer graph 51X-GE-00389, W390-S3480	N/A	DOE/WIPP

DOCKET NO: A-98-49
Item: II-B3-116

2011 -- Emplacement Inspection Report

EPA INSPECTION No. EPA-WIPP-5.11-10c
OF THE
WASTE ISOLATION PILOT PLANT
May 10 – May 12, 2011

U. S. ENVIRONMENTAL PROTECTION AGENCY
Office of Radiation and Indoor Air
Center for Waste Management and Regulation
1200 Pennsylvania Avenue, NW
Washington, DC 20460

October 2011

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1.0 EXECUTIVE SUMMARY

The U.S. Environmental Protection Agency (EPA or the Agency) conducted an inspection of the U.S. Department of Energy's (DOE) Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico, from May 10 through May 12, 2011, in accordance with 40 CFR 194.21. The WIPP is a disposal system for defense-related transuranic (TRU) waste as defined by the WIPP Land Withdrawal Act.[1] EPA certified that WIPP complies with the Agency's radioactive waste disposal regulations (Subparts B and C of 40 CFR Part 191) on May 18, 1998.

The purpose of this annual inspection is to determine that waste sent to WIPP during the past year has been emplaced in the underground facility in the manner specified in DOE's Compliance Certification Application and other approvals. The inspection reviews the site's ability to receive, process, and emplace contact-handled and remote-handled TRU wastes within the repository, the emplacement of magnesium oxide (MgO) backfill in appropriate amounts to fulfill DOE commitments and requirements, and the maintenance of records pertaining to waste shipping, packaging, and emplacement, including the electronic Waste Data System (WDS). EPA examined selected activities, such as RH and CH waste processing, waste emplacement activities, and record keeping.

EPA concluded that DOE's emplacement activities are adequate, that cellulosic, plastic and rubber material (CPR) is appropriately tracked and recorded, that MgO balances are calculated properly, and that MgO is emplaced properly. EPA observed the use of the proper waste emplacement procedures in the underground and successful implementation of the WDS bar code reader. EPA did not identify any findings or concerns during this inspection.

[1] WIPP Land Withdrawal Act, Public Law 102-579, Section 2(18), as amended by the 1996 WIPP LWA Amendments, Public Law 104-201.

2.0 INSPECTION PURPOSE AND SCOPE

The purpose of this annual inspection is to verify that contact-handled (CH) and remote-handled (RH) transuranic (TRU) waste sent to WIPP during the past year has been emplaced in the underground facility in the manner specified in DOE's Compliance Certification Application (EPA Air Docket A-93-02, Item II-G-01) and other approvals. EPA performed this inspection under the authority of 40 CFR 194.21, which authorizes the Agency to inspect WIPP during its operational period to verify continued compliance with EPA's WIPP Compliance Criteria and the certification decision of May 18, 1998. Emplacement of waste and backfill, in particular, is relevant to compliance because the emplacement method supports the models that DOE uses in the WIPP performance assessment.

The primary focus of this year's inspection was to evaluate the changes relative to the emplacement activities, particularly with regard to the handling and emplacement of the Standard Large Box (SLB II) and documentation since the annual inspection of 2010.

Activities within the scope of this inspection included: demonstration of the WIPP site's ability to receive, process, and emplace remote-handled (RH) and contact-handled (CH) TRU wastes within the repository, the use of magnesium oxide (MgO) backfill in amounts to fulfill certification requirements and other approvals, maintenance of relevant waste packaging records, including the electronic Waste Data System (WDS) and the verification of appropriately implemented quality assurance practices. The review and examination of documents related to these activities is an important part of the inspection process. The WIPP site is operated by Washington TRU-Solutions (WTS) under contract to DOE, and the majority of waste related activities onsite are described by or controlled through WTS procedures. A list of WTS procedures examined during this inspection is provided in Attachment G.

3.0 INSPECTION TEAM, OBSERVERS, AND PARTICIPANTS

The inspection team consisted of three EPA staff. Thomas Kesterson and Julia Marple of the New Mexico Environment Department observed the inspection activities. A partial list of inspection participants is provided in Table A.

Table A
Inspection Participants

INSPECTION TEAM MEMBER	POSITION	AFFILIATION
Tom Peake	Inspector	EPA ORIA
Jonathan Walsh	Inspector	EPA ORIA
Kathleen Economy	Inspector	EPA ORIA
Nick Stone	Inspector	EPA Region 6
Shankar Ghose	Inspector	EPA ORIA
Gene Valett		WTS
Rey Carrasco		WTS
Art Chavez		WRES
Mark Dziamski/Craig Suggs		WTS
Dan Ferguson		CBFO
Chris Luona		WTS
Dave Speed		WTS
David Squires		WTS
Mike Strum		WTS

4.0 PERFORMANCE OF THE INSPECTION

The inspection took place from May 10 to May 12, 2011, at DOE's Carlsbad Field Office (CBFO) and at the Waste Isolation Pilot Plant (WIPP) facility, which is located approximately 26 miles south east of Carlsbad, New Mexico. The opening meeting with CBFO and WTS personnel was held on the morning of May 10, 2011. Several DOE and WTS staff presented information addressing program status, updates and changes since the last EPA emplacement inspection which took place from June 29 to July 1, 2010. The primary focus of emplacement inspection was to determine the nature and extent of changes taken place in the areas of emplacement activities and documentation since last year's inspection, particularly with regard to the handling and emplacement of the Standard Large Box (SLB II). In the opening meeting Ed McGary presented the status and results of MgO program at the WIPP.

EPA inspectors accompanied CBFO and WTS personnel into the underground repository on the morning of May 11, in order to examine waste packages and MgO that had been emplaced in Panels 5 and 6. Inspectors reviewed paper records documenting that waste emplacement and MgO tracking were conducted in accordance with procedures. Inspectors selected several containers and recorded their numbers (see Figure 3 for container locations); the records for these containers were examined both in

the repository, and later using the WDS computer database, to verify correct waste information is recorded by DOE. WTS personnel answered EPA questions about how waste is handled and emplaced. The inspectors also examined air monitoring locations, and observed the measurement of geotechnical parameters and mining in Panel 7.

During the afternoon of May 11, EPA inspectors observed operations CH and RH bay areas of the waste handling building aboveground. Also on May 11, inspectors remotely accessed the WDS, and were able to generate Container and Canister Data Reports for the RH boreholes and CH waste containers observed in the underground that morning. On the morning of May 12, inspectors discussed record-keeping procedures with WDS data administrators at the Carlsbad Field Office, and WTS personnel generated additional reports and queries for the inspectors. EPA presented its preliminary observations at a close-out meeting on the afternoon of May 12.

5.0 WASTE EMPLACEMENT/WDS

Wastes received at the repository include contact-handled (CH) transuranic wastes from Argonne National Laboratory-East (ANL-E) in Illinois, Los Alamos National Laboratory (LANL) in New Mexico, Idaho National Laboratory (INL), Hanford Site in Washington, Rocky Flats Environmental Technology Site (RFETS) in Colorado, Savannah River Site (SRS) in South Carolina, the Nevada Test Site (NTS) in Nevada, and the Oak Ridge National Laboratory (ORNL) in Tennessee. These wastes are received and emplaced in several configurations: Standard Waste Boxes (SWBs), 55-gallon drums assembled in groups of seven called a Seven Pack, 100 gallon drums for supercompacted waste, and Ten Drum Overpacks (TDOP). RH wastes from INL, ORNL, and SRS have been emplaced in the WIPP, using the 72-B canister.

The repository is subdivided into panels, each panel consisting of seven rooms. At the time of the inspection, CH waste was being emplaced in Panel 5, Room 1 and RH waste in the walls of Panel 6, Room 7. CH waste containers are stacked in columns (waste stacks) combining SWBs, drum packs, and TDOPs (see Figures 2 and 3). TDOPs are always placed on the floor of the room, occupying the bottom and middle position of a waste column. SWBs and drums may be emplaced in any order, with most wastes emplaced as received. The waste columns are in a series of staggered rows, with a row consisting of three columns that span the distance of a disposal room from left to right (Figure 2). RH waste is placed in the walls on eight foot centers (Figures 1, 4, and 5).

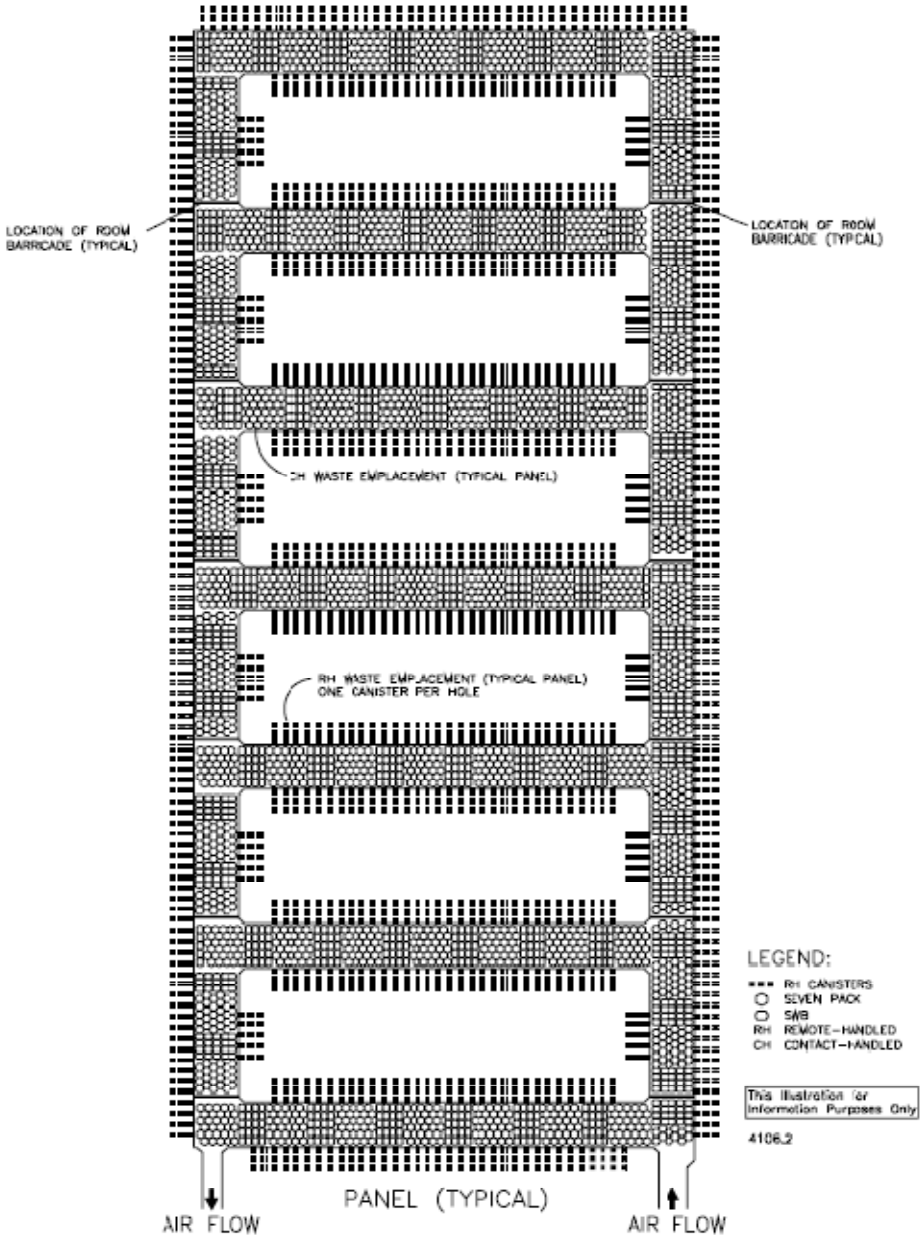

Figure 1
Typical RH and CH TRU mixed waste disposal configuration

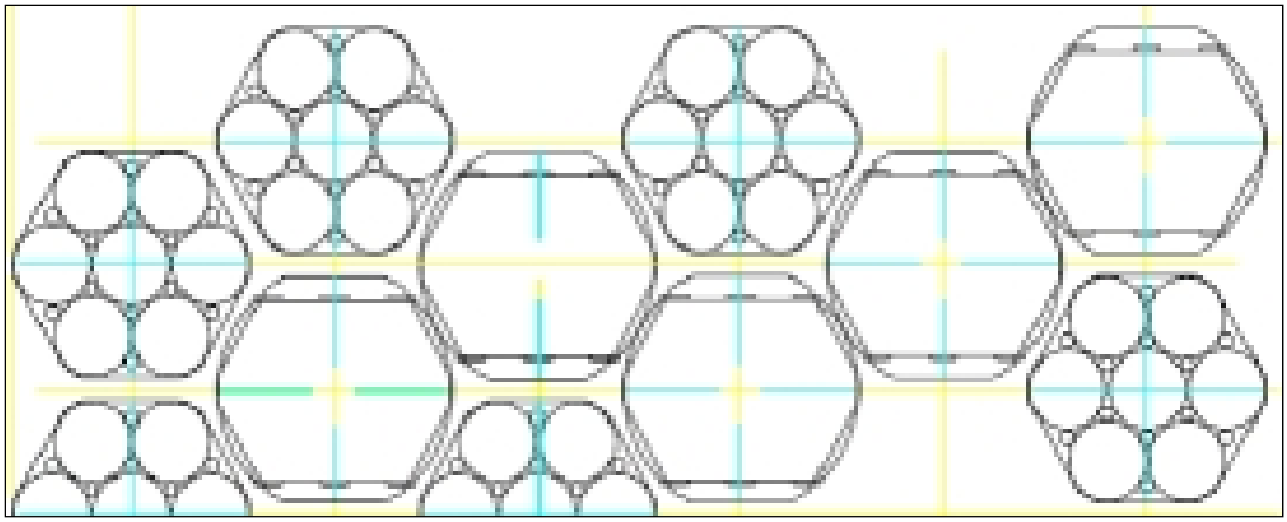

Figure 2

Figure 2 Illustrates the arrangement of disposed contact-handled waste in underground. Represented are stacks of seven-packs of drums and standard waste boxes.

In Panel 6, Room 7 inspectors observed boreholes drilled to emplace RH containers, and observed the Horizontal Emplacement/Retrieval Equipment set up to emplace a RH canister (Figure 4).

While underground in Panel 5, Room 1, EPA inspectors selected recently emplaced CH waste packages for review. The inspector noted the shipment identification numbers as read by the underground escort directly off the emplaced containers (See Figure 3 for CH locations). The containers selected are identified in Table B below.

Table B: Waste Containers Reviewed During Inspection

CH Waste Containers Reviewed During Inspection (Panel 5, Room 1)	**Container Number**	**Container Type**
	BN10404666	Ten Drum Overpack (TDOP)
	BN10399691	7- pack
	LASB01179	Standard Waste Box (SWB)
	BW10400132	55-gallon drum
	RL0062383	55-gallon drum
	RL0070588	55-gallon drum
RH Waste in Selected Boreholes (Panel 5, Room 1)	**Container Number**	**Borehole**
	AE0085	043
	BC0017	051

Since the last inspection, DOE informed EPA of plans to emplace CH waste in the repository using a new container, the Standard Large Box, or SLB-II. The SLB-II requires the use of a new shipping container, the TRUPACT-III. At the time of this inspection, no waste had been shipped to WIPP using the SLB-II. While in the Waste Handling building on May 11, EPA inspectors observed the

construction and testing of specialized robotic equipment, including the Yard Transfer Vehicle, which will be used to move and unload the TRUPACT-III in preparation for emplacement of the SLB-II. An EPA inspector returned to observe a demonstration of this equipment and implementation of relevant procedures on June 14, 2011. EPA will continue its oversight to verify that the emplacement of waste using the SLB-II is conducted appropriately.

On the morning of May 12 at CBFO, inspectors met with WTS personnel, who answered questions and generated the Nuclide Report, Waste Emplacement Report and the MgO safety factor calculations. All electronic records were found to contain required waste stream, container, and emplacement information.

6.0 MAGNESIUM OXIDE BACKFILL

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Magnesium oxide (MgO) is the engineered barrier used in the repository as backfill, as specified in DOE's Compliance Certification Application (CCA). EPA requires DOE to maintain an MgO safety factor (excess factor) to ensure that adequate MgO is chemically available to control the chemistry of each room after closure. EPA approved lowering the required safety factor to 1.2 from 1.67 in a letter dated February 11, 2008, requiring the emplacement of sufficient MgO to react with 1.2 times the amount of carbon present in the repository. Conditions of EPA's agreement stipulate that DOE must ensure a minimum reactivity of 96% for the MgO emplaced, and maintain the safety factor on a room-by-room basis. DOE instituted this change in March 2009, and it was a focus of EPA's 2009 inspection.

During the opening meeting, Edward McGary and Gene Valett gave a presentation updating DOE's MgO Program and management. The following information was provided:

- MgO bulk shipment deliveries from Manistee, Michigan continue on an as-needed basis.

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- The local bagger vendor (Questa Fertilizer, Loving, NM) continues with super sack deliveries on an as needed basis (Generally delivered weekly).
- The lab of record (ALS Laboratory Group, Fort Collins, Colorado) continues to conduct reactivity analysis sample testing on an as needed basis or whenever bulk shipment of MgO is requested.
- All necessary documentation for the MgO program continues according to the RIDS documentation system.
- No technical changes to the program since the last EPA Annual WIPP Inspection in 2010.

- Reactivity results since last visit:
    1. Average reactivity from June 29th - September 30th was 97.3% (June 29th EPA Annual WIPP Inspection for FY 2010).
    2. Average reactivity from October 25th - February 15th was 98.0
    3. The average reactivity for the above is 97.65.

Process steps guiding MgO placement and documentation in the underground continue to be found in WP 05-WH1025, *CH Waste Downloading and Emplacement*, and WP-05-WH.02, *WIPP Waste Handling Operations WDS User's Manual*. Waste Handling Engineers (WHE) may record the quantity and placement of MgO electronically using a WWIS/WDS bar code reader, or manually via paper forms

if a bar code reader is unavailable. The appropriate forms (CH Waste Downloading and Emplacement Data Sheet and Supersack/BRT Emplacement Data Sheet) are included as Attachments 1 and 3 of WP 05-WH1025. While in the underground repository, EPA inspectors verified that the proper procedures were used to track MgO emplacement in Panel 5, Room 1 and that MgO was emplaced on top of the CH waste stacks as stipulated. At the conclusion of each shift, the WHE must electronically verify the safety factor of 1.2 using the WDS. MgO safety factor calculations made using the WDS allowed inspectors to verify that a MgO safety factor in excess of 1.2 is being maintained in Panel 5, Room 1.

Checklist items 12-17 and 24 specifically relate to MgO management and demonstrate that DOE has appropriate processes in place to ensure that MgO is properly emplaced.

DOE is emplacing waste stacked 2-3 containers high topped with MgO Supersacks. Figure 3 shows all container types being shipped to date. Large drums are Ten Drum Overpacks (TDOPs), black barrels are 100-gallon drums with supercompacted waste, smaller white containers are standard waste boxes, and standard 55-gallon drums appear in 7-packs. 3000 lb MgO supersacks are visible on top of the stacks.

Figure 3. Emplaced waste in Panel 5, Room 1.

Figure 4
Equipment prepared for RH waste emplacement in Room 7 of Panel 6

Figure 5
Emplaced RH Waste selected for review

7.0 COMPARISON WITH INVENTORY LIMITS

In the Summary of Waste Emplacement Inventory Report, available through the EPA dashboard, EPA was provided data for emplaced waste, including total activities of the ten EPA-tracked radionuclides, total weights of ferrous and non-ferrous metals, and the CPR/MgO balance by room, as of April 7, 2011. More detailed data on the total amounts of specific materials emplaced was provided by WDS staff, using a script to run a custom WDS query.

EPA establishes limits for certain waste components at WIPP by approving performance assessment inventory estimates. Some limits, such as for iron and other metals, are minimum limits. The amount of iron and steel are now at 21,762,561kg. The minimum limit of 2×10^7 kg iron has now been met for the repository. Other waste component limits are maximum limits. Of special concern is the maximum limit on the total amount of cellulosic, plastic and rubber (CPR) materials. In the original CCA, DOE calculated 2.2×10^7 kg of CPR, establishing EPA's limit. In the subsequent performance assessment baseline calculations, DOE added packaging materials to the calculations, and now the CPR limit for WIPP is 2.4×10^7 kg (see Table C). CPR values are tracked on a per container basis and the current CPR values as of March 31, 2011are listed in Table C.

As of this inspection the WIPP contained almost 5,429,253.20 kg of CPR in waste and 1,540,281.56 kg of CPR in packaging material. In addition, emplacement CPR, such as the slip sheets used to aid the emplacement of the containers, accounts for another 437,035.28 kg of CPR. This is a total of 7,406,570.04 kg of cellulosic, plastic and rubber material. The mass of rubber materials currently accounts for approximately 4.7% of the total mass of CPR, compared to 4.3% in 2010, 3.4% in 2009, 5% in 2008, 4.7% in 2007, and 7% in 2006. The WIPP currently contains approximately 30% of its maximum limit for CPR. The repository held 29% of its limit for CPR in 2009, 24% in 2008, and 21% in 2007.

Table C: Emplaced CPR Quantities as of March 31, 2011

Waste CPR:

Type	Weight (kg)
Cellulosic	2,163,373.94
Plastic	2,940,275.48
Rubber	325,603.78
Total	5,429,253.20 (kg)

Emplacement CPR:

Type	Weight (kg)
Cellulosic	55,562.08
Plastic	381,473.20
	437,035.28 (kg)

Packaging CPR:

Type	Weight (kg)
Cellulosic	854,938.96
Plastic	685,342.60
Total	1,540,281.56 (kg)

MgO CPR:

Type	Weight (kg)
Cellulosic	53,202.45
Plastic	58,849.95
	112,052.40(kg)

Grand Totals:

Cellulosic + Plastic = 6,643,930.98
Rubber = 325,603.78
Total CPR = 6,969,534.76 (kg)

8.0 SUMMARY OF RESULTS

The inspectors reviewed emplacement operations, WTS procedures, and records associated with selected containers. The surface processing of CH and RH waste as well as underground operations were reviewed and found to be adequate, according to specified plans documented in the CCA. EPA concludes that DOE's emplacement activities and records are adequate, and that CPR and MgO are appropriately tracked. EPA identified no findings or concerns with the emplacement portion of the inspection.

Attachment A
WIPP Emplacement Inspection Plan for the year 2011

Purpose:

The purpose of this inspection is to verify that waste sent to WIPP during the past year has been emplaced in the underground facility in the manner specified in DOE's Compliance Certification Application (EPA Air Docket A-93-02, Item II-G-01) and other approvals.

EPA is performing this inspection under the authority of 40 CFR 194.21, which authorizes the Agency to inspect the WIPP during its operational period to verify continued compliance with EPA's WIPP Compliance Criteria and the certification decision of May 18, 1998.

Scope:

The scope of this inspection includes: demonstration of the site's ability to receive, process, and emplace contact-handled and remote-handled TRU wastes within the repository; the use of magnesium oxide (MgO) backfill in appropriate amounts to fulfill DOE commitments and requirements; maintenance of relevant waste packaging records, including the electronic WIPP Waste Data System (WDS) and the verification of appropriately implemented quality assurance practices. The availability of documentation of these processes and activities will be a major source of review.

Focal Areas for this Year's Inspection:

What changes have taken place to emplacement activities and documentation since last year's inspection, particularly with regard to the handling and emplacement of the Standard Large Box (SLB II)?

Location:

The inspection will be held at DOE's WIPP facility located twenty-six miles southeast of Carlsbad, New Mexico and the Carlsbad Field Office (CBFO) in Carlsbad. Inspection activities will include examination of the underground facilities, review of records related to waste emplacement, and other information as needed.

Duration:

The EPA expects to complete its inspection in three days, plus a return visit to view the Integrated Facility Checkout (which will demonstrate the handling of the TRUPACT-III and SLB.) Each full day will begin with an opening meeting at 8:00 a.m. and end no later than 5:00 p.m. with a closeout session.

Date: May 10-12, 2011

Documents for Review:

Provide to EPA the latest version of pertinent documentation and/or procedures related to CH and RH waste handling and emplacement, MgO emplacement and tracking, and record keeping using the WDS.

Attachment B

Summary of Waste Emplacement Inventory Report
April 07,2011

Attachment C

Materials Emplaced in WIPP as of March 31, 2011

CH WASTE:

MP	Material Type	Material Description	Material Weight (kg)
1	Waste	Iron Based Metal/Alloys	8,126,957.56
2	Waste	Aluminum Based Metal/Alloys	49,165.30
3	Waste	Other Metal/ Alloys	302,070.50
4	Waste	Other Inorganic Materials	1,500,109.98
6	Waste	Cellulosics	2,163,373.94
7	Waste	Rubber	325,603.78
8	Waste	Plastics	2,940,275.48
9	Waste	Solidified Inorganic Material	6,808,062.69
10	Waste	Solidified Organic Material	1,936,185.60
12	Waste	Soils	475,200.43
13	Steel - Packaging	Steel Container Materials	13,338,733.73
14	Plastic - Packaging	Plastic /Liners Container Materials	685,342.60
15	Cellulosic - Packaging	Cellulosic Packaging Materials	854,938.96
18	Emplacement	Cellulosic Emplacement Material	55,562.08
20	Emplacement	Plastic Emplacement Material	381,473.20

RH Waste:

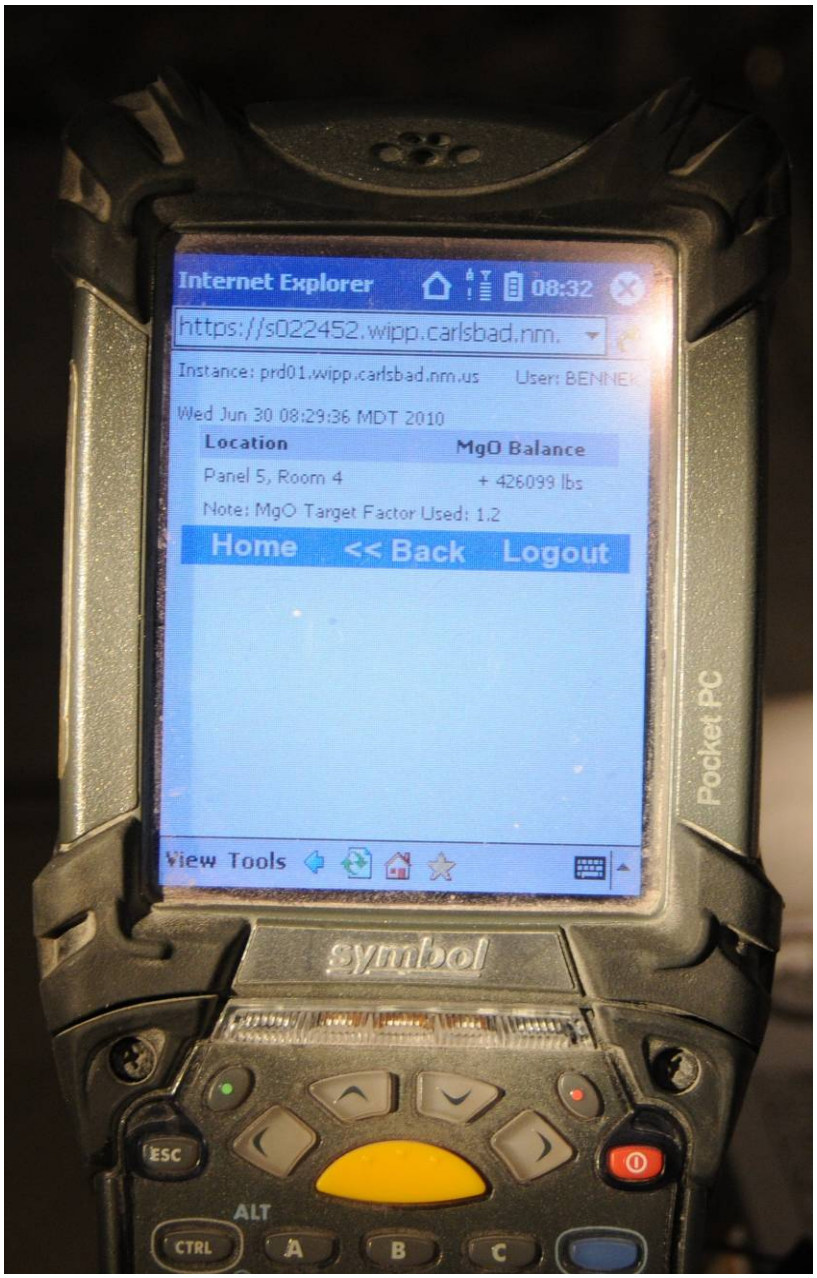
1	Waste	Iron Base Metal/Alloys	48,890.19
2	Waste	Aluminum Base Metal/Alloys	29.20
3	Waste	Other Metal/Alloys	9.72
4	Waste	Other Inorganic Materials	13.06
6	Waste	Cellulosics	71.10
7	Waste	Rubber	7.30
8	Waste	Plastics	51,720.11
9	Waste	Solidified Inorganic Material	194.55
10	Waste	Solidified Organic Material	15.06
13	Steel Packaging	Steel Container Materials	247,898.44
14	Plastic Packaging	Plastic/ Liners Container Materials	403.86
15	Cellulosic Packaging	Cellulosics Packaging Materials	4.26

MgO

16	Emplacement	Magnesium Oxide	28,581,798.99
18	Emplacement	Cellulosic Emplacement Mat'l	53,202.45
20	Emplacement	Plastic Emplacement Mat'l	58,849.95
		Totals:	**69,141,167.07**

Attachment D

WDS bar code reader displaying MO Balance for Panel 5, Room 4



Attachment E
Procedures Examined

Attachment F
EPA Emplacement Inspection Checklist – May 10-12, 2011

#	Questions:	Comments and Objective Evidence	Results
	Waste Emplacement		
1	Is waste being emplaced in the underground facility in the manner specified in DOE's Compliance Certification/ Re-Certification or other relevant documentation?	Yes. Procedure WP 05-WH1025, CH Waste Downloading and Emplacement, Section 2, describes the CH emplacement procedures. Visual verification of the emplaced waste in Rows 146 through 148 of Panel 5, Room 4 confirmed waste emplacement in accordance with facility procedure and CCA documentation . RH processing procedures for 72-B (WP 05-WH1710, WP 05-WH1725) and 10-160-B (WP 05-WH1722) containers are consistent with the approach discussed in the CCA documentation. Emplacement in the repository walls with borehole plugs was verified during inspection of the underground.	Satisfactory
2	Are CH waste containers stacked in columns appropriately given the type of container?	Yes. In WP 05-WH1025, CH Downloading and Emplacement, a note at step 2.25 specifies appropriate stacking of CH container types. Attachment 2 of the same procedure specifies payload assembly positioning. Visual verification confirmed adherence to procedure (e.g. TDOPs placed in bottom position of waste columns.)	Satisfactory

3	Are records adequate? Randomly select 3-4 CH and 2-3 RH waste containers to verify records for waste approval, shipment, and receipt.	Yes. TRU Waste Receipt WP 08-NT3020, Rev.18 describes the process. Records produced are Uniform Hazardous Waste Manifest, TRU Waste Receipt Checklist, Shipment Summary Report, RH waste Processing Data Sheet, Radiological Survey Report, and Waste Emplacement Report. CH waste produces comparable records. EPA reviewed records and found the records to be adequate and traceable. Selected Containers: **CH Waste** (Panel 5, Room 1, Rows 16-17) - Ten Drum Overpack (TDOP), BN10404666 - Standard Waste Box, (SWB), LASB01179 - Standard Waste Box (SWB), LASB01171 - 100-gallon drum, BN10368262 - 55-gallon drum, RL0062383 **RH Waste** (Panel 6, Room 7) - Borehole 051, BC0017 (55 gallon drum) **RH Waste** (Panel 6, Room 7) - Borehole 043, AE 0085 (RH CANISTER WITH REMOVABLE LID-OVERPACK)	Satisfactory
4	Is DOE properly emplacing backfill material (magnesium oxide [MgO]) with the waste packages? Are supersacks placed on top of waste stacks according to procedure?	Yes. 3000-pound supersacks were observed to be emplaced on top of each waste assembly at the active waste face in Panel 5 Room 1. WP 05-WH1025, CH Waste Downloading and Emplacement, Section 3.0, establishes procedure for emplacement of MgO.	Satisfactory
5	Verify documentation for the containers listed in item 3 - waste generator site transmittal of waste to WIPP, WIPP approval, shipment certification for transport to WIPP, shipment initiation documentation, shipment received at WIPP records, waste emplaced in the underground, and placement of engineered barrier [MgO].	Inspectors examined paper records maintained underground and electronic records kept aboveground for the selected containers. Site operators demonstrated the use of the WDS bar code reader to track emplacement of waste and MgO. Documentation was determined to be adequate.	Satisfactory

	RH Waste Emplacement Questions		
6	Are RH containers approved for receipt, received, processed, and emplaced properly?	Yes. Inspection of the underground and RH handling area showed procedures to be in agreement with WP 05-WH1710, 72-B RH Processing, and WP 05-WH1725, RH Waste Downloading and Emplacement.	Satisfactory.
7	Are RH containers appropriately tracked? Where is the information? --In the WDS, what report --During the receipt/transfer process where is it recorded? --In the underground?	Yes. Appropriate information is found in the WDS Canister Data Report, and on the underground facility map maintained by the Waste Handling Engineers in the underground.	Satisfactory.
8	Content of RH canisters --pick 1 to 3 canisters	See Item 3 above. The Canister Data Report was generated and reviewed for each canister.	Satisfactory
9	Volume and mass and/or concentration of important waste components and radionuclides (RH and CH)? Are they within statutory and regulatory limits?	Detailed description of nuclide information is included in the Waste Container Data Reports and Canister Data Reports generated. Yes.	Satisfactory
10	Are RH boreholes closed properly? (Note: also see #9 for tracking of RH in the U/G)	Recently emplaced borehole plugs, and plugs prepared for emplacement, were observed by inspectors in the underground to be in accordance with WP 05-WH1725, Rev. 3, RH Waste Downloading and Emplacement.	Satisfactory
11	Is a photographic record made of the RH canister number during emplacement and retained in the permanent record?	No. The canister ID number is verified by two operators during cask transfer, via closed-circuit television in accordance with procedure 05-WH1710, 72-B RH Processing, Section 8.24. WTS personnel provided EPA inspectors with screen shots from this process. Tapes are maintained for one year, and WP 05-WH1710 Att. 1, RH Waste Processing Data Sheet, then becomes the permanent record. EPA finds this to be adequate.	Satisfactory

	Question: Procedure		
12	Do DOE procedures reflect an MgO safety factor to 1.2?	Partially. WP 05-WH1025, CH Waste Downloading and Emplacement, Rev. 1, Section 3.0, Backfill, establishes procedures to maintain a safety factor of 1.2 or greater per room on a daily basis. Procedures in the WDS User's Manual, WP-05-WH.02, Rev. 0, Sections 6.2.5, 9.5.3, and Attachment 1 reflect the 1.2 safety factor and the use of 3,000-lb. supersacks as necessary. WHEs were observed to be using current procedures and the WDS bar code reader to record MgO emplacement in the underground.	Satisfactory
13	Are both CPR and MgO calculated and tracked on a room-by-room basis?	Yes. Calculations are performed by the Waste Handling Engineer at the conclusion of each shift, through the WDS, using the MgO Balance Report or Daily Report, as required by WP 05-WH1025, CH Waste Downloading and Emplacement, Rev. 1, Section 3.0, Backfill.	Satisfactory
14	Are sampling and analytical procedures in place to ascertain that emplaced MgO maintains a minimum of 96% reactivity?	Yes. Specification D-0101, Prepackaged MgO Backfill, Rev. 8 and WP 05-WH1105, MgO Sample Records Management, Rev. 0, set forth analytical and document management procedures to verifying that each shipment of MgO maintains a 96 +/- 2% reactivity. Average reactivity from October 25th (2010) - February 15th (2011)was 98.0 The average reactivity for the above is 97.65.	Satisfactory
15	Is the acceptance of the MgO backfill material from the supplier documented?	Yes. WP 05-WH1105, MgO Sample Records Management, Rev. 0, Sec. 2.0 requires each shipment to be numbered, and the MgO supplier to provide an Analysis of Shipment and a sample under Chain of Custody for each shipment. Supersacks in the underground were observed by inspectors to be marked with unique ID numbers, traceable to their original shipments.	Satisfactory
16	For the MgO needed for high CPR, are there procedures or documentation for the WHE or WHM (or other appropriate personnel) identifying **when** and **where** additional MgO is needed?	Yes. General procedures are found in the WIPP Waste Handling Operation WDS User's Manual, WP 05–WH.02, Attachment 1, Special Requirements for Additional MgO. Section 3 of WP 05-WH1025 calls for notification of the WHM if daily reports show the MgO safety factor of a room to be less than 1.2.	Satisfactory
17	Is there documentation that identifies **how** MgO should be placed with high CPR waste?	Yes. WP 05-WH1025, CH Waste Downloading and Emplacement, Attachment 3, Supersack/BRT Emplacement Data Sheet; and WP 05-WH1058, CH Waste Handling Abnormal Operations, Sec. 4.0, BRT Emplacement	Satisfactory

18	Verify documentation of procedures for abnormal operating conditions, and documentation of training for contingencies.	Abnormal operating and emergency procedures were reviewed, including but not limited to those listed below. WP 04-CO, Conduct of Operations, Rev. 11, identifies notification policies, supervision and training procedures, and required reading (Management Policy 1.30). WP 02-EC3506, Environmental Incident Reporting, is the Management Control Procedure for reporting releases, and includes statutory requirement charts for notifications and decision flowcharts. WP 05-WH1058, CH Waste Handling Abnormal Operations, includes instructions for recovering from a torn slip sheet, moving emplaced waste, returning waste to surface, and emplacing BRTs. Specifies that "Abnormal operations of a large scope (e.g. overpack and retrieval) will have specific plans developed." WP 05-WH1758, RH Waste Handling Abnormal Operations, includes instructions for operating the Hot Cell Crane in response to a hoist, trolley, bridge or grapple failure, installing and removing the Waste Transfer Machine Assembly (WTMA) wheels, retrieving a loaded RH –TRU 72-B Cask from the Transfer Cell, returning a loaded 10-160B Cask to a generator site and resetting the Transfer Cell Light Curtain. WP 12-9, WIPP Emergency Management Program, is the top-level document outlining emergency response procedures and responsibilities, includes training requirements for response roles. WP 05-WH4401, Waste Handler Operator Event Response, includes alarm, alert, and exit procedures. WP 12-ER3906, Categorization and Classification of Operational Emergencies includes tables of procedures for emergency notifications and classification of events. WP 12-HP4000, Emergency Radiological Control Responses, provides guidance for responding to an actual or suspected breach of a TRU container, contamination found outside controlled areas, radiation levels exceeding the limits set in WP 12-5.	Satisfactory

#	**Question**: **Records/WDS**		
	Do the characterization module, certification module, shipping module, and inventory module adequately record required information?	WWIS modules have been replaced by WDS Dashboards. Reports available through the EPA Dashboard contain the container number, shipment number, emplacement data and underground location. EPA staff queried the WDS to verify that this information is recorded correctly.	Satisfactory
19	Does the WDS adequately document waste shipment and emplacements information for waste containers selected? (Item 3 above) CH, RH	Yes. Canister, Overpack, and Container Data Reports were retrieved, all of which correctly reflected container number, shipment number, and emplacement information in the underground.	Satisfactory
20	Do records verify that contact handled waste container surface doses fall within statutory requirements? Where are CH surface dose records maintained?	Yes. CH surface dose measurements are recorded in the Container Data Report. Dose limits for each of the containers examined by EPA inspectors (listed in Item 3) were below statutory limits.	Satisfactory
21	Review a Waste Container Data Report. Does this report adequately record the Waste Stream Profile Form information?	Yes. For all containers inspected, inspectors found Container and Canister Data Reports to contain Waste Stream IDs, as well as all necessary radiological and chemical profile information.	Satisfactory
22	Review the Shipment Summary Report. Does the report correctly record the containers shipped? CH, RH	By querying the Shipment number, the Shipment Data report may be generated. Inspectors verified that the report reflects the containers shipped.	Satisfactory
23	Review the Waste Emplacement Report. Does this report adequately record the date of receipt, and disposal locations of containers? CH, RH	Yes. See Item 21.	Satisfactory
24	Is DOE assuring that the 1.2 safety factor being maintained on a room basis? Does the WDS accurately calculate the safety factor and recommend the proper amount of MgO to emplace?	Yes. See questions 12-17. EPA inspectors reviewed InSEI Matrix Requirements WWIS2-REQ-2126 and -2127 to verify that the WDS software calculates MgO excess appropriately.	

Documents Received and Reviewed During Inspection	**Emplacement Inspection**	**May 2011**
Document Title	**Subject Matter**	**Source**
WP 12-ER4902, Rev. 12, Hazardous Material Spill and Release Respon , 2/02/09	Emergency Response Procedure for RCRA event.	DOE/WIPP
WP 12-ER3906, Rev. 1, Categorization and Classification of Operational Emergencies, 12/5/08	Mangement Control Procedure for classifying emergency and beginning notification within fiteen minutes.	DOE/WIPP
WP 12-9, Rev. 29, WIPP Emergency Management Program, 7/31/08	Comprehensive overview of emergency response, notifications, and reentry.	DOE/WIPP
WP 08-NT3020, Rev. 18, TRU Waste Receipt, 6/9/09, 36 pp.	Management Control Procedure for reciept of TRU and mixed wastes, performed by Transportation Engineer. Sets storage and time limits for initial processing. Uses 'WDS/WWIS.'	DOE/WIPP
WP 08-NT.07, Rev. 6, Waste Data System Software Design Description*, 12/14/09, 17pp.	Top level summary of software design and components. Heavily rewritten to reflect WDS changeover.	DOE/WIPP
WP 08-NT.06, Rev. 6, Waste Data System Software Requirements Specification*, 12/14/09, 30pp.	Summarizes requirements, functions, user roles, constraints, and assumptions of the WWIS. Sec 5.1 clearly defines WWIS/WDS relationship.	DOE/WIPP
WP 08-NT.05, Rev. 7, Waste Data System Software Verification and Validation Plan*, 5/25/10, 16pp.	Verification and Validation activities through all life phases of the WDS. Title updated. No other major changes from 2009.	DOE/WIPP
WP 08-NT.04, Rev. 15, Waste Data System Configuration Management and Software QA Program*, 12/17/09, 26pp.	Delineates QC/Data management responsibilities for all WDS users, accounting and documentaiton procedures.	DOE/WIPP

Documents Received and Reviewed During Inspection	**Emplacement Inspection**	**May 2011**
Document Title	**Subject Matter**	**Source**
WP 08-NT.03, Rev. 11, Waste Stream Profile Form Review and Approval Program, 12/10/2009, 17pp.	Review procedures for assuring compliance with Hazardous Waste Facilities Permit Waste Analysis Plan, and WIPP Waste Acceptance Criteria, enumerating minimum reviews for each approval. Explains that WWIS is a subset of WDS.	DOE/WIPP
WP 08-NT.01, Rev. 21 Waste Data System Program and Data Management Plan, 4/14/10	Operational overview of WWIS, including regulatory requirements, process, and user responsibilities. Ties WDS functions to regulatory requirements.	DOE/WIPP
WP 05-WH4401, Rev. 3, Waste Handling Operator Event Response, 3/21/01	Emergency Procedure for CAM alarms, fire, smoke, toxic gas, structural issues, or spill/release.	DOE/WIPP
WP 05-WH1810, Underground Transuranic Mixed Waste Disposal Area Inspections, Revision 13, Effective Date: February 10, 2011	Technical Procedure for Preoperational Underground TRU Mixed Waste Dispsoal Area Inspections. Inspection checklists included in two attachments. Minor updates to reflect consolidated DSA/TSR.	DOE/WIPP
WP 05-WH1758, Rev. 7, RH Waste Handling Abnormal Operations, 12/17/09, 50pp	Technical Procedure for operation of the Hot Cell Crane in respose to a hoist, trolley, bridge or grapple failure, installing and removing the the Waste transfer Machine Assembly (WTMA) wheels, retrieving a loaded RH –TRU 72-B Cask from the Transfer Cell, returning a loaded 10-160B Cask to a generator site, or resetting the Transfer Cell Light Curtain. Minor updates reflect WDS, reference LCOs.	DOE/WIPP
WP 05-WH1752, Rev. 4, 10-160B Shielded Insert Installation and Removal, 2/05/09	Technical Procedure. CNS 10-160B cask not yet in use at time of inspection. CCTV use stipulated.	DOE/WIPP

Documents Received and Reviewed During Inspection	**Emplacement Inspection**	**May 2011**
Document Title	**Subject Matter**	**Source**
WP 05-WH1744, Rev. 11, Surface RH Transuranic Mixed Waste Handling Area Inspections, 12/17/2009, 20pp.	Technical Procedure for RH WHT/WHE to inspect aboveground RH operations. Preoperational Inspection, Daily Door Check, Trailer Parlking Area and RH Container Storage Area Weekly Inspection, RH Waste Handling Preoperational Inspection checklists included as attachments. No major changes in 2010	DOE/WIPP
WP 05-WH1729, Rev 9, RH-TRU 72-B Cask Uprighting Trailer Unloading, 5/20/10, 22pp.	See above.	
WP 05-WH1727, Rev. 8, RH-TRU 72-B Cask Uprighting Trailer Loading, 5/20/10, 20pp.	Distinct trailer from the mechanically-operated trailer which requires the bridge crane.	
WP 05-WH1726, Rev. 0, RH Waste Downloading/Emplacement Using Distributed Controls, 1/19/10, 25pp.	Distinction from WH1725 is unclear	
WP 05-WH1725, Rev. 5, RH waste Downloading and Emplacement, 3/11/10, 25pp.	Technical Procedure for RH operations in the underground. Includes paper RH Waste Processing Data Sheet. LCOs referenced by number.	DOE/WIPP
WP 05-WH1722, Rev 11, 10-160B RH Processing, 12/17/09, 35pp.	Technical procedure for unloading the CNS 10-160Band canisterizing drums into the facility canister. CCTV "if necessary" - 13.0, 14.0Reviewed 6/9/10 JPW	
WP 05-WH1718, Rev. 6, CNS 10-160B Trailer Unloading, 2/19/09	Technical procedure. CNS 10-160B cask not yet in use at time of inspection.	DOE/WIPP
WP 05-WH1717, Rev. 8, Cask Unloading Room Shield Door Operation, 6/24/09, 7pp.	Continuous Use Procedure for operating the CUR shield door. Minor updates reflect consolidated DSA/TSR.	DOE/WIPP

Documents Received and Reviewed During Inspection	**Emplacement Inspection**	**May 2011**
Document Title	**Subject Matter**	**Source**
WP 05-WH1716, Rev. 4, CNS 10-160B Cask Operation, 6/24/09, 10pp.	Technical Procedure for opening 10-160B cask. Includes cask data sheet. CNS 10-160B cask not yet in use at time of inspection.	DOE/WIPP
WP 05-WH1714, Rev. 3, RH Cask Preparation Station 41-Z-076, 3/18/10, 6pp.	Technical Procedure for preoperational checks of the RH CPS. Pertinent to 10-160B.	DOE/WIPP
WP 05-WH1713, Rev. 9, Facility Cask and Facility Cask Rotating Device, 6/24/09, 13pp.	Technical Procedure for inspection and preoperational checksof RH Facility Cask, FC Rotating Device, and Hydraulic Power Unit. Minor updates reflect consilidated DSA/TSR.	DOE/WIPP
WP 05-WH1712, Rev.3, RH-TRU 72-B Cask Operation, 5/20/10, 10 pp.	Technical procedure for opening 72-B Cask. No major changes in 2010.	DOE/WIPP
WP 05-WH1710, 72-B RH Processing,Revision 21, Effective Date: September 1, 2010	Technical Procedure for unloading the 72-B Shipping container and preparing for dowloading to the underground. Fully revised, WHE Review added. Also see Section 3.3: CCTV recording	DOE/WIPP
WP 05-WH1709, Rev. 13, Rh-TRU 72-B Trailer Unloading, 5/20/10	Technical Procedure for unloading RH-TRU 72-B from incoming trailer to Cask Transfer Car or storage rack. Npo major changes in 2010.	DOE/WIPP
WP 05-WH1707, Rev. 9, RH-TRU 72-B Trailer Loading, 6/24/09, 14pp.	Technical Procedure for loading RH-TRU 72-B for transport.	
WP 05-WH1705, Rev. 8, RH Canister Transfer System, 6/24/09, 12pp.	Technical Procedure detailing preoperational equipment checks prior to RH waste-handling. 72-B or 10-160B. CCTV for canister transfer system (sectoion 2.0)	

Documents Received and Reviewed During Inspection	**Emplacement Inspection**	**May 2011**
Document Title	**Subject Matter**	**Source**
WP 05-WH1704, Rev. 7, Facility Cask Transfer Car (41-H-003) Operation, Technical Procedure, Revision 7, Effective Date: April 17, 2009	Technical Procedure for Facility Cask Transfer Car inspection and RH waste handling - no change in 2010.	DOE/WIPP
WP 05-WH1701, Rev. 10, Road Cask Transfer Car Operation, 2/20/09	Technical Procedure for inspection and properational check of The 72-B Road Cask Transfer Car - no change in 2010.	DOE/WIPP
WP 05-WH1700, Rev. 11, Horizontal Emplacement and Retrieval Equipment Assembly, Revision 11, Effective Date: January 28, 2011	Technical Procedure for setting up the HERE in preparation for RH canister emplacement. Rewritten to highlight TSRs, LCOs, and SACs by LCO/SAC number.	DOE/WIPP
WP 05-WH1105, Rev. 3, Magnesium Oxide Sample Records Management, 4/19/10, 10 pp.	Management Control Procedure for the laboratry verification of MgO reactivity. Example MgO Tracking Spreadsheet and Request for Analysis included as attachments 1 and 2. No major changes in 2010.	DOE/WIPP
WP 05-WH1058, Rev. 5, CH Waste Handling Abnormal Operations, 6/2/10, 14pp.	Technical Procedure including instructions for recovering form a torn slip sheet, movement of emplaced waste, returing weaste to surface, and emplacement of BRTs. Added noncompliant container response, covering filters on assemblies contining high VOCs, and section on WHE review.	DOE/WIPP
WP 05-WH1025, Rev. 3 CH Downloading and Emplacement, 10/1110	Technical Procedure including paper forms for recording CH Downloading and MgO/BRT placment as attachments. Updated to reflect both WWIS/WDS.	DOE/WIPP

Documents Received and Reviewed During Inspection	**Emplacement Inspection**	**May 2011**
Document Title	**Subject Matter**	**Source**
WP 05-WH1011, Rev. 41, CH Waste Processing, 2/28/11	Continous Use proceedure for unloading TRUPACT-II or HalfPACT. Contains forms and sign-offs. Edited to reference WDS, and add LCOs. Section 2.5.31 deals with VOCs.	DOE/WIPP
WP 05-WH1010, Rev. 6, Container Overpacking, 12/17/09, 24pp.	Technical Procedure for the overpacking of contaminated or damaged containers in 85-gallon drum, SWB, or TDOP. Contains documentation for procedure.	DOE/WIPP
WP 05-WH.02, Rev. 0, WIPP Waste Handling Operations WDS User's Manual, 12/17/09, 39pp.	Replaces WP 05-WH.01, Rev. 4, WIPP Waste Handling Operations WWIS Users Manual. For use by Waste Handling Technicians and Waste Handling Engineers. Updated to reflect WDS changeover.	DOE/WIPP
WP 04-CO, Rev. 11, Conduct of Operations, 10/01/08	Facility operating practices, including shift routines, communications, inspections, training. Minimal changes to reflect consolidated references (RH/CH DSAs and TSRs) Also document revision control.	DOE/WIPP
WP 02-EC3506, Rev. 5, Environmental Incident Reporting, 2/26/07	Management Control Procedure for reporting releases, including statutory requirement charts and decision flowcharts.	DOE/WIPP
WP 02-EC1001, Rev. 8, Characterization Sampling, Shipping, and Documentation, 6/30/08	Technical procedure for waste characterization field sampling.	DOE/WIPP
Specification D-0101, Rev. 8, Prepackaged MgO Backfill, 2/11/09	Includes analytical methods to ensure reactivity, and Analysis Request/Chain of custody forms.	DOE/WIPP

Documents Received and Reviewed During Inspection	**Emplacement Inspection**	**May 2011**
Document Title	**Subject Matter**	**Source**
DOE/WIPP-09-3427, Waste Data System User's Manual, U.S. DOE, Rev. 2, November 2, 2010	Comprehensive guide for all WDS users, including automated parameters to verify compliance of containers and shipments with transportaion and emplacement requirements.	DOE/WIPP

* denotes title updated to reflect WDS changeover

Documents Received/Generated During Inspection

Overpack Data Report, Container No. BN 10404666 (TDOP), CH, Disposal Date: 5/10/11, Panel 5, Room 1. Generated May 11, 2011.
Overpack Data Report, Container No. LASB01171 (SWB), CH, Disposal Date: 5/10/2011, Panel 5, Room 1. Generated May 11, 2011.
Overpack Data Report, Container No. LASB01179 (SWB), CH, Panel 5, Room 1. Generated May 11, 2011. □
Overpack Data Report, Container No. BN10399691 (100 GAL DRUM), CH, Panel 5, Room 1. Generated May 11, 2011. □
Overpack Data Report, Container No. RL0062383 (55 GAL DRUM), CH, Panel 5, Room 1. Generated May 12, 2011,□
Container Data Report,□Container No. 931 (RH 30 GAL DRUM), Panel 5, Room 1. Generated May 11, 2011. □
Container Data Report, Container No. BC0001 (RH 55 GAL DRUM), Panel 5, Room1. Generated May 12, 2011.
Container Data Report, Container No. BC 0017 (RH 55 GAL DRUM), Panel 5, Room1. Generated May 12, 2011.
Canister Data Report, Container No. AE0085 (RH Canister with removable lid - overpack), Panel 6, Room 7. Generated May 12, 2011, □
Nuclide Report. Panel 1, Rooms 1 – 7. Generated May 12, 2011
Nuclide Report. Panel 4, Rooms 1&2, Panel 5, Rooms 4, 5 & 6. Generated May 12, 2011,
Emplacement History Overview Report, CH, Panel 4, Rooms 1- 7, RH, Panel 4 Rooms 1- 6
Nuclide Report, May 12, 2011, Panels 1- 5, Room 1 – 7, Panel 6, Room 7

Waste Isolation Pilot Plant
Summary of Waste Emplacement Inventory Report

Report Statistics

Report Version:	**1.2**
WDS Instance:	**PRD01**
Generated on:	**April 07, 2011 03:53 PM**
Generated by:	**RICHEY**
Total Pages:	**4**

Selection Criteria

End Date:	**03/31/2011**
Panel Number:	**All**
Room Number:	**All**

TRU Waste Inventory as of 03/31/2011
Panel: All Room: All

Emplaced CH Containers	73,359.92 (m^3)
Emplaced RH Containers	238.87 (m^3)
Total	73,598.79 (m^3)

Emplaced Container Counts as of 03/31/2011
Panel: All Room: All

Description	# of Containers
Contact Handled (CH) Container Types	
100-GALLON DRUM	26,257
12-INCH PIPE OVERPACK	23,903
55-GALLON DRUM	76,174
85-GALLON DRUM - TALL - OVERPACK	5
S100 PIPE OVERPACK	535
S300 PIPE OVERPACK	10
STANDARD WASTE BOX	5,044
STANDARD WASTE BOX - OVERPACK	4,389
TEN DRUM OVERPACK - OVERPACK	5,448
Remote Handled (RH) Container Types	
FIXED-LID 72-B CANISTER	18
REMOVABLE-LID 72-B CANISTER	1
REMOVABLE-LID 72-B CANISTER - OVERPACK	445
Total:	142,229

Material Parameter Inventory
as of 03/31/2011
Panel: All Room: All

Material Type	Weight (kg)
CELLULOSIC, PLASTIC, RUBBER (CPR)	7,570,829
FERROUS METAL	21,762,561
NON-FERROUS METAL	351,275
OTHER MATERIAL	10,719,781
Total:	40,404,446

EPA-Tracked Radiological Activity Inventory
as of 03/31/2011
Panel: All Room: All

Radionuclide	Repository CH Activity (Ci)	Repository RH Activity (Ci)	Total Repository Activity (Ci)
AM-241	2.143E5	2.135E2	2.146E5
CS-137	7.347E0	2.21E3	2.217E3
PU-238	3.243E5	1.002E2	3.244E5
PU-239	2.989E5	1.218E2	2.99E5
PU-240	7.315E4	9.895E1	7.325E4
PU-242	1.691E1	1.213E-1	1.703E1
SR-90	1.355E1	1.789E3	1.803E3
U-233	5.738E0	1.576E-1	5.895E0
U-234	5.933E1	3.198E-1	5.965E1
U-238	1.307E1	9.704E-3	1.308E1
Total	9.107E5	4.534E3	9.153E5

MgO-Related Information as of 03/31/2011
Panel: All Room: All

Panel	Room	MgO (kg)	Waste (kg)	CPR (kg)	Excess Factor
1	7	1,127,526	508,254	276,990	2.01
1	6	222,885	101,210	86,116	1.44
1	5	222,885	160,047	79,213	1.56
1	4	228,600	128,597	85,525	1.51
1	3	1,034,415	749,764	342,069	1.67
1	2	1,028,825	948,002	229,442	2.17
1	1	617,220	311,843	138,330	2.14
2	7	1,028,700	571,001	236,830	2.09
2	6	982,980	461,528	209,305	2.20
2	5	988,820	498,970	197,979	2.28
2	4	977,265	518,555	220,912	2.17
2	3	1,028,700	667,662	211,841	2.27
2	2	965,835	733,025	165,412	2.62
2	1	691,515	416,679	186,469	1.71
3	7	960,120	711,188	109,685	3.83
3	6	954,405	876,558	229,646	1.93
3	5	1,022,985	808,693	284,651	1.70
3	4	960,120	899,470	255,172	1.79
3	3	931,545	1,000,561	243,860	1.89
3	2	944,880	1,004,479	228,074	2.03
3	1	662,940	722,043	183,088	1.76
4	7	942,975	1,051,062	248,903	1.90
4	6	925,830	945,599	267,494	1.71
4	5	946,785	890,039	265,295	1.71
4	4	1,013,460	830,990	290,608	1.70
4	3	1,015,365	745,955	285,755	1.70
4	2	931,545	933,179	374,327	1.22
4	1	668,655	554,822	265,884	1.23
5	7	937,260	982,045	353,262	1.28
5	6	875,477	1,085,549	140,009	2.85
5	5	782,346	1,121,745	298,808	1.24
5	4	737,167	1,046,299	225,425	1.64
5	3	714,286	1,039,638	215,937	1.61
5	2	507,483	692,068	134,233	1.86
5	1	0	10,510	4,226	0.00
6	7	0	326	54	0.00