CHARACTERIZATION STRATEGY FOR CONTACT-HANDLED TRU WASTE GENERATED BY SMALL QUANTITY SITES

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ABSTRACT

Several small quantity sites across the U.S. Department of Energy (DOE) complex are generating between one and a few hundred drums of contact-handled transuranic (TRU) waste. The majority of small quantity sites have waste management goals that require the completion of site cleanup and closure activities under aggressive schedules. While the small volumes of TRU waste generated by small quantity sites will not constitute the majority of waste disposed at the Waste Isolation Pilot Plant (WIPP), compliance with site cleanup goals is a high priority for the DOE. The Central Characterization Project (CCP) will provide waste characterization and certification of small quantity site contact-handled TRU waste for WIPP disposal. The CCP is pursuing a two-tiered approach to characterizing small quantity site contact-handled TRU waste. Currently, the CCP is working to fully characterize waste at each small quantity site with traveling teams including mobile vendors to perform hands-on characterization activities. Simultaneously, the DOE-Carlsbad Field Office is pursuing a modification to the WIPP Hazardous Waste Facility Permit (Reference 1) to enable the facility to conduct central confirmation activities prior to permanent disposal of waste at the WIPP. Under this approach, the CCP will transport characterized TRU waste originating from the generator sites to the WIPP, where it will confirm the characterization and certify the waste for disposal in accordance with the requirements of the Waste Analysis Plan (WAP) of the Hazardous Waste Facility Permit. The CCP will ensure that TRU waste certified under this program is characterized, packaged, and controlled according to approved methods and will qualify for transport to and disposal at the WIPP.

The CCP will establish an interface with each participating site to allow the transfer of appropriate process knowledge and acceptable knowledge (AK) source information and other data for use in planning and initiating certification activities. The use of process knowledge and AK will comprise a primary compliance method for identifying TRU waste as eligible for WIPP disposal and for meeting WIPP certification requirements. This compliance method involves the systematic compilation and confirmation of information from individual sites.

INTRODUCTION

Within the DOE complex, several small quantity sites with inventories of between one and a few hundred drums of contact-handled TRU waste have been identified. The majority of these small quantity sites have waste management goals that require the

completion of site cleanup and closure activities under aggressive schedules. For small quantity sites, the development of full compliance programs for the WIPP certification of limited waste streams is inefficient. To facilitate site cleanup and closure, the CCP has been developed to provide efficient characterization and certification of contact-handled TRU waste for WIPP disposal, accelerate disposition of contact-handled TRU waste for small quantity sites, and provide excess capacity to other DOE generator sites. To assist small quantity sites, including those listed in Table I, in certifying their contact-handled TRU waste for disposal at the WIPP, the CCP is pursuing a two-tiered approach toward characterizing small quantity site waste. In the near term, the CCP is working to fully characterize waste at each small quantity site with travelling characterization teams including mobile vendors that will perform hands-on characterization activities. Simultaneously, DOE is pursuing modification of the WIPP Hazardous Waste Facility Permit to allow confirmation and certification of waste at the WIPP. The CCP will transport TRU waste originating from the generator sites to the WIPP, where the waste characterization will be confirmed and waste will be certified for disposal. This two-tiered approach is shown in Figure 1. The CCP will ensure that TRU waste certified under this program is characterized, packaged, and controlled according to approved methods and will qualify for transport to and disposal at the WIPP.

SMALL QUANTITY SITE BACKGROUND

The volume of waste at the small quantity sites listed in Table I is small compared to the total volume of contact-handled TRU waste that will be disposed at the WIPP. Other sites such as National Institute of Standards and Technology and Massachusetts Institute of Technology may also become small quantity sites, depending on whether defense-related items currently in use become waste and whether any waste generated meets the definition of TRU waste. About 3% of the total contact-handled TRU inventory is generated or stored at small quantity sites.

Activities that generate contact-handled TRU waste at different small quantity sites are similar to those conducted at larger sites within the DOE complex. Examples of small quantity site waste-generating activities include the following:

- Decommissioning and decontamination of gloveboxes, hot cells, tanks, drain lines, and other equipment used to work with spent fuel and other radioactive materials
- Research involving radiochemical laboratory analyses, such as separation of uranium and TRU elements from spent reactor fuel
- Hot cell facility operations such as examination and decladding of spent reactor fuel
- A variety of applications using sealed TRU sources, such as ^{238}Pu power sources for pacemakers and smoke detectors
- Analytical chemistry research activities, such as actinide solution chemistry, plutonium chemical and metallurgical properties
- Research on the health effects of actinides.

Table I: Small Quantity Sites with Contact-Handled TRU Waste

Site	[a,c] Volume of Contact-Handled TRU Waste (m^3)	[a]Scheduled Closure Date
Ames Laboratory, IA	0.4 (projected)	1999
Argonne National Laboratory-East (ANL-E), IL	95 (current) 151 (projected)	2002 (first campaign)
ARCO Medical Products, PA	0.10	NA
Babcock and Wilcox NES, VA	20	Unknown
Battelle Columbus Laboratories, OH	4.2	2005
Bettis Atomic Power Laboratory, PA	17.6[d]	2008
Energy Technology Engineering Center, CA	2.3	2006
General Electric Vallecitos, CA	9 (current)[d]	2005
Knolls Atomic Power Lab – Nuclear Fuel Services, TN	5 (current)[d] 208 (projected)[d]	Unknown
Lawrence Berkeley Laboratory, CA	1.1 (current)[d]	2003
Lawrence Livermore National Laboratory, CA	295 (current)[d] 1,220 (projected)[d]	
Lovelace Respiratory Research Institute, NM	5.7 (current)[d] 14.2 (projected)[d]	
Mound Plant, OH	247	2009
Nevada Test Site, NV	865[d]	
Paducah Gaseous Diffusion Plant, KY	11.7[d]	2010
Sandia National Laboratories, NM (SNL/NM)	30.3(current)[d] 78.1(projected)[d]	2000-2001
Separations Process Research Unit, NY	470 (projected)[d]	
University of Missouri Research Reactor (MURR), MO	1.5	[b]2001 (original agreement with state was 1998)
US Army Material Command, IL	2.5	Unknown
West Valley Demonstration Project, NY	73 (current)[d] 20 (projected)[d]	

[a] Source: *Accelerating Cleanup: Paths to Closure* (References 2 and 3)
[b] Source: *Recommended Evaluation Plan, Disposition of MURR TRU Waste* (Reference 4)
[c] Sources: *TRU Waste Baseline Inventory Report* (Reference 5) and *National TRU Waste Management Plan, Volume 1, Draft Revision 2* (Reference 6)
[d] Source: Current estimates based on Reference 6

TIER 1: CCP WASTE CHARACTERIZATION AT SITES

As shown in Table I, some small quantity sites were scheduled for closure as early as 1999. Sites with imminent cleanup or closure deadlines may not be able to wait for the WIPP permit modification process to be completed before they dispose of their waste. The DOE will establish a prioritized list of small quantity sites and the CCP team will be mobilized to perform waste characterization activities. As such, the CCP is developing a full-scope WIPP certification program to implement this approach. For the Tier 1 waste certification program under which the CCP will provide characterization and certification services at individual generator sites, the CCP has developed the implementation plans listed in Table II. In addition, the CCP must successfully complete an audit of its waste certification program by DOE. Because the CCP is the entity responsible for programmatic activities, project level data verification and validation, and/or evaluation of existing data supplied by sites under this program, the scope of the audit of the CCP by DOE will cover its waste characterization activities at all sites. As a result, DOE may streamline the audit process as the CCP team moves to another generator site and performs waste characterization activities.

The CCP is being developed by Westinghouse TRU Solutions (WTS) to ensure compliance with the WIPP Waste Acceptance Criteria (WAC, Reference 7), which summarizes all applicable requirements from the following source documents:

- TRUPACT-II Safety Analysis Report (SAR) (Reference 8),
- WIPP Technical Safety Requirements (Reference 9)
- WIPP SAR (Reference 10)
- WIPP Land Withdrawal Act (LWA) (Reference 11),
- WIPP Waste Analysis Plan (WAP) of the Hazardous Waste Facility Permit (Reference 1), and
- U.S. Environmental Protection Agency compliance certification decision.

The purpose of the Tier 1 CCP program is to describe and document how each of the certification requirements of the WIPP WAC is met by the CCP for implementation at each small quantity site. The Tier 1 CCP program scope is the same as that for DOE sites with current WIPP-certified programs. The Tier 1 program is described by plans and procedures identified in Table II. Qualified mobile vendors performing waste characterization activities such as headspace gas sampling and analysis and nondestructive assay as directed by the CCP will operate in accordance with the procedures referenced in the CCP TRU Waste Characterization Quality Assurance Project Plan (QAPjP, Reference 12). These vendors are approved by the CCP in accordance with WTS procedures for vendor qualification and are directed by CCP personnel to perform certain waste characterization activities. The CCP has developed a self-contained program to include QA programs, training, records management, and document control. This will ensure the consistency and control of the entire program.

Under the Tier 1 CCP waste characterization program, AK and process knowledge may be used to support compliance determinations. Details of implementation of these

compliance methods are described in the procedure CCP Acceptable Knowledge Documentation (Reference 13), the CCP Certification Plan (Reference 14), and the CCP TRUPACT-II Authorized Methods of Payload Control (TRAMPAC, Reference 15). The use of AK in particular involves the systematic, documented compilation and confirmation of information from individual generator sites. The CCP interfaces with each generator site to obtain data that it may compile as AK documentation and publish in an AK Summary Report.

Table II: CCP Implementation Documents

WIPP Programmatic Documents	CCP Implementation Documents	Scope
DOE/WIPP-069, WIPP WAC (Reference 7)	WP 08-WC.3, CCP Certification Plan (Reference 14)	Documents how compliance with each requirement of the WIPP WAC is demonstrated by the CCP
CAO-94-1012, Quality Assurance Program Document (QAPD) (Reference 16)	WP 13-1, WID QA Program Description (Reference 17) and CCP program documents	Documents compliance of the CCP with DOE/CBFO QAPD requirements
TRUPACT-II Certificate of Compliance No. 9218 (Reference 18) Appendix 1.3.7, TRAMPAC, of the TRUPACT-II SAR (Reference 8)	WP 08-WC.1, CCP TRAMPAC (Reference 15)	Documents how compliance with each requirement of the TRUPACT-II SAR TRAMPAC is demonstrated by the CCP
NM4890139088-TSDF, WIPP WAP (Reference 1)	WP 08-WC.2, CCP QAPjP (Reference 12)	Documents how compliance with each requirement of the WIPP WAP is demonstrated by the CCP

Transportation of small quantity site contact-handled TRU waste to WIPP will occur in the TRUPACT-II. The transportation requirements for shipment of contact-handled TRU waste in the TRUPACT-II are specified by Appendix 1.3.7, TRAMPAC, of the TRUPACT-II SAR (Reference 8). CCP certification of waste for TRUPACT-II transportation may include the evaluation of existing site data to verify compliance with TRAMPAC requirements. If evaluation of existing site data does not provide sufficient verification of compliance, qualified CCP personnel (including mobile vendor personnel) may perform additional characterization activities at the small quantity sites to provide the necessary information to demonstrate compliance.

CCP QAPjP

The CCP QAPjP (Reference 12) specifies quality requirements, management systems, and procedures necessary to meet the specific data quality objectives for contact-handled TRU waste characterization at the WIPP facility or small quantity sites as defined in the WIPP WAP (Reference 1) and WID Quality Assurance Program Description (Reference 17). TRU waste characterization activities are performed by the CCP in accordance with the requirements and implementing procedures identified in the QAPjP, including mobile vendor procedures for such activities as headspace gas sampling and radiography.

TIER 2: PERMIT MODIFICATION

The key to the success of the second tier of CCP's effort proposed for implementation at the WIPP site is modification of the WIPP WAP to allow receipt and efficient centralized confirmation and certification of waste for disposal. This option is preferred because it allows confirmation activities to be combined at one site, the WIPP facility, rather than requiring numerous different teams working simultaneously at individual sites. The WIPP WAP, which specifies waste characterization and confirmation requirements for disposal of TRU mixed waste at the WIPP, is contained in Attachments B-B6 of the Hazardous Waste Facility Permit. The New Mexico Environment Department approved WIPP's Part B permit application and issued a permit, the WIPP Hazardous Waste Facility Permit (Reference 1), on October 27, 1999, thus allowing shipments of contact-handled TRU mixed waste to the WIPP for disposal to begin.

Waste to be received at WIPP for confirmation analysis (nondestructive assay, nondestructive examination [such as radiography], visual examination, and headspace gas sampling and analysis) would be characterized at the generator/storage sites to the requirements specified in 40 CFR Part 264.13. A summary of the AK package and a waste profile form would be submitted to WIPP and to the State of New Mexico for approval prior to any shipment. Waste shipped to the WIPP in a U.S. Nuclear Regulator Commission-approved container must be characterized to meet transportation requirements, including U.S. Department of Transportation (DOT) parameters (such as identifying the radionuclides that contribute 95% of the radiological hazard) and the requirements of U.S. Nuclear Regulatory Commission Certificates of Compliance for the particular shipping container. Upon receipt at WIPP, the analyses required to confirm the AK will be completed and the waste removed to the underground repository.

DOE-Carlsbad Field Office will be required to submit a permit modification to the New Mexico Environment Department to allow the WIPP to receive waste for confirmatory analysis. The proposed modification would need to include the following provisions: 1. Increase the available storage capacity, locations, and time limits for storage to accommodate the time needed for confirmation activities; and 2. Modify permit language to allow the WIPP to accept waste for confirmation analysis prior to disposal. The proposed modification would specify that all waste must meet the requirements of 40 CFR Part 264.13 prior to acceptance at WIPP for confirmation analysis. A modification addressing these issues is currently under development by DOE.

If the proposed modification is approved and WIPP can accept waste for confirmation analysis, the CCP will certify that waste acceptance criteria established by DOE-Carlsbad Field Office are met prior to receiving waste at the WIPP site for central confirmation. DOE-established waste acceptance criteria used by the CCP would derive from the WIPP Technical Safety Requirements (Reference 9), WIPP SAR (Reference 10), the WIPP LWA (Reference 11), and other WIPP operating considerations, as well as any criteria specified in the permit modification. The criteria might also include the following parallel requirements that sites must meet prior to the acceptance of their waste at the WIPP for confirmation analysis:

- Compliance with the TRUPACT-II Certificate of Compliance No. 9218 (Reference 18) and, Appendix 1.3.7, TRAMPAC, of the TRUPACT-II SAR (Reference 8), including completion of Payload Container Transportation Certification Documents and Payload Assembly Transportation Certification Documents;
- DOT-required shipping papers; and
- Preparation of an AK summary report, a Waste Stream Profile Form, and a Land Disposal Restriction Notification in accordance with the WIPP WAP (Reference 1).

Any site would be able to ship waste to the WIPP for centralized confirmation, provided that they meet the waste acceptance criteria specified by DOE. Note that sites with existing approved TRAMPAC documents could transport waste to the WIPP in the TRUPACT-II for central confirmation analysis as certified under their own TRAMPACs. Such sites would still be required to comply with DOE-established waste acceptance criteria prior to shipping waste to the WIPP.

CCP PROGRESS AT SMALL QUANTITY SITES

Current CCP activities include the prioritization of small quantity sites and scheduling of future onsite characterization activities with mobile vendors. The sites included in this initial effort include Mound and Argonne National Laboratory-East (ANL-E).

Mound-Savannah River Site

DOE has reached an agreement with the State of South Carolina and Savannah River Site (SRS) to transfer approximately 1500 drum volumes of TRU waste to SRS in exchange for shipment of twice that volume of TRU waste (3000 55-gallon drums) from SRS to WIPP. The Mound site has an aggressive closure schedule that is impacted by the presence of ^{238}Pu-contaminated waste. SRS has the facilities to manage this waste, as well as similar in-house waste streams. Because the planned waste transfer from Mound to SRS would occur in OHOX rail cars, for which certification for transportation will expire on May 31, 2002, the first Mound waste shipments to SRS are scheduled for the fall of 2001. Acceptable knowledge development at SRS has already begun and characterization activities including assay and radiography are schedule to begin in March 2001.

ANL-E

There are 404 drums of CH-TRU waste at ANL-E. The acceptable knowledge package is under review by the CCP team. The CCP is mobilizing the mobile systems to ANL-E to perform waste characterization activities to meet the WIPP disposal requirements. Characterization activities will begin in mid-2001.

CONCLUSION

The CCP is working to provide small quantity sites with characterization services necessary for them to meet site cleanup and/or closure schedules. At the present time, the CCP is planning to fully characterize waste for WIPP disposal at individual small quantity sites as directed by the CCP Certification Plan (Reference 14), with the assistance of mobile vendors. However, when planned permit modifications are approved, the CCP will characterize waste at generator sites to meet TRUPACT-II SAR transportation requirements (Reference 8) as directed by the CCP TRAMPAC, transport the waste to WIPP, and confirm the waste characterization to meet the requirements of the WIPP WAP for disposal. This two-tiered approach will enable the DOE to accelerate the disposition of CH-TRU waste at small quantity sites, provide excess capacity to other DOE generator sites, and provide for a more streamlined and efficient waste characterization program.

REFERENCES

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15. Westinghouse TRU Solutions (WTS), "Central Characterization Project (CCP) TRUPACT-II Authorized Methods for Payload Control (TRAMPAC)," WP 08-WC.1, Westinghouse WTS (draft).

16. U.S. Department of Energy (DOE), "Quality Assurance Program Document," CAO-94-1012, DOE-Carlsbad Area Office (1999).

17. Westinghouse Waste Isolation Division (WID), "WID Quality Assurance Program Description," WP 13-1, Westinghouse WID (1999).

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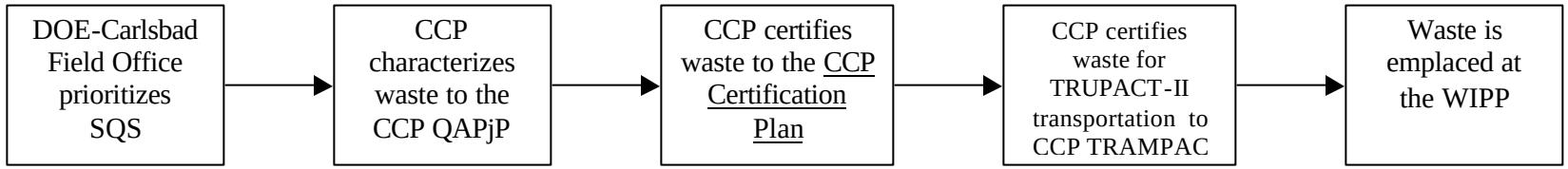
Tier 1: Before permit modification



Tier 2: After permit modification

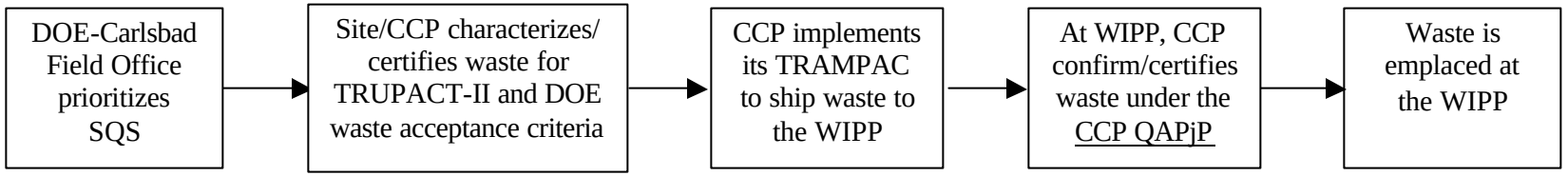


Fig. 1: Two-Tiered Approach