

Re-evaluation of Waste Isolation Pilot Plant's Passive Institutional Controls Program – Status -- 17116

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ABSTRACT

The United States government set forth in 40CFR194.43 requirements for “Passive Institutional Controls” for nuclear waste repositories. This regulation stated compliance applications for a repository “shall include detailed descriptions of the measures that will be employed to preserve knowledge about the location, design and contents of the disposal system.” In the early 1990’s the U.S. Department of Energy developed and proposed in the Compliance Certification Application of 1996 a robust and complex technical and engineering Passive Institutional Controls Program including such things as records management, large surface markers, salt berms, buried and above-ground information rooms and small subsurface markers/plaques. The Waste Isolation Pilot Plant Passive Institutional Control program meets the regulatory requirements and is certified by the U.S. Environmental Protection Agency. Presently this program is being re-evaluated in light of the Nuclear Energy Agency’s, Records Knowledge and Memory initiative, shrinking government budgets, and the ethical/moral considerations of risks versus expenditures. This paper will discuss progress made to date in re-evaluating the Waste Isolation Pilot Plant Passive Institutional Controls program and expected plans for the future.

INTRODUCTION

The Waste Isolation Pilot Plant (WIPP) Passive Institutional Controls (PICs) program was developed by the U.S. Department of Energy (DOE) in the early 1990’s to meet the requirements as specified by the U.S. Environmental Protection Agency (EPA) in 40CFR194.43 [1] and in the early years of WIPP operations (waste emplacement started in March of 1999) work continued to define implementation of the program described in the Compliance Certification Application (CCA) [2]. Between 1999 and 2004 the Permanent Marker Testing Program Plan [3], the Passive Institutional Controls Implementation Plan [4], and the Permanent Markers Implementation Plan [5], among others, were published by the DOE. These plans included schedules and costs for testing, evaluating and designing the various aspects of the PIC’s program. Shortly after, 2004 budget shortfalls and considerations of International

interest in the area of marking repositories caused the DOE to pause the program until all previous plans could be re-evaluated.

DISCUSSION

The WIPP Passive Institutional Controls Implementation Plan (DOE/WIPP 04-2301) [4] covers three main areas 1) Records, 2) Awareness Triggers, and 3) Permanent Markers.

- 1) Records: Records to be preserved for the WIPP PICs program, per the 2004 plan, are defined as documentation describing the repository and the potential hazard of the disposed waste. The general objective is to ensure this documentation is widely disseminated and preserved into the future. This definition has been expanded some by recent international work through the Nuclear Energy Agency's, Records Knowledge and Memory initiative to include facts, ideas and data that have been committed to a medium and kept for later use [6]. Four key purposes for the WIPP records management program were identified as 1) minimize inadvertent human intrusion, 2) facilitation of informed intentional intrusion, 3) support of future research, and 4) establishment of an accessible legal record. Some of the steps to implement this program include the creation of filing codes and finding aids, defining the information to be included into records packages, identifying the types of materials to be stored along with storage locations and obtaining agreements for storage. This is an area where little has been done and little has changed over the past 12 years. The RK&M international discussions on this topic have not changed the focus or intent of the WIPP records management program. This part of the PICs Implementation Plan should be revived at the earliest possible time and steps followed as outlined in the plan.
- 2) Awareness Triggers: Awareness triggers will contain enough information to allow someone unfamiliar with the project to understand the general scope, purpose, and potential associated hazards. The primary objective of awareness triggers is making as many people as possible aware of the repository through a wide distribution of WIPP information. This dissemination of data could be through electronic or physical media, and includes such things as maps, encyclopedia entries, text books and other reference resources. Awareness triggers are used to keep the memory of the repository alive during the "medium term" (see RK&M Glossary of Terms) and actually start during the operational period and run through the 100 year Active Institutional Controls (AICs) period. The PICs Implementation Plan has the Awareness Triggers program taking place in two phases, a pilot program and a full program. The pilot program will be used to define the group of participants for the final program and the needs and effectiveness of processes used for the full program. The pilot program was scheduled to begin in 2006; but was delayed for budget and re-evaluation reasons. This is an area similar to records. International guidance has not been discussed in this area, and at the present there is not a reason to assume this program

shouldn't be implemented as outlined in the PICs Implementation Plan at the earliest possible time.

- 3) Permanent Markers: The permanent markers program at the WIPP has the primary purpose of reducing the likelihood of inadvertent, intermittent human intrusion and to deter systematic or persistent exploitation of the repository. The permanent markers include both physical markers/activity indicators and markers with messages. A "marker" in the RK&M Glossary of Terms is defined as "A long-lasting object that indicates an area of influence, power or danger [6]. It is placed strategically at or near the site for immediate recognition or for the discovery at a later time." In the RK&M strategy, markers are meant to reach out to future generations in the medium term to long term time scales.

As shown in Figure 1, the markers planned and certified by the EPA for use at the WIPP include large surface monument markers made of granite; small subsurface markers made of granite, aluminum oxide, or fire clay; a salt berm; a buried information storage room made of rock slabs and a large above ground information center, entirely composed of granite. The regulations written for nuclear waste geologic repositories by the United States government as defined in 40CFR194.43 states the following:

"...measures...will be employed to preserve knowledge about the location, design, and contents of the disposal system. Such measures shall include: (1) Identification of the controlled area by markers that have been designed and...emplaced to be as permanent as practicable."

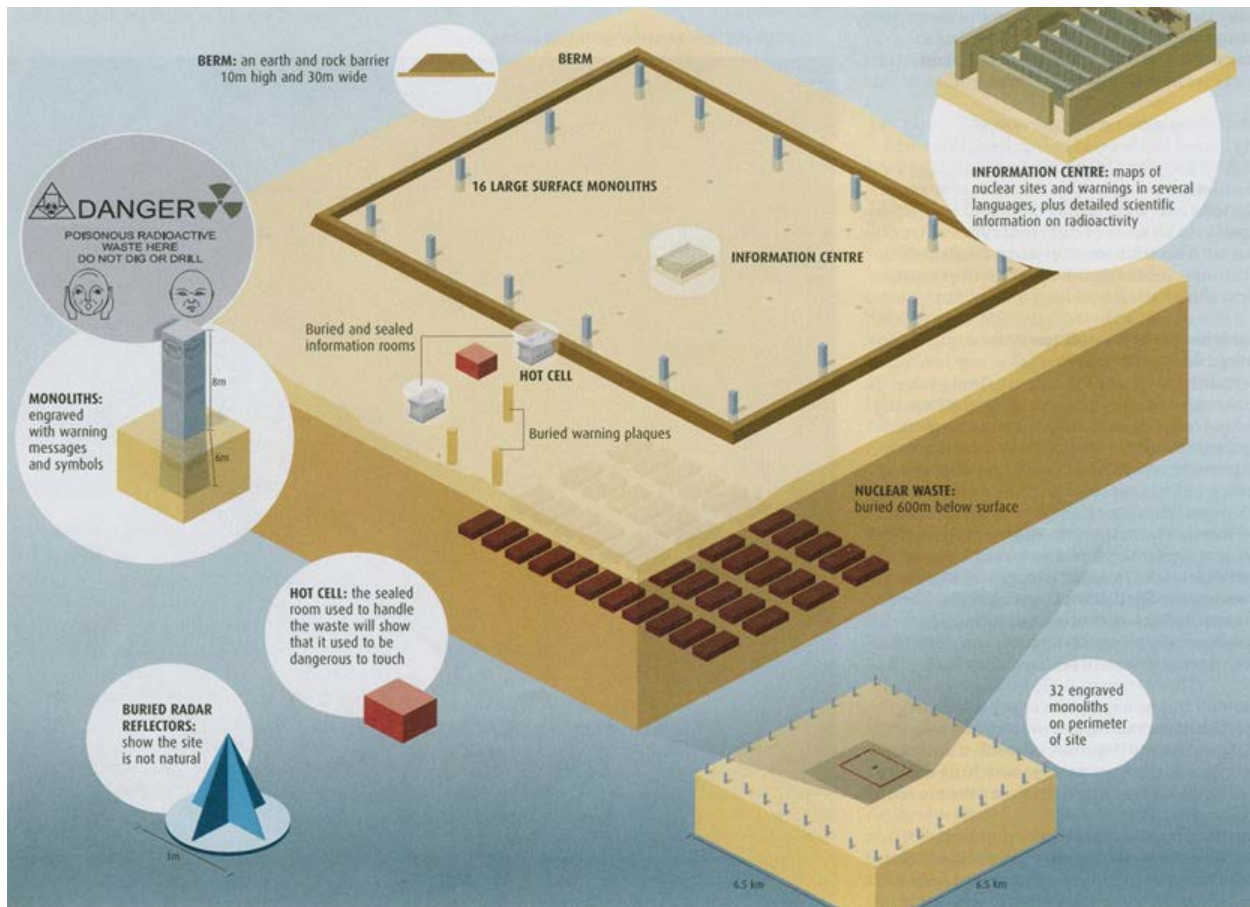


Figure 1. Proposed markers plan for the Waste Isolation Pilot Plant.

The permanent markers program as discussed in the PICs Implementation Plan consists of two parts, 1) research and development activities and 2) program implementation activities.

Research and development activities defined under the WIPP plan from 2004 includes a survey of archeological sites in the general region, a materials analysis effort to evaluate potential markers materials, the development of material test methods, plus the translation of markers messages and testing the effectiveness of the messages. Some of this work has been completed (see Contractor Report, Permanent Markers Monument Survey [7], Waste Isolation Pilot Plant (John Hart and Associates, P.A., 2000a) and Contractor Report, Permanent Markers Materials Analysis [8], Waste Isolation Pilot Plant (John Hart and Associates, P.A. 2000b)) but much of it has been delayed or postponed.

During the development of the WIPP PICs program for the Compliance Certification Application of 1996 the group of experts commissioned to make recommendations for marking the WIPP repository suggested starting the warning message with this statement (from *Expert Judgment on Markers to Deter Inadvertent Human*

Intrusion into the Waste Isolation Pilot Plant, Sandia National Laboratories report SAND92-1382 / UC-721, p. F-49) [9]:

***“This place is not a place of honor.
No highly esteemed deed is commemorated here.
Nothing valued is here.
This place is a message and part of a system of messages.
Pay attention to it!
Sending this message was important to us.
We considered ourselves to be a powerful culture.”***

Current thought is to not transmit ethical or value-laden messages. The DOE and the international community through the RK&M agree the message to the future should be factual, providing information that allows future generations to make their own informed decisions about the waste and the programs that put it there. Any determination of value and future decisions based on the message they are receiving cannot be predicted by this generation.

The WIPP PICs program specifies the monument markers are to be inscribed with seven languages: English, Spanish, French, Russian, Chinese, Arabic and Navajo. As we have all seen, languages evolve quickly in comparison to the centuries a permanent marker system is expected and designed to communicate a message to future generations. The message to be inscribed upon the markers is discussed in the WIPP Passive Institutional Controls Implementation Plan of 2004 in general terms, specify that the messages will be at varying levels of detail ranging from the simple “something human-made” is located here (the markers themselves) to the more complex details about the repository and the waste entombed conveyed through diagrams, pictographs and written language.

The exact wording, pictographs, or diagrams to be used to mark the WIPP site have not been determined; and the RK&M project is yet to take this up as a subject for consideration. While the message must be unique for each site some similarity in symbols, style, and detail may be accomplished. The messages to be placed at the WIPP site have a single purpose: to minimize the potential for inadvertent intrusion into the repository. To accomplish this purpose the message must communicated to be as “permanent as practicable”. This may be the purpose and goal that will be shared with most disposal sites throughout the world and should be an area of common interest.

The PICs implementation plan developed a methodology and a schedule for testing the message comprehension and effectiveness of the written messages, pictographs and graphics. The methodology to test has not been started. For the process to start, the message, the pictographs and the graphics need to be developed and they have not been.

The program implementation activities for permanent markers includes such items as analysis plan development, construction of test facilities, permanent markers design, testing and construction and include the development of the Permanent Markers Implementation Plan (DOE/WIPP 04-3302) [5] and the Permanent Markers Testing Program Plan (DOE/WIPP 00-3175) [3].

The Permanent Markers Testing Program Plan is to be implemented during the repository operational phase and after closure of the facility to provide information regarding the materials and final design used for permanent markers. Markers and marker materials to be tested include the proposed berm, large surface markers, small subsurface markers, and buried storage rooms. However, material testing has not taken place, test berms have not been built, and the numerous activities proposed in this plan have not been initiated. This plan also had specified materials to be used for various components of the marker. The plan allowed for changes based on testing and analysis. While testing and analysis of any materials has not been completed it is known that the use of granite will not be possible due to its limited availability and attractiveness for other uses. Decisions on the marker materials have not been made, testing and analysis have not been started and/or completed, and funding for following the plan has not been requested, or granted/denied. All activities in the permanent markers program at WIPP have been put on hold awaiting International discussion and budgetary funding.

In the international community the Paris-based Organization for Economic Co-operation and Development's Nuclear Energy Agency (NEA) initiative on Preservation of Records, Knowledge and Memory (RK&M) across Generations (<https://www.oecd-nea.org/rwm/rkm/>) is looking at formulating common approaches on disposal system markers in their second phase of the program. The first phase of this initiative addressed the question of records and records retention along with creating a glossary of terms and bibliography to ensure all parties were communicating effectively [6]. As the international community continues to discuss and study various aspects of passive institutional controls for disposal sites the DOE/Carlsbad Field Office (CBFO) will participate to ensure WIPP designs and plans are well coordinated with the latest international considerations.

CONCLUSION

The DOE/CBFO developed the Passive Institutional Controls program for WIPP in the 1990s to meet the criteria of 40CFR194.43; and included it in the Compliance Certification Application of 1996. Between 1999 and 2004, when WIPP began transuranic waste receipt and disposal, the DOE/CBFO continued to develop and refine testing and implementation plans for the PICs program; including the PICs Implementation Plan in 2004. This plan specified the testing and activities that needed to be accomplished to have a PIC's program in place that could be followed so that markers are emplaced, records retained, and information/memory memorialized at WIPP repository closure. This is a good plan, and parts of it could and should be implemented in the near future, some parts of the plan are no longer feasible, and in these areas additional studies should be accomplished, in other areas the plan is over ambitious and the whole concept should be reevaluated through additional expert elicitation or international committee/study.

As was seen by the recent events at the WIPP, shut down for the past three years and the partial closure of the south half of the WIPP repository; unforeseen activities could cause the repository to proceed into closure mode at any time. At

closure, the WIPP shafts are planned to be sealed and the surface facilities decontaminated and dismantled. The last Recertification at the time of closure is to contain a detailed plan for PICs. A shortened operational period would require DOE/CBFO to commit to following a hybrid of the presently planned and scheduled PICs program. Lack of planning and testing on permanent marker material and property increases unknowns and uncertainty.

DOE/CBFO and the NEA's RK&M initiative are both focused on the preservation of information and the transmittal of that information across generations to allow future generations to make their own informed decisions. Continued participation by DOE/CBFO in the RK&M initiative will ensure the WIPP PIC's program is in step with the latest technologies and philosophy, including the concerns of intergenerational equity. DOE/CBFO should revise the WIPP PICs Implementation Plan, the Permanent Markers Testing Plan and the Permanent Markers Implementation Plan in the near future to reflect current technology and philosophy.

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