

The Revised WIPP Passive Institutional Controls Program - A Conceptual Plan – 13145

Russ Patterson*, Thomas Klein** and Abraham Van Luik***

□ Department of Energy-Carlsbad Field Office, 4021 National Parks Highway Carlsbad,
NM 88220, Russ.Patterson@wipp.ws

**URS-Professional Solutions, 4021 National Parks Highway Carlsbad, NM 88220,
tom.klein@wipp.ws

***Department of Energy-Carlsbad Field Office, 4021 National Parks Highway Carlsbad, NM
88220, abe.vanluik@wipp.ws

ABSTRACT

The Department of Energy/Carlsbad Field Office (DOE/CBFO) is responsible for managing all activities related to the disposal of TRU and TRU-mixed waste in the geologic repository, 650 m below the land surface, at WIPP, near Carlsbad, New Mexico. The main function of the Passive Institutional Controls (PIC's) program is to inform future generations of the long-lived radioactive wastes buried beneath their feet in the desert. For the first 100 years after cessation of disposal operations, the rooms are closed and the shafts leading underground sealed, WIPP is mandated by law to institute Active Institutional Controls (AIC's) with fences, gates, and armed guards on patrol. At this same time a plan must be in place of how to warn/inform the future, after the AIC's are gone, of the consequences of intrusion into the geologic repository disposal area.

A plan was put into place during the 1990's with records management and storage, awareness triggers, permanent marker design concepts and testing schedules. This work included the thoughts of expert panels and individuals. The plan held up under peer review and met the requirements of the U.S. Environmental Protection Agency (EPA).

Today the NEA is coordinating a study called the "Preservation of Records, Knowledge and Memory (RK&M) Across Generations" to provide the international nuclear waste repository community with a guide on how a nuclear record archive programs should be approached and developed. CBFO is cooperating and participating in this project and will take what knowledge is gained and apply that to the WIPP program. At the same time CBFO is well aware that the EPA and others are expecting DOE to move forward with planning for the future WIPP PIC's program; so a plan will be in place in time for WIPP's closure slated for the early 2030's. The DOE/CBFO WIPP PIC's program in place today meets the regulatory criteria, but complete feasibility of implementation is questionable, and may not be in conformance with the international guidance being developed.

International guidance currently under development may suggest that the intergenerational equity principle strives to warn the future, however, in doing so not to unduly burden present generations. Building markers and monuments that are out of proportion to the risk being presented to the future is not in keeping with generational equity. With this in mind the DOE/CBFO is developing conceptual plans for re-evaluating and revising the current WIPP PIC's program. These conceptual plans will suggest scientific and technical work that must be completed to develop a "new" PICs program that takes the best ideas of the present plan, blended with new ideas from the RK&M project, and proposed alternative permanent markers designs and materials in consideration.

INTRODUCTION

In 1996 the DOE presented a Passive Institutional Controls (PIC's) program to the EPA as part of the application for certification of the WIPP TRU waste repository. This program was developed over several years, and at great expense, and provided a plan for design and material testing of permanent markers, a plan for records management development, and a plan for awareness triggers determination. Over the last 14 years of safe WIPP operations the feasibility of developing and implementing the permanent markers portion of the PICs program plan as presented and approved by EPA has come into question. The international community, in the form of the NEA's RK&M project has taken up the question of what a nuclear records archive program should look like and what burden should be put on today's generation to inform the future. As DOE goes through re-evaluating and revising the WIPP PICs program over the next few years, alignment with the expected international guidance is desired, while developing a financially efficient program for the American tax payer.

REGULATORY BACKGROUND

The EPA Code of Federal Regulations (CFR), Title 40, Part 191.14(c) [1] and 40 CFR 194.43 [2] require a PICs program be developed for the WIPP. The primary purpose of the PIC's program is to indicate the location of the repository and the risk it presents to an intruder, thus reducing the likelihood of inadvertent human intrusion into the repository after it has closed. The EPA regulations specify that radioactive waste disposal systems must employ measures to preserve knowledge about the location, design, and contents of the disposal system. According to 40 CFR 191.12, this can be accomplished through “(1) Permanent markers placed at a disposal site, (2) public records and archives, (3) government ownership and regulations regarding land or resource use, and (4) other methods of preserving knowledge about the location design, and contents of a disposal system.” [1]. The EPA also expected the DOE, in the Compliance Certification Application (CCA) [3], to estimate the period of time PICs are expected to endure and be understood. The EPA provided in the regulation for the DOE to potentially assume some PICs credit in the performance assessment in the form of reduced likelihood of human intrusion over several hundred years.

The EPA identified in their certification guidance document that “change in language, technology, and political institutions cannot be predicted over thousands of years, PICs and their messages cannot be assumed to last in perpetuity.”[2]. For this reason, neither the disposal regulations [1] nor the compliance criteria [4] require that PICs be shown to be effective for 10,000 years. In addition, there is no guarantee that a person will obey an admonition not to disturb the site, even if he or she has read and understood it. EPA therefore intends that PICs serve only to avert “unintentional” intrusions into the repository (e.g., resource exploration resulting from lack of knowledge of the presence of radioactive waste). The EPA also intends that PICs be designed to survive “as long as possible” using “available technology and materials.”

The PICs program submitted to the EPA in the original CCA was ultra-conservative and went well beyond the guidelines stated above. WIPP PICs was based upon programs and practices that at the time were state of the art, but that now are almost a quarter of a century old and financially inappropriate given the need to consider the actual cost to current generations as well as the potential risk to individuals in distant future generations.

THE WIPP PIC's PROGRAM

The DOE presented to EPA in 1996 a PIC's program that included a records management plan; an awareness triggers program and a detailed description of the permanent markers to be used for the WIPP site. DOE proposed to take 700 years of credit for PIC's being 99% effective in reducing future human intrusion in the performance assessment calculations. The EPA determined that the DOE complied with the requirements of section 194.43 because the measures proposed were comprehensive, practicable, and likely to endure and be understood for a long period of time. The EPA denied the request for credit of 99% reduction in human intrusion likelihood for 700 years after closure, as they felt no quantitative value of the probability can be defended. The WIPP PICs program has progressed little since the CCA was approved by EPA in 1998.

The records management program includes the copying and storage of information in local, national and perhaps international record archives. The plan calls for the development of filing codes and finding aids, the development of records packages, selecting data storage materials, selecting storage locations and obtaining agreements with record centers and archives. The DOE keeps operating records and data packages on the WIPP site and in locations within the Carlsbad, New Mexico community. Filing codes and finding aids have been developed for these paper, electronic and microfiche reports and records. These records are kept as part of normal operations and not as part of a long-term PIC's program. However information and lessons learned, such as file formats and retrieval coding may be used from these efforts. The DOE Office of Legacy Management operates the archive for DOE and some communications regarding WIPP records have taken place with them. Very little additional work has been completed in this area over the past 14 years.

Awareness triggers include the dissemination of information about WIPP to government agencies, publishers of maps, atlases, textbooks and encyclopedias, dictionaries and on the internet. Some of this has been accomplished over the last 14 years, though not through a concentrated effort to fulfill this part of the PICs program.

The permanent markers portion of the WIPP PIC's program involves long term testing and development of materials and includes conceptually a large salt core earthen berm, dozens of small and very large granite (or some other material) markers, thousands of smaller buried markers and above ground and below ground informational centers. A concentrated effort was completed in the early 2000's on the research and development phase of the permanent markers to be included as part of a planned change request to EPA to redesign the system. The planned change request including a permanent markers testing program plan, a monument survey, and a markers materials analysis; it was provided to EPA in May of 2002, with a request for a PICs program schedule change. The schedule change was approved by EPA in November of 2002, and another delay was approved in March of 2008; but DOE has performed none of the activities required to meet the present approved schedules. This portion of the program has been designed, planned, scheduled and cost-estimated in detail at least three different times. While this portion of the program has been the most planned, it is also the portion that takes the longest to carry out and the most funding to accomplish, unfortunately no real progress has been accomplished in this area since 2002. Over the last 10 years funding for the PICs program has been slashed to the bare minimum as effort and funding was dedicated to ensuring TRU waste was emplaced in the underground at WIPP at an accelerated rate.

DOE has proposed, and EPA has agreed in principle, to delay further PICs activities until the international community has prepared and proposed guidance on the subject and the DOE can develop a new conceptual model for the PICs program.

PROPOSAL FOR WIPP's FUTURE PICs PROGRAM

The WIPP PIC's program presented in the CCA was approved by EPA in 1998. DOE identified between 1998 and 2002 that the program that had been outlined in the CCA, while technically feasible, would be financially unfeasible. As DOE slipped schedules and requested delays from EPA to focus limited fiscal resources on disposing of TRU waste underground, it became clear that the WIPP PIC's program was too costly may not be in line with intergenerational equity principles and most likely would exceed what may be recommended from an international review of PICs programs. While it is important to inform future generations of the dangers that lie beneath the desert of southeastern New Mexico, and protect them from inadvertent exposure to these dangers, it is also important to do so in a way that does not present an undo fiscal burden on the present generation. And while it is important, and regulatory required, that WIPP prepares a PICs program plan by the time of the last Compliance Recertification, presently scheduled for 2034; it is also important that WIPP does not propose a plan that is inconsistent with what a developing international consensus may suggest for programs worldwide.

With these thoughts in mind, DOE has begun the process of re-evaluating the PIC's program presented to EPA during the 1990's. Some items of that program are still viable and need to be accomplished, for instance the Records Management and Awareness Triggers portions of the program. In these areas DOE should begin developing the data, processes and plans needed to put the final plan together. In the final plan (2034) methodologies for developing records packages will be determined, record centers will need to be identified, media storage techniques decided, and communication plans outlined. By 2034 the WIPP story should be determined, how the story is distributed to the world, by what media, when, and where should also be decided and included in the final PICs plan. To accomplish this, DOE must start now. For example decisions need to be made on the work scope and tasks to be budgeted and completed for such activities as records package design, storage media determination, and the preparing of the WIPP story for distribution. These tasks may take several years, as expert panels may need to be consulted, peer reviews may be required, and continuing limited budgets may dictate sequential rather than concurrent activities.

The 1996 PICs program took several years of development before being presented to EPA in the CCA of 1996; with early studies having started in the late 1970's to early 1980's. In the lead author's opinion, starting in FY2015 a multi-year contract should be provided for an external expert to review all the work that has been done in this area in the past, to discuss records packages with DOE's Office of Legacy Management, to visit and discuss record management and awareness triggers with various museums and publishers of reference publications, and to develop a report/plan for implementation in this area. Coordination with local, state, regional and national archives will be needed to set format and content guidance. If an international archive becomes established, its requirements will also need to be included.

DOE is participating in the RK&M project to collegially work with other nations' programs to determine the kind of records, knowledge and memory that should be available to help future generations make informed decisions. The focus of RK&M has evolved into developing methodologies for the preservation of records, knowledge and memory and to assure that in the medium and the long term, future generations may be able to make sense of whatever information they come across. RK&M is not focused on intrusion scenarios or permanent markers, specifically, but may concentrate on the concept of "oversight" that is being developed in the NEA's Retrievability and Recovery (R&R) project. Oversight can mean monitoring, RK&M preservation, local societal involvement, plus other items that may impact knowledge- and memory-keeping concepts and requirements. DOE will use the information coming from this NEA project to focus any planned activities in this area.

The permanent markers portion of the PICs program will require complete revamping, for example, large granite markers, are not feasible, they cannot be cut and transported as would be required, and granite is not available locally; a salt berm around the site may not be desirable, or cost effective; and a below ground information room seems to be excessive. DOE needs to begin redesigning and re-planning the permanent markers for WIPP immediately. In the lead author's opinion starting in FY2015 a multiyear program needs to be started with possibly multiple external experts involved. These experts should be tasked with reviewing the regulatory requirements and what was accomplished before, re-evaluating the concept of PICs and developing a less complex, less fiscally challenging conceptual model of the PICs program. One concept has been to include WIPP as part of a "Cold War Museum" with its own visitor center, etc; this concept and others must be evaluated and discussed; and a reasonable plan developed. This plan would then be vetted with the EPA and a Peer Review panel, and once everyone has agreed, testing and further development of the final plan could be completed, by 2034. This plan may take several years to complete as work may need to be conducted in sequence, and limited expert elicitations and peer reviews may be required. A 'planned change request' will need to be submitted to EPA, and depending on the degree of change suggested for the PICs program a rulemaking may be required. This program could easily take twenty years to complete. As these activities progress, DOE will keep aware of and involved in any national or international activities addressing PICs-related issues.

CONCLUSIONS

DOE's PIC's program for WIPP, while regulatory approved and technically feasible in theory, is not very practical for implementation. DOE has decided that the program needs to be re-evaluated and revised. The regulations governing WIPP requires this to be completed by the last recertification in the early 2030's, which means these activities must begin now. The international community through the NEA's RK&M project has started exploring the requirements for a PIC's program and guidance is expected from them in the next five years. Though the WIPP PIC's program re-evaluation should be started before this guidance is completed DOE plans to stay abreast of these developments and ensure the new program for WIPP does not contradict this guidance.

REFERENCES

1. US Environmental Protection Agency (EPA). 1985. “40 CFR Part 191: Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes; Final Rule.” *Federal Register*, Vol. 50, No. 182, pp. 38066 – 38089, September 19, 1985. Office of Radiation and Air, Washington, D.C.
2. US Environmental Protection Agency (EPA). 1998. “40 CFR Part 194: Criteria for the Certification and Recertification of the Waste Isolation Pilot Plant’s Compliance with the Disposal Regulations: Certification Decision; Final Rule.” *Federal Register*, vol. 63 (May 18, 1998): 27353–406.
3. US Department of Energy (DOE). 1996. Title 40 CFR Part 191 Compliance Certification Application for the Waste Isolation Pilot Plant, DOE/CAO-1996-2184, October 1996, Carlsbad Field Office, Carlsbad, NM.
4. US Environmental Protection Agency, 1996. *Criteria for Certification of the Waste Isolation Pilot Plant’s Compliance With the 40 CFR 191 Disposal Regulations: Final Rule*, Code of Federal Regulations, Title 40, Part 194 (40 CFR 194).