DOE/WIPP 04-2301

# Passive Institutional Controls Implementation Plan


**August 19, 2004**

**United States Department of Energy**
**Waste Isolation Pilot Plant**

**Carlsbad Field Office**
**Carlsbad, New Mexico**

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*Prepared for:*

Washington Regulatory and Environmental Services
an affiliate of
Washington TRU Solutions, LLC
P.O. Box 2078
Carlsbad, New Mexico 88221

*Prepared by:*

John Hart and Associates, P.A.
2815 Candelaria Road, N.W.
Albuquerque, New Mexico 87107
(505) 344-7868

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# 1.0 Introduction

The U.S. Department of Energy (DOE) is implementing a program of Passive Institutional Controls (PICs) for the Waste Isolation Pilot Plant (WIPP). This program is required by U. S. Environmental Protection Agency (EPA) 40 CFR Section 191.14(c) (EPA, 1993) and 40 CFR Section 194.43 (EPA, 1996). The purpose of the PICs program is to indicate the location of the repository and the dangers associated with radioactive and hazardous materials contact, thus reducing the likelihood of inadvertent human intrusion into the repository. The EPA regulations specify that radioactive waste disposal systems must be designated by multiple PICs including permanent markers, long-term records and "other PICs" which DOE is calling "awareness triggers."

This plan has been prepared by the DOE Carlsbad Field Office (DOE-CBFO) to facilitate the implementation of the WIPP PICs program, one of the six "assurance requirements" defined by the EPA certification criteria. This plan has two general objectives: (1) to serve as a tool to assist the DOE in managing activities included in the PICs program; and (2) to assist the DOE in communicating to the regulators and to the public activities which will be completed in implementing the PICs program. This implementation plan will be revised as needed during the execution of this work.

This Passive Institutional Controls Implementation Plan will be supported by three additional "lower tier" documents that will be prepared by the DOE-CBFO. Each of these three documents corresponds to one of three elements that comprise the overall PICs program. These individual implementation plans are:

- Records Management Implementation Plan;
- Awareness Triggers Implementation Plan; and
- Permanent Markers Implementation Plan.

This plan presents the overall PICs program. Greater detail for each of the three elements of the PICs program will be provided in these lower tier implementation plans.

This plan draws upon several other WIPP documents related to the PICs program. These include:

- Chapter 7 of the *Compliance Certification Application* (CCA) (DOE, 1996),
- Chapter 7 of the *Compliance Recertification Application* (CRA) (DOE, 2004),
- Appendix PIC of the CCA,
- Appendix EPIC of the CCA,
- *Expert Judgment on Inadvertent Human Intrusion into the Waste Isolation Pilot Plant* (Hora et. al, 1991), and

- *Expert Judgment on Markers to Deter Inadvertent Human Intrusion into the Waste Isolation Pilot Plant* (Trauth et. al, 1993).

Information provided in this plan includes:

1. A summary description of regulatory requirements that must be met in implementing the PICs program and the sources of these requirements, provided in Section 2.0.

2. An overview of commitments that the DOE has made regarding implementation of the PICs program, also provided in Section 2.0.

3. A description of the purposes of each of the three elements of the PICs program, the general progression of activities that will be performed in implementing each element, and the general schedule for the implementation of each element. This is provided in Section 3.0.

4. An overview of the public participation program that will be implemented by the DOE to ensure public participation in program review and decision making, provided in Section 4.0.

5. A description of quality assurance provisions that apply to work performed under the PICs program, provided in Section 5.0.

6. Regulatory citations related to PICs, provided in Attachment 1.

7. DOE Commitments in the CCA and CRA related to the PICs Program, provided in Attachment 2.

8. DOE Commitments in the HWFP related to the PICs Program, provided in Attachment 3.

# 2.0 PICs Requirements and Commitments

Requirements and commitments that impact the implementation of the PICs program stem from several sources. Requirements may be found in 40 CFR Parts 191 and 194 as well as the EPA's certification of the WIPP's compliance with the disposal standards (EPA, 1996). Guidance related to implementation of the PICs program may also be found in the EPA's *Compliance Application Guidance* (CAG) (EPA, 1996a). DOE Commitments related to implementation of the PICs program are identified in the CCA, the 2004 CRA, and the EPA's Air Docket (A-93-02) for the Certification of WIPP.

In addition, DOE has made commitments in the Hazardous Waste Facility Permit (HWFP) related to Permanent Markers.

The following sections generally describe the requirements and commitments relevant to implementation of the PICs program. Attachments 1, 2, and 3 list the specific requirements and commitments.

## *2.1 40 CFR Parts 191 and 194 and the CAG*

The EPA has specified that "[d]isposal sites shall be designated by the most permanent markers, records, and other passive institutional controls practicable" (40 CFR Section 191.14[c]). The EPA defines passive institutional controls to mean "(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" (40 CFR Section 191.12). The DOE has interpreted this regulatory language to require the development and implementation of a system of PICs, consistent with those components listed in the EPA's definition, so as to protect the integrity of the disposal system for as long as practicable after disposal.

The subject areas that must be addressed to demonstrate compliance with the regulation are provided by the EPA in 40 CFR Section 194.43: (a) detailed descriptions of the passive institutional controls, (b) the period of time that the passive institutional controls are expected to endure and be understood, and (c) justification of the time period for which the passive institutional controls are assumed to be effective in reducing the likelihood of inadvertent human intrusion. Additional guidance is provided in the CAG indicating what documentation is required in the compliance certification application to address 40 CFR Section 194.43(a), the basis of the estimates of how long the passive institutional controls are expected to endure and be understood, and the limitations on the duration of the effectiveness of the passive institutional controls assumed in the performance assessment (EPA, 1996a).

## *2.2 DOE Commitments in the CCA and CRA*

Many PICs commitments may be grouped according to their relevance to the elements of the overall program. These elements are:

1. Records Management (RM);
2. Awareness Triggers (AT);
3. Message Translation and Testing (MTT);
4. Permanent Markers Testing (PMT); and
5. Permanent Markers Final Design and Construction (PMFDC).

Other commitments pertain to all elements of the program. DOE commitments pertaining to PICs are listed in Attachment 2 and summarized in the following subsections. The commitments are assigned to the program elements within Attachment 2 using the five acronyms listed above. In addition, when a commitment pertains to all elements, the designator “ALL” is used.

### 2.2.1 PICs Records Management

The DOE has made multiple commitments involving the archiving of information related to the WIPP project. These commitments include the content of materials to be archived, where the materials will be archived, the schedule for archiving these materials, and the media upon which the documents will be archived. Beyond these commitments, the DOE has also committed to auditing recipients of archival materials to verify the receipt and maintenance of the materials.

### 2.2.2 Awareness Triggers

Awareness triggers pertain to government ownership of the site, management of the land, and the placement of notations on maps, in textbooks, and elsewhere. The DOE has committed to implement these activities. One activity, the development of a home page for the WIPP on the Internet, is complete and operational.

### 2.2.3 Permanent Markers and Testing

The DOE has committed to perform a range of tests on potential materials to be used in the construction of permanent markers. These commitments include long-term testing of granite and alternative materials, various berm materials and configurations, and other tests. These tests are intended to determine what materials or configurations would result in the most durable markers.

The DOE has also committed to determining whether specific messages proposed to be included on various permanent markers may be expected to convey the intended

warnings. Where necessary, messages and methods of presentation will be refined. The DOE has committed to translating the messages, originally composed in English, into the other six languages (French, Arabic, Chinese, Spanish, Navajo, and Russian) listed in the CCA and CRA, and testing the effectiveness of the messages among people who speak these languages.

### 2.2.4 General Commitments

Many DOE commitments apply generally to all elements of the PICs program. Of these, many involve measures to be employed to ensure the quality of work performed under the PICs program. Examples include commitments to implement appropriate quality assurance (QA) protocols, to audit the various QA programs, and to provide training to the appropriate individuals.

## *2.3 EPA's Certification of Compliance*

The EPA promulgated a set of conditions related to implementation of the PICs program in its certification of compliance (EPA, 1998). These conditions require the DOE to submit a revised schedule and additional documentation illustrating the feasibility of implementing the PICs program described in the application. This additional inforamtion must be provided no later than the final recertification application.

## *2.4 DOE Commitments in the Docket*

In Docket A-93-02, II-I-07 Enclosure 2-e, DOE committed to a number of activities. See items 102-125 in Attachment 2. Among these commitments is a schedule of activities that will be addressed in the first five years of WIPP operation. In May, 2002, DOE requested a schedule change which was approved by EPA in November, 2002 (EPA Docket A-98-49, II-B-3, Item 41). This new approved schedule is shown in Table 1 below:

## Table 1: Approved Schedule Changes for PICs Testing

| Activity | Original Time Frame | New Time Frame |
|---|---|---|
| Identification of suitable source material | 1999-2004 | 2007 |
| Submit plans for test marker system to EPA | 2003 | 2007 |
| Construct and test berm and test markers | 2004-2009 | 2008 |
| Monitor performance of test berm and markers | 2007-2083 | 2009-closure |
| Develop final design of markers | 2083-2090 | 2033 (anticipated) |
| Finalize messages | n/a | 2033 (anticipated) |

### *2.5 DOE Commitments in the HWFP*

The primary commitments in the HWFP relate to reporting to government agencies the location of the facility after closure. In addition, HWFP Attachment I, Closure Plan, references passive institutional controls and permanent markers commitments. See attachment 3 for further details.

# 3.0 PICs Program

This section describes the organization of the overall PICs program, purposes of each of the three elements of the program, the general progression of activities that will be implemented in performing each element, and the general schedule for the implementation of each element. As explained in the introduction, each element will be addressed individually in greater detail by a specific implementation plan.

## *3.1 PICs Program Organization*

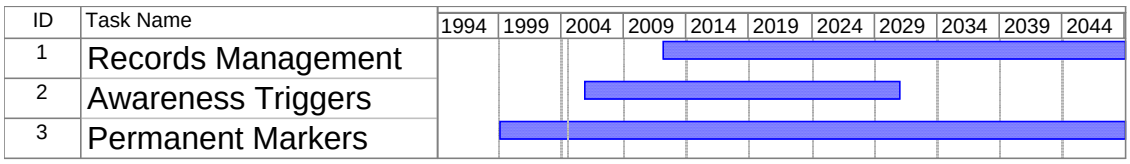
The organization of the overall PICs program is summarized in Table 2. The table shows the three elements of the program and the main activities associated with each element. This organization is somewhat different than that described previously in other documents addressing the PICs program, including Chapter 7 of the CCA and CRA; some activities have been included with the permanent markers element instead of awareness triggers to facilitate implementation.

**Table 2: Organization of the PICs Program**

| Records Management (RM) | Awareness Triggers (AT) | Permanent Markers (PM) | |
|---|---|---|---|
| | | Research and Development | Program Implementation |
| 1. Develop filing codes and finding aids<br><br>2. Develop records packages<br><br>3. Determine placement locations<br><br>4. Select data storage materials<br><br>5. Establish agreements with archives and records centers and place records in archives and records centers<br><br>6. DOE will provide the EPA with proof that the archive/record centers agree to accept and maintain provided documents | 1. Disseminate information about the WIPP to government agencies, publishers of maps, atlases, textbooks, encyclopedias, and dictionaries and on the Internet<br><br>2. Government control of the WIPP site<br><br>3. Land use restrictions<br><br>4. DOE will provide the EPA with proof of published information about WIPP | 1. Perform monument survey<br><br>2. Prepare materials analysis<br><br>3. Develop test methods<br><br>4. Translate and test messages | 1. Develop analysis plan<br><br>2. Construct test facilities, where needed<br><br>3. Perform tests<br><br>4. Specify final design; submit to EPA for approval<br><br>5. Construct markers upon approval |

The general schedule for each of these elements is provided in Figure 1. This schedule was developed based on the information contained in Chapter 7 of the CRA, Figure 7-14. Passive Institutional Controls – Long-term Schedule.

**Figure 1. General Schedule for the PICs Program**




## 3.2 PICs Records Management

PICs records consist of documentation describing the WIPP repository and the potential hazard of the disposed waste. The general objective of the PICs records management program is to ensure that this documentation is widely disseminated and preserved in the future.

### 3.2.1 Purposes of PICs Records

Four key purposes for the long-term PICs records management program have been identified. These include:

1. **Minimization of inadvertent human intrusion** - PICs records are intended to provide sufficient information to people in the future so that they do not inadvertently intrude into the repository due to either lack of knowledge of its existence or location, or lack of awareness of the dangers of exposure to the contents of the repository (i.e., that it contains potentially dangerous radioactive waste).

2. **Facilitation of informed intentional intrusion** - If it is decided at some point in the future that intentional intrusion into the WIPP vicinity or the repository is warranted (regardless of the reason), record keeping will serve to inform the intruders about what they will encounter. Whether intrusion is for resource exploitation, or for archeological investigations, the intruders will need reliable information for planning and safely performing the intended intrusion.

3. **Support to future research** - PICs records will provide a detailed description of the facility and the surface and subsurface environment in support of future research. Future researchers may include archeologists, geologists, hydrologists, geographers, historians, or others interested in current society.

4. **Establishment of an accessible legal record** - The PICs records will also provide a legal record concerning the approval and certification of the WIPP. The PICs records will be maintained both for long-term storage for the distant future, and for high accessibility for use in the near future.

## 3.2.2 Implementation of the PICs Records Management Program

Activities to be pursued by the DOE in implementing the PICs records management program are described in the following subsections. The progression of activities is generally described in the records management implementation schedule, presented as Figure 2. This schedule was developed based on the information contained in Chapter 7 of the CRA, Figure 7-14. Passive Institutional Controls – Long-term Schedule.

### 3.2.2.1 Filing Codes and Finding Aids

The creation of filing codes and finding aids is important in organizing the information to be provided in the PICs records packages. A variety of filing systems are used by records centers. Archives, however, use a special system for organizing archived material that is unique to archives. It is based on two major principles: (1) that of "provenance," or origin; and (2) "original order." Records are not distributed within an archive according to subject, but are kept together based on their provenance (in this case, the WIPP). The original order of the documents as a collection is also maintained in the manner supplied by the creator.

Once an archive has agreed to accept a collection, the next step is "arrangement and description," or "processing" of the material. "Arrangement is the intellectual and physical organization of records with regard to archival principles such as provenance and original order" (Yakel, 1994). The arrangement process should be relatively straightforward for WIPP files.

Since there is no universal filing system for the many different types of records centers (as opposed to archives), the DOE cannot provide a universally-acceptable filing code for records centers where WIPP records are stored. The DOE will assist records centers in determining how and where to include and incorporate the WIPP records into their existing system or systems.

### 3.2.2.2 Records Packages

An initial list of the information that the DOE has committed to placing in the long-term records management program is included in Chapter 7 of the CRA. Also, DOE commits to participate with the International Atomic Energy Agency (IAEA) in developing guidance for archiving of records about radioactive waste disposal in deep geological repositories. The IAEA proposes that geologic repositories implement a records management system that employs a hierarchical structure of information storage. The IAEA concept is that

different record keeping locations (i.e., archival facilities and records centers) will receive different levels (i.e., quantities) of information. A small number of locations will receive a large quantity of information with a large number of locations receiving a small quantity of information. Each location will receive a list of all the other locations and the information stored at those locations. This hierarchical system, with built-in redundancy, will help to ensure the long-term viability of information relating to the WIPP repository (IAEA, 1999).

Records will be incorporated into three levels of records packages: the primary; intermediate; and condensed information packages. Records that may be provided include significant environmental and safety documents such as a detailed map describing the exact location of the repository, key portions of the New Mexico Hazardous Waste Facility Permit, the final CRA prior to closure, environmental and ecological background data, records of waste container contents and disposal locations within the WIPP repository, and many others.

The primary information package will be the most comprehensive collection of information regarding the project. It will provide future generations access to a broad spectrum of information without being required to visit numerous locations.

The intermediate information package is intended to provide important information regarding the project in a reduced format. The intermediate information package will emphasize the information required under 40 CFR Part 194. Section 194.43(a)(2) states that records shall identify:

(i) The location of the controlled area and the disposal system;
(ii) The design of the disposal system;
(iii) The nature of the hazard of the waste;
(iv) Geologic, geochemical, hydrologic, and other site data pertinent to the containment of waste in the disposal system, or the location of such information; and
(v) The results of tests, experiments, and other analyses relating to backfill of excavated areas, shaft sealing, waste interaction with the disposal system, and other tests, experiments or analyses pertinent to the containment of waste in the disposal system, or the location of such information.

The condensed information package will provide sufficient information to minimize inadvertent human intrusion into the WIPP. This package is intended to notify future generations of the WIPP's existence, and convey an understanding of the repository system. If further information is required, it will be necessary for those performing the research to review either one of the more detailed information packages.

### 3.2.2.3 Placement Locations

The DOE has committed to delivering records to over 200 locations worldwide. These locations will be specified in the PICs Records Management Implementation Plan, although the locations may change prior to full implementation of the records management plan due to political, economic, or other reasons that eliminate or alter the use of a given location. Factors that will be considered in selecting the placement locations include accessibility, wide distribution, and redundancy.

Assumptions regarding the future interests of the public will be examined so that PICs records are placed in locations where future populations are most likely to search for the information. For example, if geologic disposal of nuclear waste is a topic assumed to be of continuing interest in the future, those countries that generate nuclear waste would likely be targeted as appropriate for WIPP records storage.

To maximize the opportunity for future societies to be made aware of the existence of the WIPP repository, the same records will be placed in more than one facility. To best implement the concept of redundancy, the records must also be retained in different types of facilities. For example, records should be kept in archival facilities for the longest possible preservation, as well as in highly accessible records centers where long-term preservation is not the main goal of the facility. Documents provided to records centers are used by the public and held for a limited period, whereas archival facilities maintain permanent records with historical importance and are used primarily by researchers.

Facility selection is also critical when considering satisfying the purposes of record keeping. Archival facilities will be selected based on their long-term stability to ensure the preservation of the records for as long as possible. The key function of records centers is to ensure that records are highly accessible to specific populations who will use those records centers. For example, those records centers frequented by persons prospecting for minerals should be one type of target facility for information related to WIPP resources.

In Chapter 9 of the CCA, Passive Institutional Controls Peer Review, DOE committed to develop QA procedures to ensure that correct documents get to the correct records centers. These procedures will be prepared prior to distribution of records to placement locations.

### 3.2.2.4 Data Storage Materials

The selection of data storage materials for the retention of PICs records is an important component of the overall program. The objective of the selection process is to choose the most appropriate materials for information preservation given the current options and regulatory commitments made by the DOE. Multiple types of data storage materials will

be evaluated. Factors to be considered in the selection process will include the cost of materials, the anticipated use of the archival record, and material preferences of the archival facility, records centers, and the DOE. The selected data storage materials must be able to sustain long-term preservation and the information must be sufficiently maintained to ensure preservation for the 10,000 year regulatory time frame.

The DOE committed in Appendix PIC of the CCA that the initial archival record will be on archival quality paper. It is also noted in the CCA that careful consideration will be given to the implications of permitting electronic storage technologies as data storage materials. The primary concerns are that no experience yet exists with long-term electronic storage technologies, and the equipment to read back information may disappear due to obsolescence. Final decisions concerning data storage materials will be made on a case-by-case basis when arrangements with specific archival facilities are negotiated. Final decisions regarding the selection of data storage materials must be made jointly by the DOE and each archival facility and records center.

### 3.2.2.5 Additional Implementation Activities

The final activities in implementing the overall PICs records management program will consist of the establishment of formal agreements with archives and records centers, the delivery of the specified records to these entities, and the routine auditing of the archives and records centers. The objectives of the auditing program will be to ensure that archives and records centers are in compliance with the provisions of their agreements with the DOE on an ongoing basis and to ensure the implementation of appropriate corrective actions, should such actions be necessary.

In addition, Condition 4 of the EPA certification decision (included in 40 CFR Part 194 as Appendix A) includes two requirements related to the records management program. The appendix provides that not later than the final recertification application submitted before closure of the disposal system, the DOE will provide the following to the EPA regarding the records program:

- Documentation showing that archives and record centers will accept the documents identified and maintain them in the manner identified in Docket A-93-02, Item II-G-1.

- Documentation showing that proposed recipients of WIPP information other than archives and record centers will accept the information and make use of it in the manner indicated by the DOE in Docket A-93-02, Item II-G-1, and supplementary information.

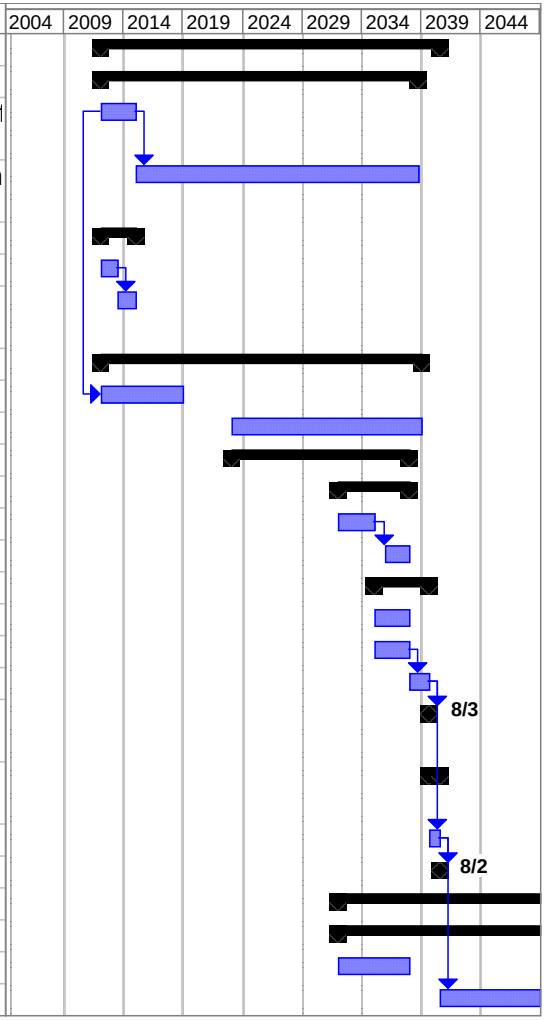
### 3.2.2.6 Implementation Schedule

The general schedule of events for the implementation of the PICs records management program can be seen on Figure 2. Because the program will be implemented over a very long period of time, the schedule extends from the beginning of operations up to the construction of the permanent markers. Initial activities focus on collecting information and tracking existing filing systems, developing a procedure for the definition and application of filing codes and finding aids, establishing procedures for the translation of documents, and determining which documents will be included in records packages. The initial record management activities will be performed beginning in calendar year 2011 and continue through 2038. The PICs Records Management Plan will be developed prior to the 2011 scheduled development of an archive filing system.

The remainder of the implementation activities will be performed as the WIPP project progresses toward completion and closure of the facility. Beginning in about 2018, more specific work will begin to develop and implement an archival filing system, identify records placement locations, define data storage materials, finalize agreements with records storage facilities, and to deliver records to these facilities. Document distributions will begin once the Active Institutional Controls (AICs) activities commence and will continue through much of the AICs period. During this time, the program will incorporate the process of auditing the activities of the recipient facilities to ensure the ongoing preservation of the records.

# Figure 2. Records Management Implementation Schedule

| ID | Task Name |
|---|---|
| 1 | **Initial Activities Schedule** |
| 2 | **1.0 Develop filing codes and finding aids** |
| 3 | 1.1 Develop CBFO procedure for establishing filing codes, finding aids, and translation of documents |
| 4 | 1.2 Implement CBFO procedure for establishing filing codes, finding aids, and translation documents |
| 5 | **2.0 Define documents to be included in records packages** |
| 6 | 2.1 Establish selection criteria |
| 7 | 2.2 Develop lists of documents: (1) primary; (2) intermediate; and (3) condensed information |
| 8 | **3.0 Propose records placement locations** |
| 9 | 3.1 Establish selection criteria |
| 10 | 3.2 Determine level of documentation to be maintained by each placement location |
| 11 | **4.0 Determine acceptability of proposed placement locations** |
| 15 | **5.0 Define data storage materials** |
| 16 | 5.1 Establish selection criteria |
| 17 | 5.2 Select materials |
| 18 | **6.0 Implement agreements with archives and records centers** |
| 19 | 6.1 Define Criteria |
| 20 | 6.2 Define goals |
| 21 | 6.3 Complete agreements |
| 22 | 6.4 Provide EPA with proof that archives and records centers will accept and maintain documents |
| 23 | **7.0 Deliver records packages, filing codes, and finding aids to archives and records centers** |
| 24 | 7.1 Deliver |
| 25 | 7.2 Complete delivery to archives and records centers |
| 26 | **Long-Term Schedule** |
| 27 | **8.0 Audit archives and records centers records-retention activities** |
| 28 | 8.1 Develop CBFO procedure for auditing archives and records centers |
| 29 | 8.2 Implement CBFO procedure for auditing archives and records centers |



## *3.3 Awareness Triggers*

The primary objective of the awareness triggers is the widespread distribution of the WIPP information, making as many people as possible knowledgeable of the presence of the repository. Information about the WIPP will be distributed by the DOE to selected organizations in a packet entitled the Awareness Triggers Package (ATP). This will consist of sufficient information to allow someone unfamiliar with the project to understand its general scope, purpose, and associated potential hazards.

Appendix EPIC of the CCA includes the following items as awareness triggers:

- Incorporation of the WIPP's location on various maps and atlases,
- Description of the WIPP's location and content within the subject matter of encyclopedias and common reference materials,
- Identification of the WIPP as a geographical name in dictionaries,
- Description of the WIPP incorporated within the text of high-school and college-level history and science textbooks, and
- The development of a home page for the WIPP on the Internet.

In addition, there are other types of awareness triggers; government control of the site and land use restrictions. These awareness triggers are already in effect; they were implemented by the passage of the WIPP Land Withdrawal Act and through the implementation by the DOE of the Land Management Plan (DOE, 1996a). CCA Appendix EPIC also notes that the berm around the repository footprint, when constructed, will act as an awareness trigger. In this plan, to avoid overlap, the berm is discussed as a permanent marker.

### 3.3.1 Purposes of Awareness Triggers

Awareness triggers help to ensure that knowledge of the presence of the repository and its potential hazards is as widespread and accessible as reasonably possible. The awareness triggers documentation program consists of the dissemination of information about the WIPP to government entities and to the publishers of maps, atlases, textbooks, encyclopedias, and dictionaries. The program also includes making information available about the WIPP and its potential hazards on the Internet and on the "New Mexico One-Call" system, or equivalent, for notification of the presence of underground utilities.

## 3.3.2 Implementation of the Awareness Triggers Program

The Awareness Triggers program will be done in two phases; a partial or “pilot” program and a full program. The pilot program will be a concentrated effort focusing on a select group of participants and will be used to determine the needs and effectiveness of the complete program. Information learned in the pilot program will shape the planning and execution of the full program. The end of the partial program will mark the beginning of the complete program. Activities to be pursued by the DOE in implementing the PICs awareness triggers program are described in the following subsections. The progression of the activities is generally described in
Figure 3. This schedule was developed based on the information contained in Chapter 7 of the CRA, Figure 7-14. Passive Institutional Controls – Long-term Schedule.

### 3.3.2.1 Awareness Triggers Package

Appendix PIC of the CCA indicates that the widely disseminated WIPP information includes several items: a description of the location of the site, information on the hazards associated with the emplaced waste, and detailed maps. This information will be incorporated in the ATP, which will be included in the PICs awareness triggers implementation plan.

### 3.3.2.2 Placement Locations

A list of planned awareness trigger locations is presented in Appendix PIC and Appendix EPIC to the CCA. Appendix PIC indicates that WIPP information is to be sent to mapping and geologic organizations such as the American Congress on Surveying and Mapping, the American Society of Cartographers, the Commission for the Geological Map of the World, mining and oil and gas professional organizations, and others.

It is also suggested in CCA Appendix PIC that companies providing energy and resource-related data for commercial activity in the Delaware Basin receive the same information as the organizations listed above. Examples of the companies that may receive the information are the Midland Map Company of Midland, Texas and I.H.S. Energy of Denver, Colorado.

Additionally, CCA Appendix PIC states that various federal and state mapping agencies should receive WIPP location and hazards information. Examples of these agencies include: the U.S. Bureau of Land Management, the U.S. Geological Survey, and the Defense Mapping Agency.

All of the relevant commitments in the CCA and CRA related to placement locations will be considered during the development of the initial list of ATP recipients. Other potential recipients will be identified through library searches and interviews with individuals

involved in the production of maps. The names and addresses of the potential recipients will be listed in the PICs awareness triggers implementation plan. This list will continue to develop as the ATP recipients may be added or deleted throughout the implementation of the awareness triggers activities.

### 3.3.2.3 Implementation Activities

The awareness triggers program will be implemented through the activities described in this section. Each of the listed organizations will be contacted by telephone. The objectives of the initial telephone contact will be to:

1. Determine the individual within each organization who is the appropriate person to represent the organization in regard to the receipt of the ATP.

2. Provide an overview description of the WIPP project and the objectives of the awareness triggers program.

3. Determine if the organization will have a use for the ATP. That is, to determine whether the organization indeed publishes maps, dictionaries, encyclopedias, or textbooks, maintains geographic information databases, or otherwise has some application suitable as an awareness trigger.

4. Determine if the organization is willing to receive and use the ATP and, if so, confirm the organization's mailing address and the correct spelling of the name of the recipient.

5. Inquire whether the individual is aware of any organizations that may appropriately be added to the list of ATP recipients.

All telephone inquiries will be recorded on a written log. All telephone logs will be entered into an awareness triggers central file to provide a record of implementation activities.

The ATP will include the following:

- An introductory transmittal letter including a request for assistance in implementing the awareness triggers objectives;

- A summary description of the WIPP project, the waste planned for emplacement, potential hazards associated with the waste, and a discussion of the importance of avoiding inadvertent human intrusion and the role of awareness triggers; and

- Information on the geographic location of the WIPP including latitude and longitude, New Mexico state plane coordinates, the township/range/section legal description of the WIPP LWA, and maps showing the location of the WIPP.

As information pertaining to the WIPP appears on maps and in dictionaries, encyclopedias, textbooks, etc., copies of the pertinent documents will be obtained and placed in the awareness triggers central file. This information will be useful in documenting progress in meeting program objectives, particularly when developing recertification packages or documentation of continued compliance at five-year intervals.

The recipients of the ATP will again be contacted by telephone to inquire as to the status of the use of the awareness trigger information and to inquire about additional organizations in need of information. This will be done annually to ensure compliance with the provisions of agreements with the DOE. Information obtained through these monitoring calls will be recorded and placed in the central file. Additionally, on a routine basis, the DOE may perform an audit on the awareness triggers central files maintained by the Management and Operations Contractor (M&OC) in Carlsbad.

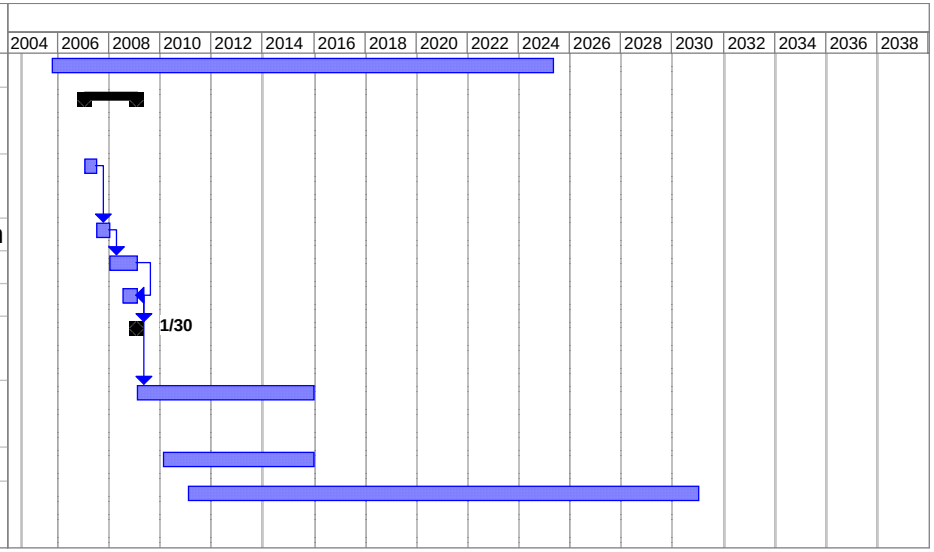
### 3.3.2.4 Implementation Schedule

As described above, two parts of the awareness triggers program are already in place; these are government control of the WIPP site and land use restrictions. No specific additional activities are necessary with regard to these parts of the program except the continued implementation of the WIPP Land Management Plan (DOE, 1996a). As noted above, construction of the berm is discussed as part of the permanent markers section of this plan.

Activities related to the distribution of the ATP will be initiated by the development of the Awareness Triggers Implementation Plan. Related activities, including the finalization of the ATP, determining the acceptability of the proposed placement locations, the submittal of the ATP to the selected locations, and follow-up telephone inquiries will be initiated in 2006, and follow-up may continue as long as the schedule for distribution endures (See Figure 3). This is planned through 2015 if found to be effective. At that point, the program will become an ongoing, relatively low level-of-effort activity to monitor implementation activities and to implement any necessary corrective actions. This activity will be ongoing throughout the operational period of the project and may continue through the 100-year period of active institutional controls, depending upon the measured success of earlier efforts.

# Figure 3. Awareness Triggers Implementation Schedule

| ID | Task Name |
|---|---|
| 1 | **1.0 Develop the awareness triggers package** |
| 2 | **2.0 Determine the acceptability of the proposed placement locations** |
| 3 | 2.1 Develop CBFO procedure to perform and record all stages of telephone inquiries |
| 4 | 2.2 Conduct initial telephone inquiries and record information |
| 5 | 2.3 Assess the acceptability of placement locations |
| 6 | 2.4 Document acceptance agreements |
| 7 | 2.5 Provide the EPA with proof that publishers are willing to publish information about WIPP |
| 8 | **3.0 Submit the Awareness Triggers Package to selected locations** |
| 9 | **4.0 Initiate follow-up telephone inquiries** |
| 10 | **5.0 Monitor and audit awareness triggers implementation activities; implement any necessary corrective actions** |



## *3.4 Permanent Markers Program*

The permanent markers program will consist of two general parts: (1) research and development activities; and (2) program implementation activities. The schedule for the progression of the Permanent Markers Program activities is described Figure 7. This schedule was developed based on the information contained in Chapter 7 of the CRA, Figure 7-14. Passive Institutional Controls – Long-term Schedule.

### 3.4.1 Purposes of Permanent Markers

The primary purposes of the permanent markers are to reduce the likelihood of inadvertent, intermittent human intrusion and to deter systematic or persistent exploitation of the WIPP site.

### 3.4.2 Research and Development

Research and development activities that support the Permanent Markers Program include a survey of archaeological sites in the general region of the WIPP, a materials analysis effort to evaluate potential materials of construction for the various marker components, the development of specialized test methods, and the translation of markers messages and testing the effectiveness of the messages. Each of these activities is described below.

#### 3.4.2.1 Monument Survey

Important considerations to permanent markers design are the ability of the marker material to be inscribed with warning messages and the durability of these messages over very long periods of time. A key objective of the permanent markers program is to optimize the design of the marker components by evaluating alternative configurations and materials and aiding in the development of final designs. One activity identified in the CCA was the survey of monuments within 150 miles of the WIPP site to obtain any information useful in the selection of marker materials and the development of marker designs.

The DOE commissioned the performance of this survey in 2000; the results of this work are reported in *Contractor Report, Permanent Markers Monument Survey, Waste Isolation Pilot Plant* (John Hart and Associates, P.A., 2000a). This report documents the results of a survey performed in the summer of 2000. The objective of this survey was to collect and compile information relevant to the assessment of the durability of ancient inscriptions made on various rock types where the topography, climate, and regional conditions were similar to the conditions found at the WIPP site. Some of the monument

sites surveyed were farther than 150 miles from the WIPP site, but the conditions were comparable for weathering and anthropogenic influence. Conclusions are provided related to the durability of various rock types, the effects of aspect, the rates of erosion of inscriptions, the effects of inscription form, and the importance of contrast in color and texture in regard to inscription legibility. Recommendations based on study observations and related to the longevity of inscriptions on various rock types are provided. These include:

**Rock Types** – Rocks of hardness and durability suitable for use as WIPP permanent markers are available within a few hundred miles of the WIPP site. Basalt and sandstone are the most abundant, so one or both of these should be selected for further evaluation. Intrusive igneous rocks that are susceptible to exfoliation should not be used.

**Form of Inscriptions** – To the extent consistent with the necessary written and symbolic warnings and messages, inscriptions should be as large as possible, with groove widths several times the largest mineral particle size. Unless the rock is very fine grained like basalt, it probably will not be practical to inscribe letters smaller than about 25mm minimum plan dimension or less than 5mm deep.

**Additional Studies** – Given the consistent findings over the 16 sites included in the survey, it is anticipated that additional monument (petroglyph) surveys would not be useful. However, studies on material properties of rock and man-made materials would be useful, with emphasis on surface hardness, methods to create and preserve color contrast, and the effects of rock texture on inscribability and inscription durability.

The monument survey activity is complete.

### 3.4.2.2 Materials Analysis

A literature review and initial assessments of marker materials included in the conceptual design as well as potential alternative materials have been performed; this work is reported in *Contractor Report, Permanent Markers Materials Analysis, Waste Isolation Pilot Plant* (John Hart and Associates, P.A., 2000b). The permanent markers will be constructed of materials that will be selected through an evaluation process. Candidate materials identified in the CCA conceptual designs will be evaluated against performance criteria. The evaluations will be performed using methods identified in the *Permanent Markers Testing Program Plan (DOE/WIPP 00-3175)*. Information obtained from literature reviews is provided in this report and has been used to refine the evolving candidate materials lists. The literature review also provides information supporting preliminary evaluations of the candidate materials. This information is also of value in

planning laboratory and field tests that will provide additional information necessary to make final marker materials selections.

In conjunction with the materials analysis report, the DOE commissioned a review of ancient applications of concrete. This work is reported in *Contractor Report, Ancient Cementitious Materials* (John Hart and Associates, P.A., 2000c). The conceptual design for WIPP permanent markers calls for granite as the primary construction material for the large surface markers, small subsurface markers, buried storage rooms, and information center. Although the conceptual design specifies granite, the DOE has committed to evaluate alternative materials in an effort to optimize final designs. One potential alternative material is concrete. Accordingly, a literature review was performed to investigate instances in which man-made cementitious materials have survived for very long time periods. The intent of this effort was to determine and document, when possible, the attributes of cementitious materials that contribute to their long-term survival.

This literature review showed that cementitious materials used nearly 9,000 years ago have survived intact to the present day. Concretes that have survived over such long periods have been some form of pozzolanic concrete. Results suggest that the blending of ancient and modern concrete technologies may provide a durable, long-lasting concrete meeting the DOE goal to mark the WIPP site for a very long time.

### 3.4.2.3 Test Methods Development

Markers testing will occur in two general ways: laboratory testing and field testing. The specific tests performed will vary according to the marker component and associated individual testing and evaluation needs.

A variety of standard test methods already exists and is appropriate to apply to many components of the markers system. In these cases, testing may begin with no need for test-method development. In other cases, however, no appropriate test method currently exists. An example of this case is the testing of radar reflectors to determine the optimal configuration for airborne detection.

In those cases where no suitable test method currently exists, it will be necessary for the DOE to define a test method and testing protocol prior to the initiation of testing.

### 3.4.2.4 Messages Translation and Testing

This element of the PICs program will define the messages that will be inscribed on permanent markers placed at the WIPP site. These messages are intended to incorporate increasing degrees of complexity, ranging from Level I to Level IV. The most detailed messages, Level V, will not be placed on site, but instead in records centers.

The initial message, without use of language (i.e., Level I), is that “something man-made” is present on the site. The Level II messages state through language and pictographs that there is danger present, and the danger is below the land surface. Level III messages tell that radioactive and hazardous waste is buried, instruct persons not to dig or drill, indicate the depth of burial, when WIPP was closed, that the repository is intended to last at least 10,000 years, that there is a decreasing danger over time, and requesting that the messages be updated to the current language or languages in use (space is left on the markers for this purpose). This information is conveyed through diagrams and pictographs as well as written language. Finally, Level IV messages expand on the above topics, and also address the potential for releases through ground water, identify cancer as the primary risk, provide detailed information on the radioactive and chemical constituents of the waste, provide a geologic cross-section with reasons for choosing the Salado Formation for the WIPP, describe the locations world-wide where other nuclear waste sites are located, and urge readers to seek out those other sites and ensure consistency of messages.

The message translation and testing activity, however, addresses only message Levels II, III, and IV, since Level I does not use language; it simply conveys through the existence of structures, markers, etc. that something man-made exists in this location. Level V consists of the more detailed records placed in archives and records centers. The messages translation and testing activity focuses on refining the text of the messages, translation of the text into six designated languages, and testing comprehension of the text in the various languages along with the accompanying diagrams and pictographs, which are intended to complement and enhance comprehension of the text.

Messages to be placed at the site have a single purpose: to minimize the potential for inadvertent intrusion into the repository. This purpose is accomplished by communicating to future populations that “something” exists or is different about this place, and that whatever exists is potentially dangerous. As the messages increase in complexity, more information is provided to further discourage persons from digging or drilling.

To accomplish this purpose, communication must occur, and it must occur over as long a time period as possible. Reflecting the current state of the art in linguistics at the time that the markers panel was convened in 1991 and 1992, the program is intended to use every means known to enhance comprehension of the messages to the greatest degree possible. Methods planned to enhance the potential for understanding are:

- Inclusion of messages in English and six additional languages representing different cultures and geographical locations;
- Use of simple words and short sentences;
- Use of complementary diagrams and pictographs;

- Testing messages comprehension with populations indigenous to areas speaking each language; and
- Revising the messages as needed according to test results.

The current literature in linguistics will be reviewed to determine whether new research related to communication to the future has been performed since the work of the Markers Panel. If additional methods have been identified or developed, they will be incorporated into the messages translation and testing program.

The seven languages chosen for PICs messages on permanent markers in the CCA are the six United Nations languages (English, Spanish, French, Russian, Chinese, and Arabic) and Navajo. This list of languages may be revisited and revised in the future as several of these may use English terms for technical concepts and may not add to future generations' understanding of the danger. Preliminary text of the messages in English is included in Appendix PIC of the CCA.

Established quality assurance standards and procedures will be applied to all aspects of message development below. First, existing draft messages will be evaluated in the following sequence of activities:

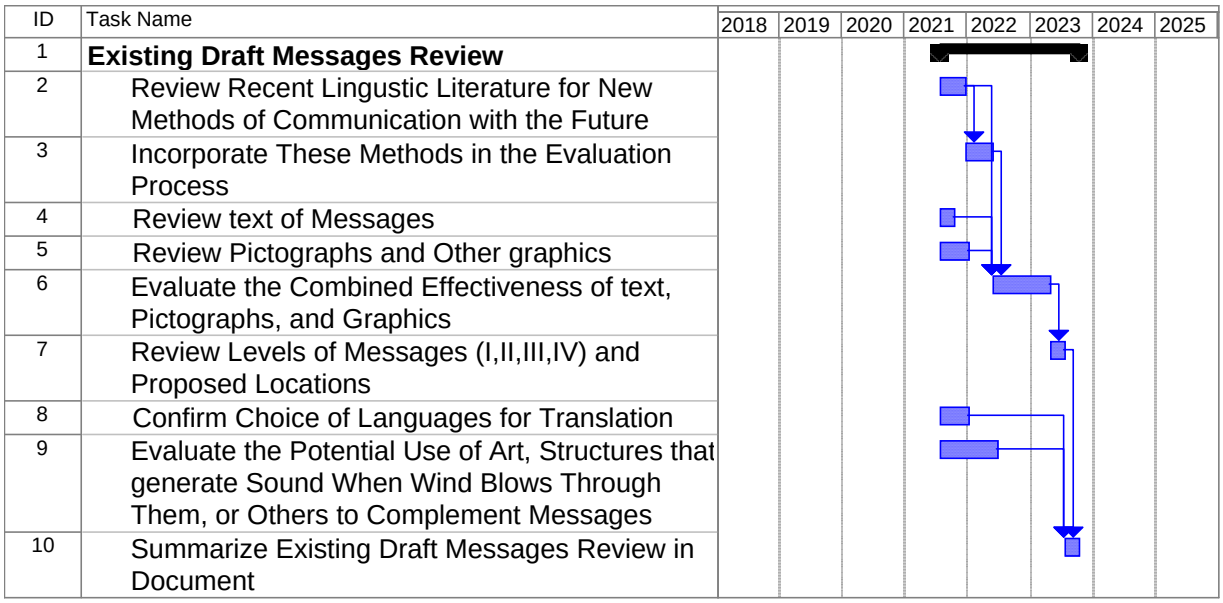



**Figure 4. Message Testing Phase 1: Existing Draft Messages Review**

Based on the results of the messages review, messages will be tested, revised as appropriate, and finalized in the following sequence of activities:

| ID | Task Name |
|---|---|
| 11 | **Finalize Messages** |
| 12 | Revise Draft English Messages Consistent with Results from Review |
| 13 | Identify Variety of Cultural Groups That Speak English as Their Primary Language * |
| 14 | Identify Representatives of These Groups That are Willing to Participate |
| 15 | Test English Messages with Identified Groups |
| 16 | Test Pictographs and Graphics with Identified Groups |
| 17 | Revise English Messages, Pictographs and Graphics Based on Test Results |
| 18 | Verify Corrected Versions with Test Groups |
| 19 | Finalize Messages in English |
| 20 | Coordinate with Permanent Markers Testing Program for Compatibility with Chosen Materials and Engravability |

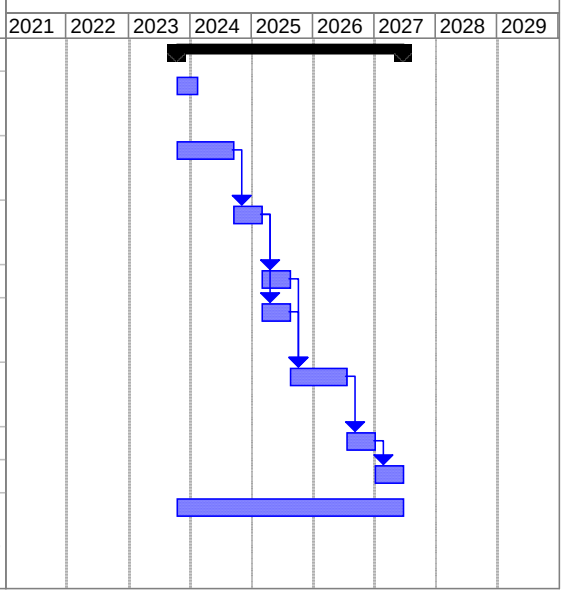



**Figure 5. Message Testing Phase 2: Finalize Messages**

* Identify a variety of cultural groups that speak English as their primary language, including different ethnic and racial groups, education levels, incomes, genders and age ranges, different regions of the U.S. and Canada, and different regions of the United Kingdom; identify representatives of these groups, and ascertain their willingness to participate in this activity;

Activities to prepare, test and finalize text translations will include:

| ID | Task Name |
|---|---|
| 21 | **Finalize Text Translations** |
| 22 | Identify Translators with required Expertise and Willingness to Participate |
| 23 | Prepare Translations |
| 24 | Identify Cross-Cultural Groups of Indigenous Speakers of the Other Chosen Languages |
| 25 | Identify Individuals representing These Groups and Willing to participate |
| 26 | Test Translated Messages with Identified Groups |
| 27 | Test Pictographs and Graphics with Identified Groups |
| 28 | Revise Translated Messages, Pictographs and Graphics Based on Test Results |
| 29 | Verify Corrected Versions with Test Groups |
| 30 | Ensure that Finalized Messages Meet Requirement of the Quality Assurance Program |
| 31 | Enter Final Text of Messages, Diagrams, and Pictographs into the records Management System until Markers Inscription is Performed |

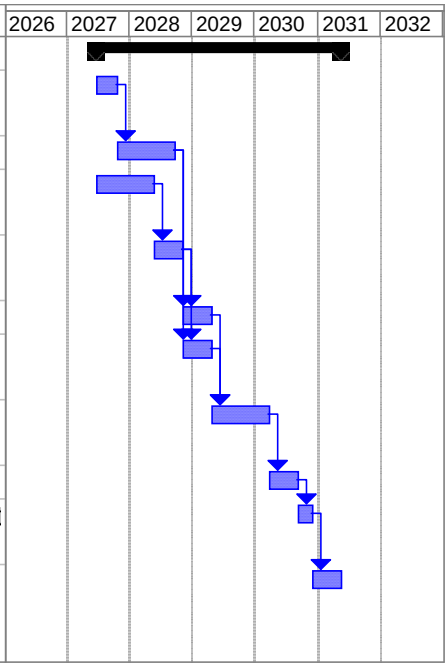



**Figure 6. Message Testing Phase 3: Finalize Text Translations**

### 3.4.3 Permanent Markers Program Implementation

Activities to be pursued by the DOE in implementing the permanent markers program are summarized in the following subsections. For additional details on Permanent Markers, see the *Permanent Markers Implementation Plan* (DOE/WIPP 04-3302).

#### 3.4.3.1 Analysis Plan Development

Permanent markers work must be performed in accordance with established QA standards and procedures. The DOE-CBFO QA process requires documentation on design control from beginning to end for the permanent markers testing program. The documentation must define key elements of the work including the analysis approach, any software to be used, applicable implementing procedures, identification of data needed and data to be developed, and documented review of the work. Plans for the acquisition and long-term storage of materials samples must also be addressed.

#### 3.4.3.2 Construction of Test Facilities

Testing implementation will include the construction of scaled test marker components. Prior to construction, DOE will conduct surveys and complete cultural clearances as described in the Land Management Plan, DOE/WIPP 93-004. In addition, grazing leases will be reviewed for impact and renegotiated, if necessary. Observation will be done of

permanent marker durability and performance over a long time frame. Results of the testing activities will be reported routinely and test plans may be amended if deemed appropriate as more is learned about the performance of the test components. Update reports on the progress of the testing program will be prepared at five-year intervals.

The *Permanent Markers Testing Program Plan* (DOE/WIPP 00-3175) (DOE, 2000) calls for the construction of the following test facilities:

Large Surface Markers - Scaled mock-ups to evaluate visibility and the number and positions of the markers

Buried Storage Rooms - Scaled prototype buried room for long-term structural testing

Berm - Test section of the berm to evaluate in-place density and other properties of materials of construction and to evaluate structural stability, erosion rates, and biointrusion

### 3.4.3.3 Permanent Markers Testing

The permanent markers testing program will be implemented during the operational period of the WIPP project and after closure of the facility to provide input to decision making regarding materials selection and the final design of the permanent markers system. The purposes of the testing program and the general sequence of activities to be performed in implementing the program are described in this section. Greater detail regarding specific aspects of the program will be developed and included in the *Permanent Markers Implementation Plan* (DOE/WIPP 04-3302). In addition, a second document, *Permanent Markers Testing Program Plan* (DOE, 2000) has already been prepared to guide testing activities.

The general purpose of the permanent markers materials testing program is to provide information useful in materials specifications and construction methods. Marker components to be tested will include:

- Berm;
- Large Surface Markers;
- Small Subsurface Markers; and
- Buried Storage Rooms.

Testing will help to determine the durability of optional construction configurations and materials. The practicability of the construction of alternative designs will also be evaluated.

Detailed plans will be developed for testing the markers components. This work will include the development of criteria to be applied to the selection of test materials, test designs, and the construction of test markers. Each test design will be defined in detail, including test requirements, goals, reporting, quality assurance provisions and protocols, schedule, and estimated cost. The detailed test plans will be prepared, published, and distributed to identified interested parties for comment. As appropriate, the test plans will be amended in response to comments.

### 3.4.3.4 Specify Final Designs and Submit to EPA for Approval

The definition of the permanent markers final design requires the determination of performance objectives, performance criteria, and design criteria for each of the markers components. These are derived from the requirements defined in the regulations and associated commitments made by the DOE. They provide a basis for evaluating the acceptability of current and alternative designs. They are identified in the *Permanent Markers Implementation Plan* (DOE/WIPP 04-3302) (DOE, 2004)

In addition, decision logic will be applied to the process of determining the final designs, including materials selection and constructability, for each of the markers components. This decision-making process is described in the *Permanent Markers Implementation Plan*. The decision-making process will be supported by the results of laboratory and field tests.

Upon DOE's selection of the final markers system design, the design will be submitted to the EPA for final approval. This is consistent with Condition 4 of the EPA certification decision, included in 40 CFR Part 194 as Appendix A. The appendix provides that not later than the final recertification application submitted before closure of the disposal system, the DOE will provide the following to the EPA regarding the markers components:

1. A schedule for implementing passive institutional controls that demonstrates markers will be fabricated and emplaced and other measures will be implemented as soon as possible following closure of the WIPP. The schedule will also describe how testing of any aspect of the conceptual design will be completed before or soon after closure and what changes to the design of passive institutional controls may be expected to result from such testing.

2. Documentation showing that the granite pieces for the proposed monuments and information rooms described in Docket A-93-02, Item II-G-1, may be quarried (cut and removed from the ground) without cracking due to tensile stresses from handling or isostatic rebound; engraved on the scale required by the design; transported to the site, given the weight and dimensions of the granite pieces and the capacity of existing rail cars and rail lines; loaded, unloaded, and erected

without cracking based on the capacity of available equipment; and successfully joined.

#### 3.4.3.5 Construct Permanent Markers

After the submittal of the final markers system design to the EPA and EPA approval of the design, the components will be constructed. Once again, the Land Management Plan requirements will be reviewed and complied with, prior to beginning construction.

### 3.4.4 Implementation Schedule

The initial permanent markers activities, the monument survey and materials analysis, are complete and the *Permanent Markers Implementation Plan (DOE/WIPP 04-3302)* is being provided in conjunction with this plan for DOE approval. In addition, the Permanent Markers Testing Program Plan (DOE/WIPP 00-3175) was prepared in September of 2000 and is planned for revision in 2004.

The general schedule of events for the implementation of the PICs permanent markers program can be seen on Figure 7. The schedule shows two phases: Research and Development Phase and Program Implementation Phase.

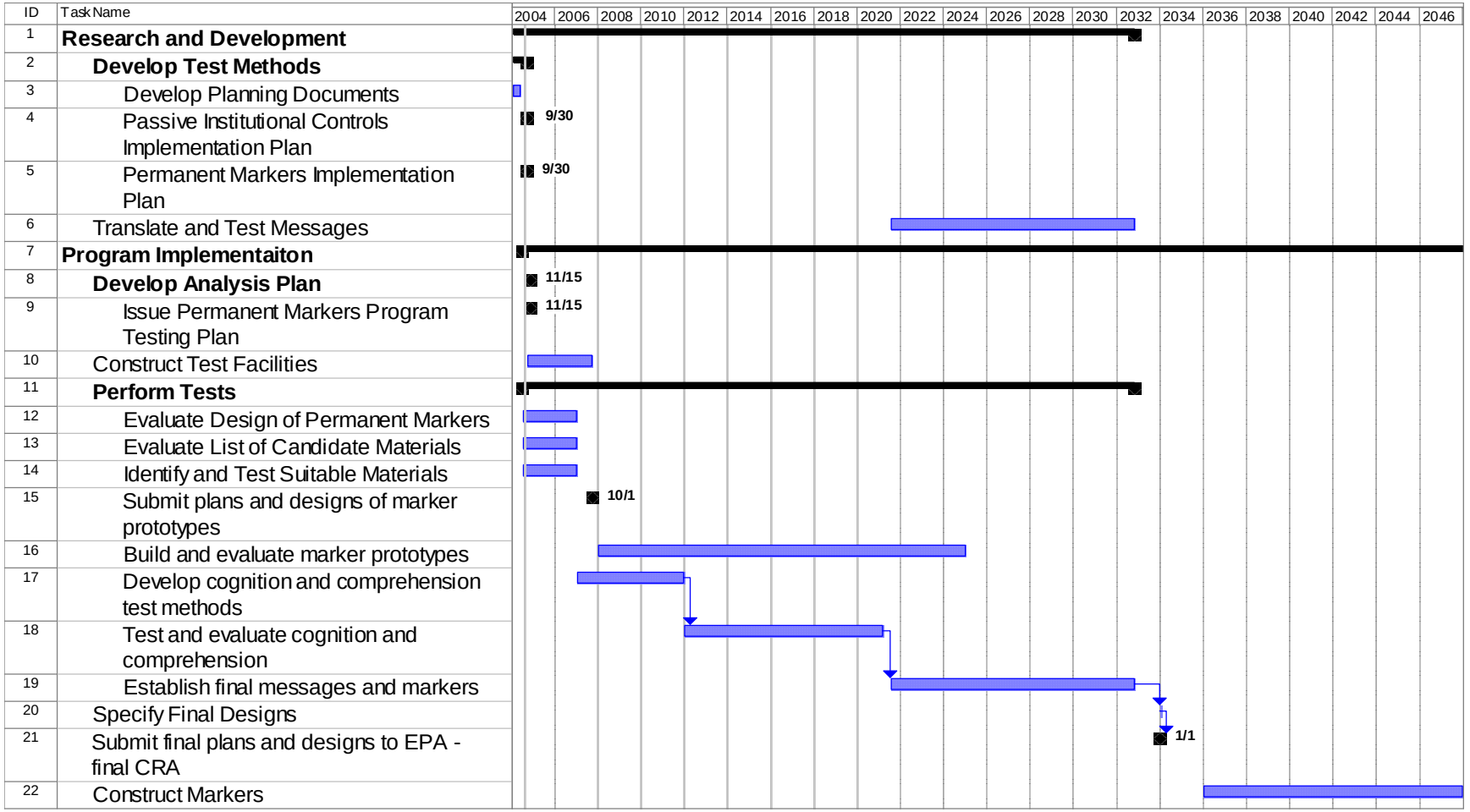
Most of the activities in the Research and Development Phase will be completed by the end of FY2004. This includes research, surveys, and planning documents. The text message translation will be done in the final 15 years of WIPP operations to allow for content changes as operations and cognitive tests continue.

A number of the activities in the Program Implementation Phase (see Figure 7) are scheduled to be completed by 2007 to meet the EPA approved schedules. These include activities needed to finalize the permanent marker prototypes for long-term testing and monitoring. These activities include evaluating the design of the permanent markers, evaluating the list of candidate materials for marker components, and choosing and testing suitable materials.

Activities past 2007 include building and monitoring the marker prototypes and developing the final messages to be included in the marker system.

Additional information on Permanent Markers is provided in the lower tier documents: *Permanent Markers Implementation Plan* (DOE/WIPP 04-3302) and the *Permanent Markers Testing Program Plan* (DOE/WIPP 00-3175).

# Figure 7. Permanent Markers Implementation Schedule



# 4.0 Public Participation

The DOE recognizes the importance of stakeholder participation in the decision-making process for the PICs program. Regular public information meetings will be held to report program progress and to solicit public input regarding program decisions. The meetings may occur in Carlsbad, Albuquerque, and/or Santa Fe. It is the intent of the DOE to hold these meetings as often as warranted by the project.

Following the first public information meeting, the DOE will establish a mailing list of individuals and organizations expressing interest in the PICs program. Information regarding program status and progress will be distributed to those on this list at least annually.

Also, as described in Section 3.0, detailed PICs test plans will be prepared, published, and distributed to interested parties for comment. As appropriate, test plans will be amended in response to comments.

An additional avenue for public participation in the PICs program is the five-year EPA recertification process. In correspondence from EPA to DOE (letter dated November 7, 2002, from Mr. Marcinowski to Dr. Triay, EPA Docket A-98-49, Category IIB-3, Item 41) the EPA states:

> "Throughout the operational phase of the WIPP, the DOE should present information in each recertification application showing progress with regard to testing and implementation of all PICs (markers, archived records, etc.)."

It is the DOE's intent to provide updated material regarding progress in implementing the PICs program in each recertification application. By its inclusion in each CRA, this information will be available for public review and comment.

Also in its letter of November 7, 2002, the EPA states the following:

> "The DOE is obligated to execute site markers as described in the CCA and subsequent DOE correspondence (February 7, 1997, letter from G. Dials to R. Trovato; Air Docket A-93-02, Item II-I-07). If the DOE determines that the original marker design (including location, number, materials, and configuration) should be altered or improved, the Department must notify the EPA and receive the Agency's approval before proceeding.
>
> Certain changes (such as different component materials or dimensions) may be possible without modifying the certification, as long as the design itself remains essentially the same. However, the introductory section of the proposal (page 2)

> states, ‘DOE plans to re-examine whether…all of the components of the permanent marker system proposed in the CCA are needed.’ Elimination of one or more components may require modification.”

Formal DOE notification to EPA of any proposals for significant changes to the PICs program is required by 40 CFR Section 194.4(b)(3) and will ensure that program decisions benefit from public input.

# 5.0 Quality Assurance

The work performed in implementing the PICs program shall be conducted in accordance with the requirements of the DOE *Quality Assurance Program Description* (QAPD) (DOE, 2003) and applicable implementing documents. The QAPD contains requirements applicable to all work, items, and activities conducted in support of the DOE-CBFO. Applicability of requirements for implementation of the PICs program will be determined using a graded approach. Organizations supporting the DOE are required to use the QAPD in the performance of work that is important to safety and waste isolation. The DOE PICs project management is responsible for ensuring that the applicable QAPD requirements are contractually imposed on subcontractors doing work in support of the PICs project.

In addition, in Chapter 9 of the CCA, Passive Institutional Controls Peer Review, DOE has committed to develop several QA procedures related to the PICs program. These procedures will ensure that correct documents get to the correct records centers.

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U.S. Environmental Protection Agency (EPA), 1996, *40 CFR Part 194 Criteria for the Certification and Recertification of the Waste Isolation Pilot Plant's Compliance with the 40 CFR Part 191 Disposal Regulations: Final Rule*, Federal Register, Vol. 61, No. 28, pp. 5224-5245, February 9, 1996, Washington, D.C.

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# Attachment 1: Regulatory Citations Related to PICs

# Regulatory Citations Related to PICs

Following are the full regulatory quotations pertaining to the PICs program. The quotations are provided in the same order as the associated text in the report.

## 40 CFR Parts 191 and 194 and the CAG

### 40 CFR Section 191.12

Passive institutional control means: (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.

### 40 CFR Section 191.14(c)

(c) Disposal sites shall be designated by the most permanent markers, records, and other passive institutional controls practicable to indicate the dangers of the wastes and their location.

### 40 CFR Section 194.43

(a) Any compliance application shall include detailed descriptions of the measures that 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 will be fabricated and emplaced to be as permanent as practicable;
2. Placement of records in the archives and land record systems of local, State, and Federal governments, and international archives that would likely be consulted by individuals in search of unexploited resources. Such records shall identify:
   (i) The location of the controlled area and the disposal system;
   (ii) The design of the disposal system;
   (iii) The nature and hazard of the waste;
   (iv) Geologic, geochemical, hydrologic, and other site data pertinent to the containment of waste in the disposal system, or the location of such information; and

(v) The results of tests, experiments, and other analyses relating to backfill of excavated areas, shaft sealing, waste interaction with the disposal system, and other tests, experiments, or analyses pertinent to the containment of waste in the disposal system, or the location of such information.

3. Other passive institutional controls practicable to indicate the dangers of the waste and its location.

(b) Any compliance application shall include the period of time passive institutional controls are expected to endure and be understood.

(c) The Administrator may allow the Department to assume passive institutional control credit, in the form of reduced likelihood of human intrusion, if the Department demonstrates in the compliance application that such credit is justified because the passive institutional controls are expected to endure and be understood by potential intruders for the time period approved by the Administrator. Such credit, or a smaller credit as determined by the Administrator, cannot be used for more than several hundred years and may decrease over time. In no case, however, shall passive institutional controls be assumed to eliminate the likelihood of human intrusion entirely.

**CAG Section 194.43**

**(a) Any compliance application shall include detailed descriptions of the measures that will be employed to preserve knowledge about the location, design, and contents of the disposal system.**

EPA expects any compliance application to include:

- detailed descriptions of passive controls; and
- locations of passive controls.

EPA expects any compliance application will describe how the Passive Institutional Controls (PICs) planned for implementation will describe the disposal system's:

- location;
- design; and
- contents.

**Such measures shall include:**

**(1) Identification of the controlled area by markers that have been designed, and will be fabricated and emplaced to be as permanent as practicable;**

EPA expects any compliance application to include:

- a time line for implementation/construction and emplacement of markers; and
- a description of the markers (e.g., size, materials, etc.).

**(2) Placement of records in the archives and land record systems of local, State, and Federal governments, and international archives that would likely be consulted by individuals in search of unexploited resources.**

EPA expects any compliance application to identify the:

- location of archives -- of local, State, and Federal governments (to include Native American governments as well) -- in which records will be placed;
- location of land record systems of local, State and Federal governments in which records will be placed;
- location of international archives in which records will be placed;
- time line for implementation and emplacement of records; and
- the practices employed by each archive and repository for maintaining records and making them accessible to the public.

**Such records shall identify:**

**(i) The location of the controlled area and the disposal system;**
**(ii) The design of the disposal system;**
**(iii) The nature and hazard of the waste;**
**(iv) Geologic, geochemical, hydrologic, and other site data pertinent to the containment of waste in the disposal system, or the location of such information; and**
**(v) The results of tests, experiments, and other analyses relating to backfill of excavated areas, shaft sealing, waste interaction with the disposal system, and other tests, experiments, or analyses pertinent to the containment of waste in the disposal system, or the location of such information.**

EPA expects any compliance application to describe how records will identify:

- the location of the controlled area and the disposal system;
- the design of the disposal system, as identified in accordance with 40 CFR Section 194.14(b);

- nature and hazard of the waste, as identified in accordance with 40 CFR Section 194.24(a);
- geologic data;
- geochemical data;
- hydrologic data;
- other site data;
- analyses relating to backfill of excavated areas;
- analyses relating to shaft sealing;
- analyses relating to waste interaction with the disposal system; and
- other tests, experiments, or analyses pertinent to the containment of waste in the disposal system.

EPA believes that such information could reasonably be identified in archives by incorporating relevant parts of compliance applications into records planned for archiving. DOE may choose simply to state the location of the information contained in 40 CFR Section 194.43(a)(2)(iv) and (v) above; however, EPA recommends that actual location(s) be easily accessible to future "individuals."

**(3) Other passive institutional controls practicable to indicate the dangers of the waste and its location.**

EPA expects any compliance application to identify and describe:

- other practicable passive controls proposed for use at the WIPP.

**(b) Any compliance application shall include the period of time passive institutional controls are expected to endure and be understood.**

EPA expects any compliance application to include:

- the period of time passive controls are expected to endure and be understood;
- the basis for estimating the time period; and
- any assumptions pertaining to the effectiveness of passive controls.

**(c) The Administrator may allow the Department to assume passive institutional control credit, in the form of reduced likelihood of human intrusion, if the Department demonstrates in the compliance application that such credit is justified because the passive institutional controls are expected to endure and be understood by potential intruders for the time period approved by the Administrator. Such credit, or a smaller credit as determined by the**

**Administrator, cannot be used for more than several hundred years and may decrease over time. In no case, however, shall passive institutional controls be assumed to eliminate the likelihood of human intrusion entirely.**

EPA may allow up to approximately 700 years of credit for passive institutional controls in performance assessments. If DOE proposes a credit, EPA expects that DOE's implementation plan for such controls will clearly articulate why credit is warranted for the proposed time frame. For example, if DOE assumes credit for as long as 700 years after disposal, the information provided in the compliance application relative to PICs is expected to support that assumption. Under no circumstance may passive controls be assumed to eliminate human intrusion entirely.

If DOE assumes credit for passive controls, EPA expects any compliance application to identify:

- the estimated effectiveness of passive controls over time, in terms of reducing the likelihood of potential human intrusion; for example, a graphic representation illustrating how credit will diminish over time;
- the methodology employed to estimate the effectiveness of passive controls; and
- justification for the proposed credit, based on how well the controls are expected to endure and be understood.

If any credit is assumed for passive controls, credit should begin at the time of disposal (i.e., when the shafts of the disposal system are backfilled and sealed), although some of the credit may not be needed in light of credit for active institutional controls.

EPA will make its determination regarding credit for passive controls based on the two aspects of PICs identified in 40 CFR Section 194.43(c): that they are expected to endure for the proposed period, and that they are expected to be understood by potential intruders for the proposed period. EPA expects that DOE's justification of the proposed credit will clearly address these two aspects. The first aspect, the period of time for which the markers "are expected to endure," is likely to require a deterministic analysis, based on scientific data, that takes into account assumptions like those outlined in The CAG for 40 CFR Section 194.43(a)(1).

The second aspect, the period of time for which the markers will "be understood by potential intruders," is likely to require qualitative analysis and discussion. EPA expects that DOE will establish a framework of assumptions for PICs that is a

prudent extrapolation of the future state assumptions established in 40 CFR Section 194.25. For example, 40 CFR Section 194.25 may allow DOE to assume, for the purpose of developing the performance assessment models, that particular governmental regulations will remain in force. Such an assumption would be inappropriate, however, in the justification of credit for PICs. Instead, DOE may choose to assume that while some form of governmental regulation exists, the exact form and content of any regulation cannot be identified with certainty. In other words, DOE may not a priori rely on the future states assumption in this context. Rather, DOE must demonstrate--based on the particular measures at issue and documented, reasoned justification--why any assumptions made in these circumstances are sound.

EPA believes that there are certain societal "common denominators," such as the existence of some form of government and some level of regulatory control over the exploration for and development of resources, that could be considered in the discussion of PICs. These common denominators are patterns of human behavior that may be detected throughout history and around the world. The degree to which the PICs implemented at the WIPP rely on common denominators will determine the degree to which the PICs are effective at being understood by potential intruders in the future. Other examples of common denominators (but by no means a comprehensive list) are: the ability of pictures to convey meaning, the curiosity of humans, the expectation that some people will avoid, ignore or be ignorant of governmental controls, the use of the written word to transmit information and concepts, and story-telling or the generational "passing down" of history.

Explicit application of future state assumptions to passive controls -- i.e., the assumption that all present-day societal and demographic factors will remain constant -- will not be considered by EPA to justify adequately the design of PICs or the estimation of credit.

**EPA's Certification of Compliance**

**p. 27356**

Condition 4 of the certification relates to passive institutional controls ("PICs"). The WIPP compliance criteria require DOE to use both records and physical markers to warn future societies about the location and contents of the disposal system, and thus to deter inadvertent intrusion into the WIPP. (40 CFR Section 194.43) In its application, DOE provided a design for a system of PICs, but stated that many aspects of the design would not be finalized for many years (even up to 100) after closure. The PICs actually

constructed and placed in the future must be consistent with the basis for EPA's certification decision. Therefore, Condition 4 of the certification requires DOE to submit a revised schedule showing that markers and other measures will be implemented as soon as possible after closure of the WIPP. The DOE also must provide additional documentation showing that it is feasible to construct markers and place records in archives as described in DOE's certification application. After closure of the WIPP, DOE will not be precluded from implementing additional PICs beyond those described in the application. (See the preamble discussion of 40 CFR Section 194.43 for more information on PICs).

**p.27396**

3. Passive Institutional Controls (40 CFR Section 194.43)

The compliance criteria at 40 CFR Section 194.43 require a description of passive institutional controls ("PICs") that will be implemented at the WIPP. The EPA defined PICs in the disposal regulations as markers, public records and archives, government ownership of and restrictions on land use at the site, and any other means of preserving knowledge of a site. (40 CFR Section 191.12) PICs are intended to deter unintentional intrusions into a disposal system by people who otherwise might not be aware of the presence of radioactive waste at the site.

Section 194.43 requires DOE to: (1) identify the controlled area with markers designed, fabricated, and emplaced to be as permanent as practicable; (2) place records in local State, Federal, and international archives and land record systems likely to be consulted by individuals in search of resources; and (3) employ other PICs intended to indicate the location and dangers of the waste. In accordance with 40 CFR Section 194.43(b), DOE also must indicate the period of time that PICs are expected to endure and be understood by potential intruders. Finally, DOE is permitted to propose a credit for PICs in the PA, as explained in 40 CFR Section 194.43(c). This credit must be based on the proposed effectiveness of PICs over time, and would take the form of reduced likelihood in the PA of human intrusion over several hundred years. The compliance criteria prohibit DOE from assuming that PICs could entirely eliminate the likelihood of future human intrusion into the WIPP.

The EPA proposed that DOE complied with 40 CFR Section 194.43(a) and (b) because the measures proposed in the CCA are comprehensive, practicable, and likely to endure and be understood for long periods of time. The EPA also proposed a condition that DOE submit additional information concerning the schedule for completing PICS, the fabrication of granite markers, and commitments by various recipients to accept WIPP records. (62 FR 58827-29) The EPA did not receive any comments disputing this decision, and so finds DOE in compliance with 40 CFR Section 194.43(a) and (b).

However, DOE must fulfill Condition 4 of Appendix A to 40 CFR Part 194 no later than the final recertification application. For further information on EPA's evaluation of compliance with 40 CFR Section 194.43, see CARD 43. (Docket A-93-02, Item V-B-2)

Some commenters expressed the concern that PICs in general, and DOE's plan in particular, would not be sufficient to prevent drilling or other intrusions into the WIPP over 1 0,000 years. The EPA has never asserted that PICs, as an assurance measure, could or must be sufficient to prevent human intrusion into a site entirely or for a specified period (such as 10,000 years). In fact, the WIPP compliance criteria prohibit DOE from assuming that PICs can completely eliminate the likelihood of human intrusion. (40 CFR Section 194.43(c)) DOE's design incorporates features that will serve to promote the endurance and comprehensibility of PICs over time, such as: redundant markers, highly durable materials with low intrinsic value, messages in multiple languages, and record storage in multiple locations. Also, the CCA clearly discusses the manner in which DOE accounted in the design for possible, realistic failures. The Agency believes that the existence of site-specific markers and records, designed to be durable over long periods of time, will greatly improve the chances that future generations will retain knowledge of the hazard posed by waste stored at the WIPP.

The EPA proposed to deny DOE's request under 40 CFR Section 194.43(c) that the likelihood of human intrusion into the WIPP during the first 700 years after closure be reduced by 99 percent based on the anticipated effectiveness of PICs. The EPA denied the credit because DOE did not use an expert judgment elicitation to derive the credit, as explicitly envisioned by the Agency. The EPA expected that an expert judgment elicitation that makes use of the best available information and expertise would be used to account for the considerable uncertainties associated with a prediction of the ability of PICs to prevent human intrusion hundreds of years into the future. Since the WIPP is located in an area of resource exploitation, the uncertainty was not sufficiently reflected in the near 100 percent credit proposed in the CCA. The Agency received comments both supporting and refuting this decision. Comments supporting EPA's proposed decision tended to reflect the position that any PICs credit would be too uncertain for use in the PA. In opposition to EPA's decision, comments stated that EPA drew improper conclusions about DOE's use of expert judgment and treatment of uncertainty. These comments requested that EPA reverse its denial of PICs credit, or at least consider future credit proposals, but did not identify why EPA's conclusions were incorrect other than to reiterate positions taken in the CCA that were explicitly assessed by EPA in the proposal. (62 FR 58828) Therefore, EPA sees no cause to reverse its decision to deny DOE’s request for PICs credit under 40 CFR Section 194.43(c). However, EPA’s final decision today applies only to the credit proposal in the CCA and should not be interpreted as a judgment on the use of PICs credit in performance assessments generally. In the future, DOE may present to EPA additional information derived from an expert elicitation of PICs credit. Any future PICs credit proposals will be considered in

the context of a modification rulemaking, and will be subject to public examination and comment.

# Attachment 2: DOE Commitments in the CCA and CRA Related to the PICs Program

# DOE Commitments in the CCA and CRA Related to the PICs Program

1. In some cases the particular commitment was derived from the EPA's WIPP Docket and not necessarily the CCA or CRA. If a commitment was derived from the EPA's WIPP docket, notation is provided under the CCA Location Column.

2. The various implementing programs and their corresponding codes for the commitments listed above are as follows:

Records Management - RM
Awareness Triggers - AT
Message Translation and Testing - MTT
Permanent Markers Testing - PMT
Permanent Markers Final Design and Construction - PMFDC
Commitments relevant to all PICs Programs – ALL

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 1. | Components of the passive controls system will be instituted at the site and at remote locations (see Appendix PIC).<br><br>The DOE will implement passive institutional controls that involve multiple types and multiple levels of passive controls to make human intrusion into the disposal site unlikely. To accomplish this, the DOE intends to use several types of monuments and markers, land ownership, and written notations in land records in numerous locations (see Section XVI of Appendix PIC). Written documentation will include information on the location, design, and disposal contents and hazards, as well as stipulations on allowable land uses. Components of the passive controls system will be instituted at the site and at remote locations (see Appendix PIC).<br><br>As technology advances, this design concept will be revisited over the operational lifetime of the WIPP. If the DOE believes the design can be enhanced, changes will be proposed during the recertification process for EPA approval. | 7.3 | 7.3 | ALL |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 2. | The DOE will provide the following to the EPA:<br><br>1. A schedule for implementing passive institutional controls that demonstrates markers will be fabricated and emplaced and other measures will be implemented as soon as possible following closure of the WIPP. The schedule will also describe how testing of any aspect of the conceptual design will be completed before or soon after closure and what changes to the design of passive institutional controls may be expected to result from such testing. | | 7.3.1 | PMT |
| 3. | The DOE will provide the following to the EPA:<br><br>2. Documentation showing that the granite pieces for the proposed monuments and information rooms described in Docket A-93-02, Item II-G-1, may be quarried (cut and removed from the ground) without cracking due to tensile stresses from handling or isostatic rebound; engraved on the scale required by the design; transported to the site, given the weight and dimensions of the granite pieces and the capacity of existing rail cars and rail lines; loaded, unloaded, and erected without cracking based on the capacity of available equipment; and successfully joined. | | 7.3.1 | PMT |
| 4. | The DOE will provide the following to the EPA:<br><br>4. Documentation showing that archives and record centers will accept the documents identified and maintain them in the manner identified in Docket A-93-02, Item II-G-1. | | 7.3.1 | RM |
| 5. | The DOE will provide the following to the EPA:<br><br>5. Documentation showing that proposed recipients of WIPP information other than archives and record centers will accept the information and make use of it in the manner indicated by the DOE in Docket A-93-02, Item II-G-1, and supplementary information. | | 7.3.1 | AT |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 6. | Permanent Markers Testing Program Plan, Waste Isolation Pilot Plant (DOE 2000) . This document presents DOE plans for the program to test conceptual designs and alternative permanent markers materials, physical configurations, and locations. The markers testing program will develop information useful in materials selection and in the development of final designs. Testing will help to determine the effectiveness and durability of selected and alternative materials and design configurations. | | 7.3.3 | PMT |
| 7. | The components of the passive institutional controls for the WIPP consist of (1) monuments that define the boundary of the withdrawal area, (2) markers at the footprint of the repository that consist of monuments that identify the outer boundary of the subsurface facility, a berm surrounding the repository footprint, an information center on the surface at the center of the repository footprint, a buried room halfway between the information center and the berm, a buried room halfway between the berm and the hot cell, and randomly spaced buried markers distributed across the repository footprint, (3) sets of records distributed to national and international archives, (4) sets of records distributed to records centers locally, nationally, and internationally (both those of a general nature and those specializing in land and resource use), (5) government control and land-use restrictions, and (6) other means of communication, such as encyclopedias, dictionaries, textbooks, and various maps and road atlases. | 7.3.3.1 | 7.3.3.1 | ALL |
| 8. | CCA Appendix PIC sets forth the permanent markers system for the WIPP facility. This system involves the use of surface monuments, small subsurface warning markers, buried rooms, and large earthen structures marking the WIPP repository footprint on the surface. | 7.3.3.1.1 | 7.3.3.1.1 | PMFDC |
| 9. | The berm design, including materials of construction, will be refined through the ongoing design-development process and finalized prior to its construction. Final design specifications will be provided to the EPA for approval prior to construction. | | 7.3.3.1.1 | PMT |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 10. | A significant part of the overall system will be the archiving of important information at sites remote to the repository. The archived material will include information that defines the location, design, content, and hazards associated with the WIPP. The amount of information will be more extensive than that available within the permanent marker system at the repository location. Information will be preserved using practicable materials and techniques at record centers and archives throughout the world. | 7.3.3.1.2 | 7.3.3.1.2 | RM |
| 11. | Prior to implementing the passive institutional controls, a testing program will determine whether the specific messages proposed can be expected to convey the intended warnings and information across cultures and whether the proposed media for transmitting the messages will endure to the degree anticipated in the development of the conceptual model. The testing to be conducted will address the refinement of the messages, diagrams, and the method of presentation. The testing programs are described in Appendix PIC. | 7.3.3.2 | 7.3.3.2 | MTT |
| 12. | DOE has prepared a tentative schedule of the implementation of the passive controls program. The schedule is shown in Figure 7-16. The following is provided as a brief expansion of the timelines provided in Figure 7-16.<br><br>1996-2083 Design and Test Permanent Marker Concepts and Materials. During this period the testing and monitoring described in CCA Appendix PIC related to the permanent marker components, materials, and communication concepts are conducted. | 7.3.3.3 | 7.3.3.3 | ALL |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 13. | DOE has prepared a tentative schedule of the implementation of the passive controls program. The schedule is shown in Figure 7-16. The following is provided as a brief expansion of the timelines provided in Figure 7-16<br><br>2004 Establish Filing System. The DOE will establish the filing system under which the record center and archival information will be assembled. Completion of the system by 2004 will support the information collection program. | 7.3.3.3 | 7.3.3.3 | RM |
| 14. | DOE has prepared a tentative schedule of the implementation of the passive controls program. The schedule is shown in Figure 7-16. The following is provided as a brief expansion of the timelines provided in Figure 7-16.<br><br>2033 - 2090 Collect Active Control Period Information and Marker Configuration. Collect the information relative to WIPP active controls and the results of testing of the permanent marker system components and communication concepts. | 7.3.3.3 | 7.3.3.3 | RM |
| 15. | DOE has prepared a tentative schedule of the implementation of the passive controls program. The schedule is shown in Figure 7-16. The following is provided as a brief expansion of the timelines provided in Figure 7-16.<br><br>2023 - 2033 Establish Agreements and Submit Information to Publishers. During this period, the DOE will establish agreements with map makers and text publishers including financial support and provide hazard, history, and location information to be included on maps and various text materials. | 7.3.3.3 | 7.3.3.3 | AT |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 16. | DOE has prepared a tentative schedule of the implementation of the passive controls program. The schedule is shown in Figure 7-16. The following is provided as a brief expansion of the timelines provided in Figure 7-16.<br><br>2083 - 2093 Finalize Archival Information. During this period, the DOE will develop the final additions to the planned submittal, which include information describing the WIPP history during the first 50 to 60 years following closure and the final configuration of the permanent marker system. | 7.3.3.3 | 7.3.3.3 | RM |
| 17. | DOE has prepared a tentative schedule of the implementation of the passive controls program. The schedule is shown in Figure 7-16. The following is provided as a brief expansion of the timelines provided in Figure 7-16.<br><br>2093 Promulgate Archival & Records Center Information. The DOE will make the distribution of the final portion of the archived information nationally and internationally. | 7.3.3.3 | 7.3.3.3 | RM |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 18. | Without assumptions about technological sophistication, messages will be provided in various levels of complexity, ranging from the most basic marker of human construction rather than a natural phenomenon, to the entire written record of information about the repository and its certification. Because it is not known what languages will be spoken in the future, the markers will include non-linguistic means of communication, such as pictures of humans, star charts, and the periodic table of the elements. In this way, the design of the markers responds to the EPA's requirement for the most permanent markers, records, and other passive institutional controls practicable to indicate the dangers of the wastes and their location.<br><br>Although the Markers Panel considered only the messages on the markers, the same information, both text and pictographs, will be included in the records in records centers and archives. | 7.3.4.1 | 7.3.4.1 | MTT<br>RM |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 19. | The DOE will remove the surface facilities and return the land disturbed by the WIPP activities to a stable ecological state that will assimilate with the surrounding undisturbed ecosystem. However, the ability to return the land to the pre-WIPP condition will be impacted by the following conditions:<br>• As part of the permanent marker system, the hot cell concrete structure, protected by a chain link fence, will remain as an artifact marking the WIPP site. The hot cell is a reinforced concrete structure measuring approximately 71 feet by 40 feet with 4.5-foot thick walls (21.6 meters by 12 meters with walls 1.4 meter thick). The hot cell foundation extends approximately 28 feet (8.5 meters) below grade and the roof is 61 feet (18.6 meters) above grade.<br>• The test program supporting the permanent marker system will require the construction of a berm section, the erection of test monuments, and the emplacement of test markers, all of which impact the ability to return the land disturbed by the WIPP activities to a stable ecological state that will assimilate with the surrounding undisturbed ecosystem.<br>• A posted access barrier will be erected around the repository footprint, also affecting the return of the land disturbed by the WIPP activities to a stable ecological state.<br>• Elevation benchmarks to support the long-term monitoring program will be located within a grid network on the surface of the withdrawal area.<br>• A portion of the mined salt sufficient to support future construction of the berm component of the permanent marker system (see Appendix PIC) will remain on the surface.<br>• The water supply line to the site will be disconnected. At a future time, a water supply may have to be reestablished to support construction of the permanent marker system. This supply will also be disconnected when construction of the marker system is complete.<br>• The electrical supply to the site will be removed and isolated at the utility company's substation. Electricity will be required for the future construction of the permanent marker system. | Appendix AIC, Forward | Appendix unchanged for CRA | PMT<br>PMFDC |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 20. | Over the several decades following site restoration, activities supporting the long-term monitoring program and evaluation of the performance of the permanent marker system test program will require occasional access to the site surface area. Construction of the permanent marker system will be a significant effort that will again require the development of water, electrical, and transportation facilities at the site. Both railroad and trucking will be used to transport required materials to the site. This effort is scheduled to last several years. | Appendix AIC, Forward | Appendix unchanged for CRA | PMT PMFDC |
| 21. | Upon completion of the permanent marker system, the access control program for the site will be reevaluated and modified as required to address any changes necessitated by the effects of the permanent marker system. At the time that the permanent marker system construction effort is completed, the utilities and railroad spur supporting the site will be removed and the affected terrain returned to a stable ecological state that will assimilate with the surrounding undisturbed ecosystem. | Appendix AIC, Forward | Appendix unchanged for CRA | PMFDC |
| 22. | To optimize the final design of the permanent marker system, testing of various materials and berm configurations over a long period of time is a prudent and logical course of action. The detailed activities supporting the testing required to evaluate various aspects of the planned permanent marker system design will be included in the schedule managed during the active institutional controls period. Periodic reports will also be managed by the scheduling activity during the active controls period. | Appendix AIC. Sec. 3.0 | Appendix unchanged for CRA | PMT |
| 23. | The post-decommissioning phase will include the implementation of active and passive institutional controls. | Appendix D&D, Sec. 1.2.1 | Appendix unchanged for CRA | ALL |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 24. | Electrical power, telephone lines, water, railroad spurs, and roads will be removed, as required (electrical power, RR spurs and roads should remain to the degree necessary to support future construction of the Permanent Marker System and Permanent Marker testing). | Appendix D&D, Sec. 1.5.1 | Appendix unchanged for CRA | PMFDC |
| 25. | A copy of records of waste disposal locations and quantities specified under 40 CFR Section '264.73(b)(2) will be submitted to the regional administrator and local land authority within 60 days of closure of the facility. | Appendix D&D, Sec. 1.10 | Appendix unchanged for CRA | RM |
| 26. | The distribution of documents to archives, record centers, and other organizations for the preservation of knowledge of the WIPP, its location, the design of the disposal system, and the nature and hazard of the waste associated with intrusion can begin during the decontamination and decommissioning phases. At that stage of disposal operations, the total inventory of the waste stored at the site will be known and documented. The distribution of the volume of information intended for archives and record centers and the translation into the several official languages of the United Nations of a summary of the WIPP design, location, waste identification, and hazards associated with any intrusion activity will take several years. | Appendix PIC, Sec. I.A | Appendix unchanged for CRA | RM<br>AT<br>MTT |
| 27. | PIC will include a permanent marker system comprised of a large earthen structure marking the WIPP repository footprint on the surface, various messages, surface monument markers, small sub-surface warning markers, on-site rooms for long-term storage of messages, archival storage of WIPP information off-site, and distribution of information to record centers and other entities for the preservation of knowledge of the WIPP. | Appendix PIC, Sec. I.B | Appendix unchanged for CRA | ALL |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 28. | All three earthwork configurations would be constructed in a similar manner as described later in this report. The testing effort is for the purpose of better understanding the long-term chemical stability and weathering resistance characteristics of various materials and message configurations. The resulting information will then be used for the final design of the permanent marker system prior to its construction after closure of the facility. | Appendix PIC, Sec. I.B | Appendix unchanged for CRA | PMT<br>MTT |
| 29. | In all three configurations monuments are placed around the repository footprint perimeter and the controlled area perimeter. The monuments are all of the same design. They consist of two separate stone monoliths joined by a 1.5M (5 feet) long tendon. As an erected structure, each monument consists of a buried truncated pyramid base 6.7M (22 feet) high including the tendon and a 7.6M (25 feet) high right prism 1.2M (4 feet) square mounted over the tendon. Each monument has a warning message engraved in seven languages. The messages on the controlled area perimeter monuments are different than those on the repository perimeter. See Section V for monument details. | Appendix PIC, Sec. I.B | Appendix unchanged for CRA | PMFDC<br>MTT |
| 30. | The Storage Rooms buried in the berm and in the controlled area outside the berm perimeter contain a detailed Level IV message (see Appendix 2 for message details) in seven languages. The overall room measurements are 11.9M X 6.7M X 4.9M (39 ft. X 22 ft. X 16 ft.). The rooms are constructed from granite slabs fitted into cut slots. This technique should avoid the need for using grouts and metal attachments. | Appendix PIC, Sec. I.B | Appendix unchanged for CRA | PMFDC |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 31. | The Information Center design is consistent for each berm configuration. The Information Center will be located at the geometric center of the repository footprint. The overall dimensions of the structure are 12.2M X 9.8M X 3M (40 ft. X 32 ft. X 10 ft.). The Level IV message in seven languages will be engraved on the granite walls of the Center. The Center will be of open construction to permit observation of its contents using natural light. The walls will be supported by burying them in 1.5M (5 feet) of compacted caliche. The location site will be graded for drainage away from the Information Center. | Appendix PIC, Sec. I.B | Appendix unchanged for CRA | PMFDC |
| 32. | Small markers made of three different materials (see Section V for details) will be buried throughout the repository footprint. Each marker will have a warning message in one of the seven languages used on the monuments, Storage Rooms, and Information Center. The markers will be buried at random intervals over a range of 0.6M-1.8M (2-6 ft.) below the surface. Spacing will also be random. It is intended that some of the buried markers would be unearthed and serve as a warning to any individuals attempting to exploit resources via drilling and/or mining activities prior to their actually intruding into the repository. | Appendix PIC, Sec. I.B | Appendix unchanged for CRA | PMFDC |
| 33. | The testing described in Section IX will include the development of data regarding the long-term durability of construction materials intended to be used in the Permanent Marker System. It is anticipated that this testing program will initiate during the disposal phase and continue on beyond decommissioning into the Active Controls phase. During the Active Controls phase periodic evaluation of test structures will be conducted. Actual construction of the Permanent Marker System will be delayed for some decades after decommissioning to provide sufficient time to effectively evaluate the long-term durability of the various construction materials and the effects of weathering on monument markers and a section of berm. | Appendix PIC, Sec. I.C | Appendix unchanged for CRA | PMT |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 34. | During the decontamination and decommissioning phase, the DOE will assemble descriptive material to be archived, assemble descriptive material to be provided to record centers, develop the WIPP descriptive summary document, and develop the indexing system to be used by archive locations in their storing of the WIPP material. In addition during this period, the DOE will establish agreements with the proposed archival and record center locations identified in Sections XIV and XV to ensure that the planned locations are willing to accept the information to be promulgated. Distribution of these materials will be accomplished during the Active Controls phase of the WIPP project. | Appendix PIC, Sec. I.C | Appendix unchanged for CRA | RM |
| 35. | It is planned as part of this conceptual design that the concrete Hot Cell will remain as an archeological monument after decommissioning the WIPP site. | Appendix PIC, Sec. II | Appendix unchanged for CRA | PMFDC |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 36. | Drawing on information found in the table and a review of the individual team reports documented in Trauth et. al., 1993, the following principles were applied to guiding the conceptual permanent marker design:<br>• The site is marked<br>• Message(s) are truthful and informative<br>• Multiple components exist within a marker system<br>• Multiple means of communication (e.g., language, pictographs, scientific diagrams) are provided<br>• Multiple messages with differing levels of complexity between messages are inscribed on individual marker system elements<br>• Materials with little recycle value are used<br>• Compliance with international standards of marking locations and contents of nuclear waste repositories.<br>All but the last of these principles have been followed to the extent practicable in this concept design document. The last principle, while laudatory is not achievable at this point in time. No international standards exist. If, in the future, standards are developed and adopted by the United States, they will be evaluated for incorporation as appropriate in preparing the final permanent marker design. | Appendix PIC, Sec. II | Appendix unchanged for CRA | PMFDC |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 37. | Five levels of messages will be used in the Permanent Marker System as recommended in Trauth et. al., 1993.<br>• Message level I conveys the information that the site is manmade. The message itself is in the physical form of the marker system and the effort expended in constructing it.<br>• Message level II conveys the cautionary information that something manmade is here and it is dangerous. That the dangerous material is buried is conveyed in the cautionary prohibition against digging or drilling. This message is carried in seven languages uniformly distributed among the subsurface warning markers. Each marker has the message in a single language. The level II message is also engraved on each footprint perimeter monument in seven languages. The controlled area boundary markers caution against drilling or mining within the controlled area.<br>• Message level III conveys basic information that tells what, why, when, where, who, and how. This message is engraved on the footprint perimeter monument markers.<br>• Message level IV conveys complex information in seven languages. The message is a highly detailed written record of the WIPP repository and includes tables, figures, maps, and diagrams. This message is contained in the Information Center, in the room buried within the berm, and in the room buried within the controlled area outside the repository footprint.<br>• Message level V is archival and stores a complete rulemaking record. It is more detailed and voluminous than the messages provided at the WIPP site. This record is not stored at the site but shall be located in various archives at the state, federal, and international levels. A less detailed version of this record addressing location, design, hazards, test/experiment results, and pertinent site data will be located in record centers at the local, state, and federal level. | Appendix PIC, Sec. IV | Appendix unchanged for CRA | PMFDC<br>PMT<br>MTT |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 38. | During the final design phase, the messages will be translated into the other six languages. Testing of the messages' ability to convey their intent to inform the public about the danger of intruding into the repository will be tested among populations indigenous to the language's locale. | Appendix PIC, Sec. IV | Appendix unchanged for CRA | MTT |
| 39. | Monument markers are those elements of the marker system consisting of large monoliths (Kaplan, 1982) on the surface and small warning markers buried throughout the repository footprint. The material of choice for the monuments is granite. Trauth et. al., 1993 suggests basalt or granite. In a discussion with a number of commercial rock quarries (e.g. Rock of Ages, Bear VT: Harmony Blue Granite, Elberton, GA; and Cool Springs Granite Co., Marble Falls, TX) no source of large basalt monoliths were identified. To facilitate fabrication and shipping of the monuments, each monument will consist of two separate stones connected by a tendon joint. The large monuments erected around the perimeter of the repository footprint will be engraved with level II and III messages. The large monuments erected around the perimeter of the controlled area (area defined by the LWA) will be engraved with the message in Appendix 3. | Appendix PIC, Sec. Appendix PIC, Sec. | Appendix unchanged for CRA | PMT PMFDC |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
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| 40. | Figures V-1 and V-2 provide the dimensional characteristics of the large monuments. The conceptual configuration represents a simple design for ease of fabrication. Quarries contacted regarding the feasibility of producing large monoliths stated that fabrication of stone with flat surfaces was significantly simpler to quarry than those with curved surfaces. The wastage of material (and thus cost) is also significantly less for flat surface stones. Thus the choice was made to produce a foundation monolith in the shape of a truncated pyramid and a surface monolith as a regular four sided prism. Trauth et. al., 1993 suggests protecting the message carrying monuments from the effects of wind and sand with another structure. In that the monuments are inscribed on all surfaces and are in close proximity to the berm which will provide some protection, the additional protective structures were not included in the conceptual design. | Appendix PIC, Sec. V | Appendix unchanged for CRA | PMT PMFDC |
| 41. | Each of the repository footprint monuments will be inscribed with the level II and III messages in seven languages, the six official United Nations languages (English, French, Spanish, Chinese, Russian, and Arabic) and Navajo. Trauth et. al., 1993 discusses in some detail the selection of these languages by the MP. In addition, each footprint monument will be inscribed with a diagram (Figures IV-3 and IV-4) depicting two concepts. The first concept is comprised of four frames illustrating the danger of digging or drilling into the repository and releasing the radioactive and toxic waste. The second concept illustrates the decay of the radioactive material (decreasing size of the trefoil and improving disposition of the icon) over many thousands of years by depicting the precession of the earth's north pole through the major constellations (Ursa Minor, Ursa Major, Draco, and Cygnus) and the bright star, Vega. | Appendix PIC, Sec. V | Appendix unchanged for CRA | MTT |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 42. | The controlled area monuments will be engraved with the Appendix 3 message also in seven languages. In addition the controlled area monuments will have inscribed the Figures IV-8 and V-4. Figure IV-8 will assist in establishing the date of the site as described above. Figure V-4 will provide an overall perspective of the location of the repository footprint to the controlled area perimeter defined by the controlled area monuments. | Appendix PIC, Sec. V | Appendix unchanged for CRA | MTT |
| 43. | One of the MP recommendations with respect to the monument placement is for both above ground and below ground inscriptions. Trauth et. al., 1993 prescribes that at least one copy of the level II and III messages should be inscribed at a height well above a position "accessible to a standing person, or a person on horseback or standing on top of common farm equipment (wagons, pickup trucks, tractors)." To meet the intent of this restriction, individual monuments will have the messages inscribed in the top 1.8M-2.4M (6-8 feet) on all four sides. | Appendix PIC, Sec. V | Appendix unchanged for CRA | PMFDC |
| 44. | On both the footprint perimeter and controlled area perimeter monuments, three translations and one illustration are inscribed above ground. Four translations are inscribed on the buried portion of the monuments in the area of 1.5M-3.6M (5-12 feet) above the base. Placement of the messages in these areas also provides ample surface area for future generations to inscribe messages in their respective languages. Individual translations will be varied in their locations among all of the monuments so that copies of all translations will be located both above ground and below ground. | Appendix PIC, Sec. V | Appendix unchanged for CRA | MTT |
| 45. | The monuments will be quarried from granite and shipped by rail to the WIPP site. Monument locations will be excavated to at least 1.5M (5 feet) into the caliche. After emplacing the base monument, the upper monument will be placed over the base tendon and the excavation will be backfilled. | Appendix PIC, Sec. V | Appendix unchanged for CRA | PMFDC |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 46. | As suggested by Team A in Trauth et. al., 1993 small warning markers are buried throughout the repository footprint. The small warning marker is shown in Figure V-3. The Level II message placed on the small subsurface warning markers will also be in the seven languages described above. However, each marker will have the message in only one of the seven languages. Warning markers will be placed throughout the repository footprint, within the berm, and in the shaft sealing system. The Level II message is shown in Figure IV-1. The warning markers will be made of granite, aluminum oxide, and fired clay to provide a diversity of materials and thus improve the likelihood that at least some materials will endure for a 10,000 year period. | Appendix PIC, Sec. V | Appendix unchanged for CRA | PMT PMFDC |
| 47. | Spacing between warning markers should be random with a range of approximately 4.5M (15 feet) to 12.2M (40 feet). The warning markers should be buried 0.6M-1.8M (2-6 feet) below the surface but above the caliche. | Appendix PIC, Sec. V | Appendix unchanged for CRA | PMFDC |
| 48. | The planned buried Storage Rooms differ from those recommended by Trauth et. al., 1993 in that they will be constructed of granite. | Appendix PIC, Sec. VI | Appendix unchanged for CRA | PMFDC |
| 49. | The storage room for containing the Level IV message and associated diagrams is designed to endure for the 10,000 year period of regulatory concern. | Appendix PIC, Sec. VI | Appendix unchanged for CRA | PMFDC |
| 50. | As designed, individual walls, the floor, and the roof are comprised of single granite slabs joined only at the perimeter locations. The internal walls are each made of three sections to provide redundancy of the information as suggested in Trauth et. al., 1993. | Appendix PIC, Sec. VI | Appendix unchanged for CRA | PMFDC |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
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| 51. | The basic principle of joining the various sections of the Storage Rooms is the use of slotted joints. An examination of Figures VI-2 through VI-4 will show that the base slab, the roof slab, and the outside wall slabs are slotted. The internal walls containing the Level IV messages are fitted into the slots in the base slab, the roof slab, and one outside wall. An individual inside wall is a "sandwich" comprised of three walls. The sandwich is held in place by the slots into which they are fitted. Once erected, the room excavation will be backfilled providing additional stability for the room. | Appendix PIC, Sec. VI | Appendix unchanged for CRA | PMFDC |
| 52. | In each of the conceptual design configurations described later in this report, at least one room is buried. In addition, an Information Center will be located on the surface providing access to the same information contained in the buried rooms. | Appendix PIC, Sec. VI | Appendix unchanged for CRA | PMFDC |
| 53. | Within the Information Center and in the Level III message on the monuments will be details regarding the location of the buried Storage Room containing identical information. Location information of the both the Storage Room buried in the controlled area outside the berm perimeter and the Storage Room buried within the berm will be available in the documents archived off-site. | Appendix PIC, Sec. VI | Appendix unchanged for CRA | RM<br>MTT |
| 54. | The buried storage room is located 6M (20 feet) below the surface 160M (525 feet) north of the berm on a line passing through the information center, the center of the northern and southern sections of the berm, and the hot cell concrete artifact standing approximately 320M (1050 feet) north of the berm centerline. | Appendix PIC, Sec. VI | Appendix unchanged for CRA | PMFDC |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 55. | The overall room dimensions are approximately 11.9M long by 6.7M wide by 4.9M high (39 feet by 22 feet by 16 feet). The message texts in Appendix 2 are engraved on the walls in the arrangement similar to that for the Information Center shown in Figure VII-1. In addition the diagrams are arranged on the walls of the rooms similar to that shown in Figure VII-1 for the Information Center and as depicted in Figure VI-4 for the buried rooms. | Appendix PIC, Sec. VI | Appendix unchanged for CRA | PMFDC |
| 56. | To provide redundancy, additional granite slabs engraved with the message text and the diagrams are held in place against the interior walls. The room entrance is a single plug in one wall measuring 0.6M (2 feet) at the inner minimum diameter. The tapered plug weighs approximately 1600 pounds. | Appendix PIC, Sec. VI | Appendix unchanged for CRA | PMFDC |
| 57. | A second storage room will be buried within the berm. It will be located at the center of the southern berm section. The room will be erected at grade level and the berm will be built over it. The presence of this room will not be identified in any of the messages available at the site. However, its presence will be described in the archived information. | Appendix PIC, Sec. VI | Appendix unchanged for CRA | PMFDC |
| 58. | An isometric drawing of the Information Center shown in Figure VII-1 illustrates an above ground structure which contains the same information provided in the buried storage rooms. | Appendix PIC, Sec. VII | Appendix unchanged for CRA | PMFDC |
| 59. | Construction of the Information Center is comprised of solid granite walls embedded 1.5M (5 feet) into compacted caliche for support. Engraved on the walls is the Level IV message in seven languages and the graphics information provided in the storage rooms buried underground. Figure VII-2 provides the dimensional characteristics of the Information Center exterior and interior walls. | Appendix PIC, Sec. VII | Appendix unchanged for CRA | PMFDC |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
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| 60. | In addition to the Level IV message and its associated diagrams, the Information Center will also contain a message regarding the location of the controlled area buried Storage Room. Appendix 4 illustrates the proposed message. The message provides information for locating the room both in relation to the Information Center/berm and by magnetic signature. | Appendix PIC, Sec. VII | Appendix unchanged for CRA | PMFDC MTT |
| 61. | Figure VIII-1 depicts the general cross-sectional berm construction configuration. The core base material to be used is salt remaining from the excavation of the repository. | Appendix PIC, Sec. VII | Appendix unchanged for CRA | PMFDC PMT |
| 62. | A practical and locally available protective covering for the salt core is the caliche soil found locally up to 15 feet below the surface. | Appendix PIC, Sec. VII | Appendix unchanged for CRA | PMFDC PMT |
| 63. | A third layer of berm material will be comprised of riprap quarried near Carlsbad, NM. | Appendix PIC, Sec. VII | Appendix unchanged for CRA | PMFDC PMT |
| 64. | In that the berm configuration totally encloses the repository footprint, see Figure VIII-2, some means needs to be provided to mitigate the possibility of significant ponding occurring during heavy rainfall. To provide for drainage to outside the berm enclosed area, drainage paths through the berm will be provided at approximately 100M (328 feet) intervals. These drainage paths will consist of riprap filled trenches 3M (10 feet) deep and 2M (6.5 feet) wide through the berm base below the surface. | Appendix PIC, Sec. VII | Appendix unchanged for CRA | PMFDC PMT |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
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| 65. | To provide a distinctive magnetic signature for the berm, large permanent magnets buried in the berm can be used, Mallick 1994 and Krefta 1994. Large strontium ferrite permanent magnets buried within the berm at intervals of 75-100 meters would give a signal detectable with current state of the art airborne equipment 100 meters above the magnets. The individual magnets would be approximately 1 meter in length and 1/2 meter by 1/2 meter in cross-section. Should future climatic conditions cause sand shifts so extensive that the berm and monuments become covered (not expected), future generations conducting magnetic surveys of the area should still be able to detect a magnetic anomaly resulting from the permanent magnets. The magnetic signal's geometric form will provide strong indication that it could only have been man made. This should inspire any organization capable of magnetic surveying to investigate this anomaly further prior to initiating any planned drilling activities in the local area enclosed by the magnetic signature. | Appendix PIC, Sec. VII | Appendix unchanged for CRA | PMFDC PMT |
| 66. | To provide a unique radar signature, the trihedrals will be grouped in sets of four spaced approximately every 91M (300 feet) around in the berm as shown in Figure VIII-2. In addition, four trihedrals will be placed around controlled area buried room to provide a unique radar signature at the room location. One trihedral will be placed adjacent to each room exterior wall approximately midway along the wall. During the testing period conducted throughout the disposal phase and for some period after decommissioning, buried bare stainless steel trihedrals, trihedrals encased in concrete, and inconel trihedrals should be evaluated for performance of their respective RCS and corrosion resistance. Encasing the trihedral in concrete reduces the likelihood of its being efficiently salvaged and also may add to the effective lifetime of the trihedral by the protective concrete covering. | Appendix PIC, Sec. VII | Appendix unchanged for CRA | PMFDC PMT |
| 67. | The berm Storage Room will be buried midway in the southern portion of the berm opposite the Information Center. | Appendix PIC, Sec. VII | Appendix unchanged for CRA | PMFDC |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
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| 68. | However, it is DOE intent to complete implementation of PIC including the construction of the permanent marker system by the end of 100 years after closure of the site. In that the design of the permanent marker system has a long lifetime goal, it is prudent that the DOE conduct some long range testing of the construction materials planned for use as permanent marker material. | Appendix PIC, Sec. VII | Appendix unchanged for CRA | PMFDC |
| 69. | During the testing program, a portion of the test berm configuration can be used to monitor the performance of salt consolidation under the influence of the weather and testing can be conducted to validate the information gained during the 1985-1994 period. | Appendix PIC, Sec. VIII | Appendix unchanged for CRA | PMT |
| 70. | One aspect of the long-term testing is the construction of a section of the berm. The overall size (height and width) of the test section of the berm will match the design of the permanent marker berm. However, the test berm length will be shorter than the full size berm. A section approximately 50 to 100 meters will provide a length sufficient to test a number of different configurations. | Appendix PIC, Sec. IX | Appendix unchanged for CRA | PMT |
| 71. | Actual construction and testing will initiate during the Disposal Phase to provide a maximal time for testing. | Appendix PIC, Sec. IX | Appendix unchanged for CRA | PMT |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
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| 72. | The major subjects which may be evaluated during this testing program are:<br>• Salt consolidation under the influence of the weather and/or implementation of artificial consolidation activity<br>• The system for unloading and moving large quantities of material from the railroad spur to the permanent marker site<br>• Performance of the railroad spur and maintenance required. This may impact a decision of whether to conduct periodic maintenance of the spur or refurbish it at the time of initiating construction of the permanent marker system<br>• Survey representative monuments within a 150 mile radius of the WIPP to more extensively evaluate the climatic environmental affects on granite<br>• Identification of a suitable local source of caliche and establishing the required contractual and regulatory agreements to obtain and move the caliche in the quantities required<br>• Identification of a suitable local source of riprap and establishing the required contractual and regulatory agreements to obtain and move the riprap in the quantities required<br>• Construction techniques applicable to a large berm. Determine what, if any, configuration changes may have significant impacts on the cost of construction<br>• Evaluate various berm surface materials (e.g., size of rocks, types of soil, types of vegetation) for durability and success in supporting vegetation overgrowth | Appendix PIC, Sec. IX | Appendix unchanged for CRA | PMT<br>PMFDC |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 72. (continued) | • Procure, ship, and erect various type granites for the monument rock and evaluate long-term environmental effects (e.g., wind, rain, and blowing sand). This will provide experience to be applied for contractual specifications developed for procurement and erection of multiple monuments. In addition concrete should be emplaced underground and tested for durability as a substitute for the granite in construction of some parts of the Storage Rooms proposed above (e.g., the floor and roofing slabs which will not be engraved)<br>• Evaluate the magnetic signature, durability, and stability of sample permanent magnets (e.g., strontium ferrite, samarium cobalt, and alnico) buried within the berm to determine optimum locations and spacing<br>• Evaluate the effects of various soils and salt used as protective backfill for granite<br>• Evaluate the effects of chemical interaction with the backfill material<br>• Evaluate the effects of plant root and burrowing animal intrusion into the berm and potential for salt dissolution and berm slumping<br>• Evaluate the effectiveness of sample radar reflectors buried within the berm at various distances. Evaluations should include reflectors directly buried in the berm and buried reflectors encased in concrete. | Appendix PIC, Sec. IX | Appendix unchanged for CRA | PMT PMFDC |
| 73. | Other testing to be conducted should address the refinement of the messages, diagrams, and the method of presentation. | Appendix PIC, Sec. IX | Appendix unchanged for CRA | MTT |
| 74. | As recommended in Trauth et. al., 1993, the translated versions of the message text should be evaluated by presentations to groups indigenous to the countries whose language is represented in the message. | Appendix PIC, Sec. IX | Appendix unchanged for CRA | MTT |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 75. | Testing also should be conducted on the various materials used for the warning markers buried near the surface. Warning markers made of aluminum oxide, granite, fired clay, glass (specifically lanthanumborate made by Corning, Trauth 1993), and polyethylene should be fabricated and buried at depths of 0.3M-3M (1-10 feet) below the surface. | Appendix PIC, Sec. IX | Appendix unchanged for CRA | PMT |
| 76. | To provide for a more accurate assessment of the environmental effects on granite at the WIPP site, granite monuments made from materials from multiple quarries within the U.S. will be engraved and emplaced at the WIPP site during the disposal phase. Over a period of decades, data will be taken to better judge the affect of weathering on both the granite material and the lettering. The data will be developed for both the buried and above ground surfaces. These data will then be used in developing the final design specifications for the monolithic monuments emplaced as permanent markers. Similar testing should be conducted on sample basalt and sandstone monument material. | Appendix PIC, Sec. IX | Appendix unchanged for CRA | PMT |
| 77. | A variety of permanent magnet materials and protective coating for the magnets should be buried at the bottom of the berm. In addition, this permanent magnet test program should evaluate the effectiveness of providing a directional magnetic signal. | Appendix PIC, Sec. IX | Appendix unchanged for CRA | PMT |
| 78. | Figure XI-1 represents the surface plan view of design B. The repository footprint and its panels, rooms, and salt pillars are ghosted with dotted lines within the berm area. This design concept features a rectangular berm enclosing the repository footprint and slightly larger than the footprint dimensions. | Appendix PIC, Sec. XI | Appendix unchanged for CRA | PMFDC |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 79. | Buried within the berm is a Storage Room containing the level IV message. Also buried within the berm are a number of radar reflectors and permanent magnets to provide an electronic signature of the berm outline to future generations. 160 meters north of the berm a second Storage Room containing the level IV message is buried approximately 6M (20 feet) below the surface. | Appendix PIC, Sec. XI | Appendix unchanged for CRA | PMFDC |
| 80. | Immediately within the berm enclosure and along the dimensional perimeter of the repository footprint, the sixteen (16) granite monuments are emplaced. At the center of the footprint, the Information Center described in Section VII is erected. The small warning markers are buried below the surface throughout the footprint area. Access across the berm will be provided by a stairway along the berm's western edge. | Appendix PIC, Sec. XI | Appendix unchanged for CRA | PMFDC |
| 81. | Outside the berm perimeter approximately 320 north is the concrete Hot Cell structure which will remain as an archeological remnant. During the test program, the Hot Cell structure will be periodically monitored to determine the erosion resistance of concrete in the WIPP environment. The berm stairway will be constructed of concrete or granite stones. | Appendix PIC, Sec. XI | Appendix unchanged for CRA | PMFDC |
| 82. | A significant part of the overall plan to provide PIC is the distribution of important information remote from the repository for preservation. | Appendix PIC, Sec. XIV | Appendix unchanged for CRA | RM |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
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| 83. | To ensure that access to the most pertinent location, potential hazards of intrusion, and land use restrictions information is readily available, the DOE will develop a WIPP summary document. This document will be distinctively bound. The receiving archive will be requested to locate and catalog this summary volume such that it is readily available to the general public with particular emphasis on availability to potential natural resource investigators, historians, and archaeologists. | Appendix PIC, Sec. XIV | Appendix unchanged for CRA | RM |
| 84. | These summary documents will be prepared and translated into the six recognized United Nations languages. The receiving archive will determine which language version shall be archived. | Appendix PIC, Sec. XIV | Appendix unchanged for CRA | RM |
| 85. | The initial form of the information should be on archival quality paper. Paper will be specified to meet or exceed the requirements of National Archives and Records Administration (NARA) Bulletin Number 95-7 (Bechtold, 1996) or ANSI/NISO Z39.48-1992 (or latest version), Permanence of Paper for Documents and Libraries to ensure that the stored records will have a maximum opportunity of surviving for thousands of years. In addition, offset printing using an oxidizing, carbon black ink with a buffered fountain solution (pH >5.5) or equivalent will be specified. | Appendix PIC, Sec. XIV | Appendix unchanged for CRA | RM |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 86. | The DOE will strive to reach agreements for accepting and archiving the provided documents with the following facilities/organizations:<br>• National Archives and Records Services<br>• The State Archives of New Mexico and Texas<br>• The national archives of the nations worldwide which possess nuclear weapons and/or operate nuclear power generating plants<br>• The archives of the United Nations<br>• The national archives of the world nations which possess natural gas and/or petroleum resources and are not included in the list of nations have nuclear weapons/nuclear power plants above (see Appendix 6). | Appendix PIC, Sec. XIV | Appendix unchanged for CRA | RM |
| 87. | To ensure the proper storage and retrievability of archived material, the DOE archivist will develop a filing code system specifically for the WIPP material. This system will be a part of the overall document submittal DOE will provide to the various archival locations. | Appendix PIC, Sec. XIV | Appendix unchanged for CRA | RM |
| 88. | To reduce the possibility that future archivists may destroy the provided documents, each volume containing documents will be labeled with a warning that the intent of providing the archived material is to ensure its preservation for the 10,000 year regulatory time frame stipulated in the United States Government's regulations controlling the disposal of Transuranic Waste. | Appendix PIC, Sec. XIV | Appendix unchanged for CRA | RM |
| 89. | Within two years following the distribution of archival material and at least every 15 years thereafter during the Active Institutional Controls period, the DOE will conduct audits of selected archival locations to verify retention and retrievability of the historical documents. | Appendix PIC, Sec. XIV | Appendix unchanged for CRA | RM |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 90. | In that the record centers normally serve a more functional nature than do archives for individuals explicitly interested in resource exploitation rather than historical or archeological information, a smaller volume of documentation will be provided. Information provided to these record centers should be focused on location, design, and hazards information. | Appendix PIC, Sec. XV | Appendix unchanged for CRA | RM |
| 91. | The record centers should include various Federal and State libraries/agencies and commercial mapping agencies to ensure that the WIPP location and drilling or mining restrictions are identified on widely distributed maps used by almost all public and private organizations. | Appendix PIC, Sec. XV | Appendix unchanged for CRA | RM<br>AT |
| 92. | It is intended that the quantity of documents provided to record centers be significantly reduced from that provided to archives. However, the information regarding design, location, hazards, and land use restrictions (see Section XVI) will still require a significant amount of storage shelf space. | Appendix PIC, Sec. XV | Appendix unchanged for CRA | RM |
| 93. | As with archival documentation, information provided to record centers will contain the admonition to preserve these records for the regulatory time frame. | Appendix PIC, Sec. XV | Appendix unchanged for CRA | RM |
| 94. | To ensure wide spread location information of the WIPP site and the hazards associated with the emplaced waste, detailed maps and descriptions of the hazardous material will be sent to national and international professional societies of cartographers and geographers. | Appendix PIC, Sec. XV | Appendix unchanged for CRA | RM<br>AT |
| 95. | The actual distribution of the information will depend on agreements worked out between the DOE and these organizations and societies. | Appendix PIC, Sec. XV | Appendix unchanged for CRA | RM<br>AT |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 96. | In addition, companies providing energy and resource related data to commercial ventures active in the Delaware Basin should receive location and hazardous record information. | Appendix PIC, Sec. XV | Appendix unchanged for CRA | RM<br>AT |
| 97. | Location and hazards information should be submitted to various Federal and State of New Mexico mapping agencies to ensure that the WIPP location and drilling or mining restrictions are identified on widely distributed maps used by almost all public and private organizations. | Appendix PIC, Sec. XV | Appendix unchanged for CRA | RM<br>AT |
| 98. | It is expected that government control of the land withdrawal area will be retained for as long as a U.S. Government exists and this control will act as an awareness trigger for anyone contemplating resource exploitation within the controlled area. | Appendix PIC, Sec. XV | Appendix unchanged for CRA | RM<br>AT |
| 99. | Other passive institutional controls that will be incorporated to contribute to maintaining society's knowledge of the WIPP location and cautions regarding the maintenance of its integrity include:<br>• Incorporation of WIPP's location on various maps and road atlases<br>• Description of WIPP's location and content within the subject matter of encyclopedias<br>• Identification of WIPP as a geographical name in dictionaries<br>• Descriptions of WIPP incorporated within the text of high school and college level history books<br>• Development of a home page for the WIPP on the Internet (the current home page address for WIPP information is http//:www.wipp.carlsbad.nm.us). | Appendix PIC, Sec. XVI | Appendix unchanged for CRA | AT |
| 100. | Quality Assurance and Quality Control disciplines should be applied to a number of aspects of the permanent marker procurement and construction efforts. | Appendix PIC, Sec. XVII | Appendix unchanged for CRA | PMT<br>PMFDC |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 101. | In order to ensure that these design solutions are implemented, the DOE is developing QA procedures addressing the three implementation steps (encode in language, capture in media, and transmit) from the panel's general communications model (Figure 3.2.2-1 of their report). The DOE believes that these QA procedures will provide the documentation that the panel felt was necessary to indicate how correct information will get into the records centers and archives. | 9.3.7.3 | 9.3.7.3 | RM |
| 102. | The design described in Appendix PIC for the Permanent Marker System is the final design which the EPA should evaluate. This design meets the regulatory requirements. Its construction and implementation processes are practicable with today's technology. The DOE acknowledges the appropriateness of EPA's assuming that the conceptual design that is proposed is the same one that will be implemented. If circumstances where such that the DOE had to initiate construction of the permanent marker system today, the system described in Appendix PIC would be the configuration installed. Under these considerations it is appropriate to recognize the described system as the final design representing the system which will be installed on the order of 100 years in the future. However, the reality is that in acting responsibly with respect to its public obligation, the DOE should take advantage of technological improvements and information gained during the operational period that may refine some aspects of the design. For example, if in the future, materials are developed which duplicate the environmentally stable characteristics of granite and the fabrication and installation of the permanent marker components can be accomplished with this new material at a lower cost, then the DOE will have to give serious consideration to its use. Similarly if during the planned decades of testing the granite monuments, data is obtained suggesting modifications to the planned configurations that would have significant effects on the monuments durability without the expenditure of a disproportionate amount of funds, then it would only be responsible for the DOE to evaluate appropriate changes to the design and make those changes which are prudent and cost effective. | Docket A-93-02 II-I-07 (Enclosure 2-e) | Docket A-93-02 II-I-07 (Enclosure 2-e) | PMFDC PMT |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 103. | With the exception of final construction of the Permanent Marker System, all aspects of preparing for and implementing the Passive Institutional Controls will be performed during the operational period of WIPP with the following exceptions. Information about the long-term degradation of granite, the durability of the berm configuration, the degradation of buried markers material, and the long-term degradation of the magnetic material used in the WIPP environment may result in some refinements to the design following completion of the operational period. In addition, advancement in materials over the decades between decommissioning and construction of the permanent marker components could lead to reconsideration of the use of granite. This information and knowledge can be significantly enhanced by accumulating the data over a period of several decades after site restoration. To fully construct the Permanent Marker System immediately after site restoration would deprive the final configuration of what could be significant advancements in materials and/or design refinements which mitigate the long-term effects of environmental aggression. | Docket A-93-02 II-I-07 (Enclosure 2-e) | Docket A-93-02 II-I-07 (Enclosure 2-e) | ALL |
| 104. | The DOE expects to pursue various aspects of the Passive Institutional Controls refining the description presented in Appendix PIC throughout the operational period of the WIPP. EPA will be provided status reports and plans regarding the progress towards final implementation of the passive controls as a part of the re-certification update every five years. | Docket A-93-02 II-I-07 (Enclosure 2-e) | Docket A-93-02 II-I-07 (Enclosure 2-e) | ALL |
| 105. | First Five Year Period- The following activities described in Appendix PIC will be addressed in the first five years of WIPP operation:<br>• Survey stone monuments within a 150 mile radius of WIPP to evaluate the environmental affects on various types of granite (blue, gray, black etc.)<br>• Identify suitable sources of caliche and riprap and contract for delivery during construction of the berm test section | Docket A-93-02 II-I-07 (Enclosure 2-e) | Docket A-93-02 II-I-07 (Enclosure 2-e) | PMT |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 106. | Berm Testing- Detailed plans for the construction of a test section of the berm to be included in the Permanent Marker System will be submitted to the EPA in the recertification application for the second five year period of operation (2002). This test section will provide a means of testing, various configurations and material distributions, the construction and installation of test monuments, the fabrication and installation of samples of buried markers for testing long performance, the performance testing of radar reflectors buried within the berm, and the performance testing of markers buried within the berm . Actual construction of the test section of the berm and the installation of test monuments and buried markers will be concluded during the second recertification period to permit time for consolidation of the base of the berm. The base structure will use salt excavated from the WIPP. | Docket A-93-02 II-I-07 (Enclosure 2-e) | Docket A-93-02 II-I-07 (Enclosure 2-e) | PMT |
| 107. | Establish Archival Filing System- The filing system under which WIPP documentation will be gathered for archival storage will be established in 2003 and implementation will be initiated by 2004. The EPA will be provided a status report on the specifics of the system and the progress in bringing all WIPP documents under that system in the recertification application for the third five year period of WIPP operation (2007). | Docket A-93-02 II-I-07 (Enclosure 2-e) | Docket A-93-02 II-I-07 (Enclosure 2-e) | RM |
| 108. | Test Message Comprehension- Detailed plans for conducting message comprehension will be included in the recertification submittal for the fifth five year period of operation (2017). Actual testing will occur during the fifth five year period and any resulting refinements to the messages which result from the testing will be provided to EPA at the end of the five year period. The diagrams accompanying the level IV message on pages 115-122 of Appendix PIC are not anticipated to change except to reflect actual conditions as they exist at the time of engraving the diagrams in stone. The focus of the message comprehensiveness will be on the text material itself. | Docket A-93-02 II-I-07 (Enclosure 2-e) | Docket A-93-02 II-I-07 (Enclosure 2-e) | MTT |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 109. | Submit Information to Publishers- During the sixth and seventh five year periods of operation (2023-2033), and after closure of the salt shaft, the DOE will contact major publishers, professional organizations, and map makers to conclude arrangements for their acceptance of WIPP information and its publishing. The organizations with which satisfactory arrangements are made will be identified to EPA along with a summary of what each organization has agreed to publish and the status of the publishing commitment in the DOE update following conclusion of site restoration. | Docket A-93-02 II-I-07 (Enclosure 2-e) | Docket A-93-02 II-I-07 (Enclosure 2-e) | RM AT |
| 110. | Establish Agreement With Archival Recipients and Record Centers- The DOE will submit to the EPA a plan for soliciting the participation of specific archives and record centers in the recertification application for the sixth five year period (2022). The solicitation and agreements effort will be completed by the conclusion of site restoration. This list will include any changes from the current plans resulting from events occurring during the period from 1997-2022. | Docket A-93-02 II-I-07 (Enclosure 2-e) | Docket A-93-02 II-I-07 (Enclosure 2-e) | RM |
| 111. | WIPP Summary Document- The summary document described in Appendix PIC, page 92 will be completed at the conclusion of site restoration and provided to EPA. The document will summarize the history of WIPP up to site restoration. | Docket A-93-02 II-I-07 (Enclosure 2-e) | Docket A-93-02 II-I-07 (Enclosure 2-e) | RM |
| 112. | Promulgate Information Accumulated Through WIPP Closure and Decommissioning- The DOE will distribute archival documents in 2035. The DOE will provide a status report on the distribution at the end of 2035 and annually thereafter until the initial distribution is completed. | Docket A-93-02 II-I-07 (Enclosure 2-e) | Docket A-93-02 II-I-07 (Enclosure 2-e) | RM |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 113. | Archival Auditing- Within two years following the distribution of material to archives, the DOE will conduct an audit of selected archives to verify retention and retrievability of the material. Follow-up auditing will be conducted every 15 years thereafter until conclusion of the Active Institutional Controls. The EPA will be provided the results of these audits and any actions which result from audit findings at the conclusion of each audit. | Docket A-93-02 II-I-07 (Enclosure 2-e) | Docket A-93-02 II-I-07 (Enclosure 2-e) | RM |
| 114. | If at anytime during the operational period, observational data and evaluation support that refinements to the design should be implemented, DOE will make the necessary design refinements and describe them to the EPA in the recertification application following the identification of the changes. | Docket A-93-02 II-I-07 (Enclosure 2-e) | Docket A-93-02 II-I-07 (Enclosure 2-e) | ALL |
| 115. | The berm test section will be constructed to the overall dimensions described in Appendix PIC. However, the thickness of individual layers of caliche, riprap, and soil/riprap and well as the ratio of soil to riprap in the top layer will be varied. | Docket A-93-02 II-I-07 (Enclosure 2-e) | Docket A-93-02 II-I-07 (Enclosure 2-e) | PMT AT |
| 116. | Once erected, these test monuments will be monitored over a period of nearly nine decades. Data regarding the durability of the granite material and the weathering on the engraved lettering and diagrams will be used to refine the final design. The data could lead to substantial changes in the configuration of the monuments and the information center. It is not anticipated that there will be substantial changes to the design of the buried rooms. | Docket A-93-02 II-I-07 (Enclosure 2-e) | Docket A-93-02 II-I-07 (Enclosure 2-e) | PMT |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 117. | The data obtained by monitoring the interface of granite and caliche could give rise to modifying the use of caliche as a fill material. If data obtained during the operational phase indicates that there is aggressive deterioration of the granite at the interface, the DOE will change fill composition during the operational period to permit the gathering of additional test information. | Docket A-93-02 II-I-07 (Enclosure 2-e) | Docket A-93-02 II-I-07 (Enclosure 2-e) | PMT |
| 118. | Considering the designed configuration of the Permanent Marker System and its major components, it is not anticipated that wind blown sand will present a substantial issue. The large expanse of the system and the fact that sand moves from one locale to another reduces the risk of the entire system being masked from future generations. However, during the decades of testing some data will be developed relative to the affects of wind blown sand. Should the current assumptions prove to be wrong, significant changes to the configuration would be included in refining the design and those changes will be described in the recertification application following the identification of the refinement. | Docket A-93-02 II-I-07 (Enclosure 2-e) | Docket A-93-02 II-I-07 (Enclosure 2-e) | PMT |
| 119. | From the information obtained by the testing experience gained during the operational period, the DOE will refine the design of the Permanent Marker System and then make the appropriate changes to the test structures where such changes are deemed significant with respect to longevity of the marker system. In each instance of refinement to the design, the DOE will describe the refinement in the following recertification application. Making these changes prior to completion of site restoration will then provide an additional 50-60 years of weathering to determine the effectiveness of the changes. Any changes to the design will be provided to the EPA for review. | Docket A-93-02 II-I-07 (Enclosure 2-e) | Docket A-93-02 II-I-07 (Enclosure 2-e) | PMT |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 120. | In determining how WIPP related information can be included in college and/or high school level texts, McGraw-Hill Publishing Company's Engineering and Science Editorial Division was contacted. The company's representative stated that inclusion of information would need to be determined by each individual author. The company can provide a list of texts which they publish and from that list a selection can be made and then the individual authors contacted. It is then at the discretion of each author whether or not WIPP related material would be included in any planned reprintings or revisions of the particular publication. A very similar policy, was confirmed for the publisher, John Wiley & Sons. This policy is not unexpected. Considering that major publishers publish numerous authors for the academic community it is only reasonable that some percentage of the authors will be receptive to the idea of including relevant WIPP operating, location, and hazards information in the texts. The time to do this, however, is after some history can be developed regarding the actual emplacement of waste in the WIPP during its operational period. The DOE will initiate such an effort at the time of sealing the last shaft. | Docket A-93-02 II-I-07 (Enclosure 2-e) | Docket A-93-02 II-I-07 (Enclosure 2-e) | RM AT |
| 121. | In Appendix PIC the DOE has identified in excess of 200 archives, record centers and libraries, for consideration in receiving information related to the WIPP project. Recognizing that such an undertaking is a major commitment of resources and desiring emphasis be placed on where the effort is likely to provide the most benefit, the DOE will conduct the negotiations with planned recipients on a priority basis. The driving motivation for widespread dissemination of WIPP information is to ensure that the WIPP's location and associated hazards are not lost in society's memory. | Docket A-93-02 II-I-07 (Enclosure 2-e) | Docket A-93-02 II-I-07 (Enclosure 2-e) | RM |

## DOE Commitments in the CCA and CRA Related to the PICs Program

| No. | Commitment | CCA Location[1] | CRA Location[1] | Program Element[2] |
|---|---|---|---|---|
| 122. | Therefore the program for distributing relevant information will focus on locations that are likely to be sought as sources of information when researching the Delaware Basin for oil, gas, and mineral resources; national locations which are likely to be sought by individuals doing oil, gas, and mineral resource investigation in the southwestern portion of the U.S.; and international locations in countries whose stable economic condition is conducive to the development of a cadre of individuals with the financial incentive to search for natural resources worldwide. | Docket A-93-02 II-I-07 (Enclosure 2-e) | Docket A-93-02 II-I-07 (Enclosure 2-e) | RM |
| 123. | During the course of obtaining agreements for this initial set of recipients, the DOE will develop a second level of priority based upon experience gained in the initial round of negotiations and determine the list of locations to focus on at this level. All other locations will be addressed upon completion of the second round of negotiations. The DOE will provide the second priority list in its sixth recertification application prior to completion of site restoration. | Docket A-93-02 II-I-07 (Enclosure 2-e) | Docket A-93-02 II-I-07 (Enclosure 2-e) | RM |
| 124. | The feasibility of including remaining archives, record centers, and professional organizations identified in Appendix PIC which are not included in the first and second prioritization will be investigated and a determination made on their participation. The DOE will provide the EPA with a final listing of all participants at the conclusion of site restoration. | Docket A-93-02 II-I-07 (Enclosure 2-e) | Docket A-93-02 II-I-07 (Enclosure 2-e) | RM |
| 125. | We (i.e. DOE) plan to implement the PIC program during the AIC period so there is the overlap in the programs to assure continuity. | Docket A-93-02 II-G-2 (Comment 7.22) | Docket A-93-02 II-G-2 (Comment 7.22) | ALL |

# Attachment 3: DOE Commitments in the HWFP Related to the PICs Program

# DOE Commitments in the HWFP Related to the PICs Program

| No. | Commitment | RCRA | HWFP | Program Element[2] |
|---|---|---|---|---|
| 1. | Survey Plat. No later than the submission of the certification of closure of each hazardous waste disposal unit, the owner or operator must submit to the local zoning authority, or the authority with jurisdiction over local land use, and to the Regional Administrator, a survey plat indicating the location and dimensions of landfills cells or other hazardous waste disposal units with respect to permanently surveyed benchmarks. This plat must be prepared and certified by a professional land surveyor. The plat filed with the local zoning authority, or the authority with jurisdiction over local land use, must contain a note, prominently displayed, which states the owner's or operator's obligation to restrict disturbance of the hazardous waste disposal unit in accordance with the applicable subpart G regulations. | 40 CFR Section 264.116 | | AT |
| 2. | Prior to cessation of active controls, monuments will be emplaced to serve a long-term site markers to discourage activities that would penetrate the facility or impare the ability of the salt formation to isolate the waste from the surface environment for at least 10,000 years. | | HWFP, Attachment I, 1a(2) Miscellaneous Unit | PMFDC |
| 3. | The Federal Government will maintain administrative responsibility for the repository site in perpetuity and will limit future use of the area. | | HWFP, Attachment I, 1a(2) Miscellaneous Unit | AT |

## DOE Commitments in the HWFP Related to the PICs Program

| No. | Commitment | RCRA | HWFP | Program Element[2] |
|---|---|---|---|---|
| 4. | If, as currently projected, the WIPP facility is dismantled at closure, all surface and subsurface facilities (except the hot cell portion of the Waste handling Building, which will remain as an artifact of the Permanent Marker System (PMS). | | HWFP, Attachment I, 1d(2) Schedule for Final Facility Closure | PMFDC |
| 5. | Provisions would be left for active post-closure controls of the site and for the installation of long-term markers and monuments for the purpose of permanently marking the location of the repository and waste, | | HWFP, Attachment I, 1e(2)(f) Final Contouring and Vegetation | PMFDC |
| 6. | The Permanent Marker Conceptual Design Report and other provisions during the first 100 years after closure are addressed under another Federal regulatory program. | | HWFP, Attachment I, 1e(2)(g) Closure Monuments, and Records | PMFDC |

## DOE Commitments in the HWFP Related to the PICs Program

| No. | Commitment | RCRA | HWFP | Program Element[2] |
|---|---|---|---|---|
| 7. | Detailed records shall be filed with local, State, and federal government agencies to ensure that the location of the WIPP facility is easily determined and that appropriate notifications and restrictions are given to anyone who applies to drill in the area. This information, together with land survey data, will be on record with the U.S. Geological Survey and other agencies. | | HWFP, Attachment I, 1e(2)(g) Closure Monuments, and Records | AT |
| 8. | The Federal government will maintain permanent administrative authority over those aspects of land management assigned by law. | | HWFP, Attachment I, 1e(2)(g) Closure Monuments, and Records | AT |
| 9. | Within sixty (60) days of completion of closure activities for each underground HWDU, and no later than the submission of the certification of closure of each underground HWDU, the Permittees will submit to the Secretary of the NMED a survey plat indicating the location and dimensions of hazardous waste disposal units with respect to permanently surveyed benchmarks. This plat will be prepared and certified by a professional land surveyor and will contain a prominently displayed note that states the Permittee's obligation to restrict disturbance of the hazardous waste disposal unit. In addition, the land records in the Eddy County Courthouse, Carlsbad, New Mexico, will be updated through filing the final survey plats. | | HWFP, Attachment I, 2(b) Survey Plat | AT |

## DOE Commitments in the HWFP Related to the PICs Program

| No. | Commitment | RCRA | HWFP | Program Element[2] |
|---|---|---|---|---|
| 10. | Because of the Numerous regulations, the Permittees have prepared a single strategy for post-closure management of the WIPP. This strategy consists of three elements: 1) active controls, 2) monitoring, and 3) passive controls. Only the first and second elements occur within the post-closure period covered by this permit. | | HWFP, Attachment J, 1(a) Post-Closure Plan after Final Facility Closure | PMFDC |

RCRA -- Resource Conservation and Recovery Act
HWFP – Hazardous Waste facility Permit

The various implementing programs and their corresponding codes for the commitments listed above are as follows:

Records Management - RM
Awareness Triggers - AT
Message Translation and Testing - MTT
Permanent Markers Testing - PMT
Permanent Markers Final Design and Construction - PMFDC
Commitments relevant to all PICs Programs – ALL