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Volume 3
Public Comments
and Responses

FINAL SUPPLEMENT ENVIRONMENTAL IMPACT STATEMENT

Waste Isolation Pilot Plant

Volume 3 of 13

January 1990

U.S. DEPARTMENT OF ENERGY
Office of Environmental Restoration
and Waste Management

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U.S. DEPARTMENT OF ENERGY
Office of Environmental Restoration
and Waste Management
Washington, D.C. 20585

COVER SHEET

RESPONSIBLE AGENCIES:

Lead Agency: U.S. Department of Energy (DOE)
Cooperating Agency: U.S. Department of the Interior, Bureau of Land Management (BLM)

TITLE:

Final Supplement, Environmental Impact Statement, (SEIS), Waste Isolation Pilot Plant (WIPP)

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ABSTRACT:

In 1980, the DOE published the Final Environmental Impact Statement (FEIS) for the WIPP. This FEIS analyzed and compared the environmental impacts of various alternatives for demonstrating the safe disposal of transuranic (TRU) radioactive waste resulting from DOE national defense related activities. Based on the environmental analyses in the FEIS, the DOE published a Record of Decision in 1981 to proceed with the phased development of the WIPP in southeastern New Mexico as authorized by the Congress in Public Law 96-164.

Since publication of the FEIS, new geological and hydrological information has led to changes in the understanding of the hydrogeological characteristics of the WIPP site as they relate to the long-term performance of the underground waste repository. In addition, there have been changes in the information and assumptions used to analyze the environmental impacts in the FEIS. These changes include: 1) changes in the composition of the TRU waste inventory, 2) consideration of the hazardous chemical constituents in TRU waste, 3) modification and refinement of the system for the transportation of TRU waste to the WIPP, and 4) modification of the Test Phase.

The purpose of this SEIS is to update the environmental record established in 1980 by evaluating the environmental impacts associated with new information, new circumstances, and proposal modifications. This SEIS evaluates and compares the Proposed Action and two alternatives.

The Proposed Action is to proceed with a phased approach to the development of the WIPP. Full operation of the WIPP would be preceded by a Test Phase of approximately 5 years during which time certain tests and operational demonstrations would be carried out. The elements of the Test Phase, tests and operations demonstration, continue to evolve. These elements are currently under evaluation by the DOE based on comments from independent groups such as the Blue Ribbon Panel, the National Academy of Sciences, the Environmental Evaluation Group, and the Advisory Committee on Nuclear Facility Safety. At this time, the Performance Assessment tests would be comprised of laboratory-scale, bin-scale, and alcove-scale tests. The DOE, in December 1989, issued a revised draft final Test Phase plan that focuses on the Performance Assessment tests to remove uncertainties regarding compliance with long-term disposal standards (40 CFR 191 Subpart B) and to provide confirming data that there would be no migration of hazardous constituents (details are available in Subsection 3.1.1.4 and Appendix O). The tests would be conducted to reduce uncertainties associated with the prediction of natural processes that might affect long-term performance of the underground waste repository. Results of these tests would be used to assess the ability of the WIPP to meet applicable Federal standards for the long-term protection of the public and the environment. The operational demonstrations would be conducted to show the ability of the TRU waste management system to certify, package, transport, and emplace TRU waste in the WIPP safely and efficiently. Waste requirements for the Integration Operations Demonstration remain uncertain. A separate document would be developed to describe in detail the Integration Operations Demonstration following the DOE's decision as to the scope and timing of the demonstration.

During the Test Phase, National Environmental Policy Act (NEPA) requirements would be reviewed in light of the new information developed and appropriate documentation would be prepared. In addition, the DOE will issue another SEIS at the conclusion of the Test Phase and prior to a decision to proceed to the Disposal Phase. This SEIS will analyze in more detail the system-wide impacts of processing and handling at each of the generator/storage facilities and will consider the system-wide impacts of potential waste treatments.

Upon completion of the Test Phase, the DOE would determine whether the WIPP would comply with U.S. Environmental Protection Agency (EPA) standards for the long-term disposal of TRU waste (i.e., 40 CFR Part 191, Subpart B; 40 CFR Part 268). The WIPP would enter the Disposal Phase if there was a favorable Record of Decision based on the new SEIS to be prepared prior to the Disposal Phase and if there was a determination of compliance with the EPA standards and other regulatory requirements. During this phase, defense TRU waste generated since 1970 would be shipped to and disposed of at the WIPP. After completion of waste emplacement, the surface facilities would be decommissioned, and the WIPP underground facilities would serve as a permanent TRU waste repository.

The first alternative, No Action, is similar to the No Action Alternative discussed in the 1980 FEIS. Under this alternative, there would be no research and development facility to demonstrate the safe disposal of TRU waste, and TRU waste would continue to be stored. Storage of newly generated TRU mixed waste would be in conflict with the Resource Conservation and Recovery Act (RCRA) Land Disposal Restrictions; treatment would be required to avoid such conflict. The WIPP would be decommissioned as a waste disposal facility and potentially put to other uses.

The second alternative to the Proposed Action is to conduct the bin-scale tests at a facility other than the WIPP and to delay emplacement of TRU waste in the WIPP underground until a determination has been made of compliance with the EPA standards for TRU waste disposal (i.e., 40 CFR Part 191, Subpart B). The bin-scale tests could be conducted outside the WIPP underground facilities in a specially designed, aboveground facility. The implications of this alternative include delays in both the operational demonstrations and alcove-scale tests, the lack of alcove-scale test data for the compliance demonstration, and placing the WIPP facilities in a "standby" mode. The specialized facility for aboveground bin-scale tests could be constructed at any one of the DOE facilities. In order to analyze the environmental impacts of this alternative in the final SEIS, the DOE has evaluated the Idaho National Engineering Laboratory in Idaho as a representative facility for the aboveground bin-scale tests.

ADDITIONAL INFORMATION:

The 1980 FEIS was reprinted and provided to the public with the draft SEIS which was published April 21, 1989. Public comments on the draft SEIS were accepted for a period of 90 days after publication. During that time, public hearings were conducted in Atlanta, Georgia; Pocatello, Idaho; Denver, Colorado; Pendleton, Oregon; Albuquerque, Santa Fe and Artesia, New Mexico; Odessa, Texas; and Ogden, Utah.

This final SEIS for the WIPP project is a revision of the draft SEIS published in April 1989. It includes responses to the public comments received in writing and at the public hearings and revisions of the draft SEIS in response to the public comments. Revisions of importance have been identified in this final SEIS by vertical lines in the margins to highlight changes made in response to comments.

Volumes 1 through 3 of the final SEIS contain the text, appendices, and the summary comments and responses, respectively. Volumes 6 through 13 of the final SEIS contain reproductions of all of the comments received on the draft SEIS, and Volumes 4 and 5 contain the indices to Volumes 6 through 13. An Executive Summary and/or Volumes 1 through 5 of the final SEIS have been distributed to those who received the draft SEIS or requested a copy of the final SEIS. Although not distributed to all who commented on the draft SEIS, Volumes 1 through 13 of the final SEIS have been placed in the reading rooms and libraries listed in Appendix K; these volumes will be mailed to the general public upon request.

A notice of availability of the final SEIS has been published by the EPA in the Federal Register. The DOE will make a decision on implementation of the Proposed Action or the alternatives no earlier than 30 days after publication of the EPA notice of availability. The DOE's decision will be documented in a publicly available Record of Decision to be published in the Federal Register and distributed to all who receive this final SEIS.

Foreword

In October 1989, the Secretary of Energy issued a draft Decision Plan for the Waste Isolation Pilot Plant (WIPP). The Decision Plan listed all key technical milestones and institutional activities for which Departmental, Congressional, or State actions are required prior to receipt of waste for the proposed Test Phase, which is the next step in the phased development of the WIPP. The Plan was issued for review to States, Congressional representatives, other Federal agencies (including the Environmental Protection Agency and the Department of the Interior), and oversight groups (e.g., the Advisory Council for Nuclear Facility Safety, the Blue Ribbon Panel, the National Academy of Sciences, and the Environmental Evaluation Group). Revision 1 of the Plan was issued in December 1989.

Departmental activities required prior to receipt of waste at the WIPP include completion of the "as-built" drawings for the facility, the Energy Systems Acquisition Advisory Board review process, waste-hoist repairs, preoperational appraisal and operational readiness review, mining and outfitting of the alcoves for the proposed Test Phase, and completion of this Supplement to the Environmental Impact Statement.

Other Departmental activities include completion of the Final Safety Analysis Report (FSAR) and issuance of the FSAR addenda to address the proposed Test Phase and associated waste retrieval (if necessary). Future Departmental activities include the planned issuance of the EPA Standards Compliance Summary Report and the evaluation of waste form treatments and design modifications that may be required to meet the EPA Subpart B disposal standards.

Key activities involving oversight groups include final development of an acceptable retrievability program to demonstrate that waste emplaced during the first five years of the facility operation are fully retrievable, and an integrated waste handling demonstration using simulated wastes to ensure system-wide readiness for receipt of wastes for the Test Phase.

Institutional activities include concurrent pursuance of legislative and administrative land withdrawal (legislative withdrawal is the process preferred by the Department); the EPA's ruling on the DOE's No-Migration Variance Petition in compliance with the Land Disposal Restrictions under the Resource Conservation and Recovery Act (RCRA); resolution of regulatory issues, including the State of New Mexico's authority to regulate mixed waste under the RCRA and the designation of routes to be used for transport of transuranic waste; Departmental resolution of any mineral lease at the WIPP; and completion of appropriate agreements with the Western Governors Association and Southern States Energy Board.

This Supplemental Environmental Impact Statement (SEIS) is one of a number of milestones which are critical to the opening of the Waste Isolation Pilot Plant. This SEIS provides an upper bound of the potential impacts of the Proposed Action and alternatives. Based on this final SEIS, the Department will issue a Record of Decision no sooner than 30 days after the EPA publishes a notice of availability in the Federal Register.

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INTRODUCTION

The comment and response volume and comment (reproduced public comments) volumes of the Final Supplement to the Environmental Impact Statement (SEIS) for the Waste Isolation Pilot Plant (WIPP) have been prepared in compliance with the Council on Environmental Quality (CEQ) regulations 40 CFR 1503.4 and 1506.6, which provide for the consideration of comments received during the public comment period on the draft SEIS. Volume 3 contains responses by the Department of Energy (DOE) to summaries of the approximately 9,000 pages of comments the DOE received from about 2,200 individuals during the public comment period and during nine public hearings conducted in May, June, and July, 1989. All comments received are reproduced in Volumes 6 through 13. Volumes 4 and 5 contain indices to Volumes 6 through 13.

On February 17, 1989, the DOE announced the preparation of a supplement to the 1980 Final Environmental Impact Statement (FEIS) for the WIPP in a Federal Register notice (54 FR 7251). On April 21, 1989, the DOE published another notice in the Federal Register (54 FR 16350) announcing the availability of the draft SEIS, a 60-day public comment period, and the schedule, locations, and procedures for six public hearings. On June 12, 1989, a notice was published (54 FR 24940), announcing two additional hearings on the draft SEIS, in Texas and New Mexico, and a 7-day extension of the comment period. On June 26, 1989, a notice was published (54 FR 26828) announcing a third additional public hearing on the draft SEIS, in Ogden, Utah, and an extension of the public comment period to July 11, 1989. In response to requests, the public comment period was extended to July 20, 1989 (90 days total), to ensure that all interested citizens had time to comment (54 FR 20909). Nine public hearings were held as follows:

Atlanta, Georgia	May 25, 1989
Pocatello, Idaho	June 1, 1989
Denver, Colorado	June 6, 1989
Pendleton, Oregon	June 8, 1989
Albuquerque, New Mexico	June 13-14, 1989
Santa Fe, New Mexico	June 15-17, 1989
Artesia, New Mexico	June 22, 1989
Odessa, Texas	June 26, 1989
Ogden, Utah	July 10, 1989

On April 13, 1989, copies of the 1980 FEIS and the draft SEIS were distributed to U.S. legislators, Federal agencies, and Governors of the 23 affected States. On April 14, copies of the documents were sent to State agencies, State public libraries, legislators of the 23 States, DOE reading rooms, and to local, State, and national public interest groups. Current generator facilities' mailing lists were obtained and also used. Copies of the 1980 FEIS and the draft SEIS were provided to the public and media upon request.

HANDLING OF COMMENT AND RESPONSES

At the beginning of the public comment period, a procedure was established to receive, document, identify, and summarize public comments. Each comment (written, oral, exhibit, or question/answer session) has been assigned an identification number and is reproduced in Volumes 6 through 13 of the final SEIS.
The identification numbers assigned were as follows:

TGXXXXX	=	Oral testimony given at the Atlanta, Georgia, hearing on May 25, 1989.
TPXXXXX	=	Oral testimony given at the Pocatello, Idaho, hearing on June 1, 1989.
TDXXXXX	=	Oral testimony given at the Denver, Colorado, hearing on June 6, 1989.
TOXXXXX	=	Oral testimony given at the Pendleton, Oregon, hearing on June 8, 1989.
TQXXXXX	=	Oral testimony given at the Albuquerque, New Mexico, hearing on June 13-14, 1989.
TSXXXXX	=	Oral testimony given at the Santa Fe, New Mexico, hearing on June 15-17, 1989.
TAXXXXX	=	Oral testimony given at the Artesia, New Mexico, hearing on June 22, 1989.
TTXXXXX	=	Oral testimony given at the Odessa, Texas, hearing on June 26, 1989.
TUXXXXX	=	Oral testimony given at the Ogden, Utah, hearing on July 10, 1989.
WDXXXXX	=	Written document sent to the DOE during the comment period.
EXXXXXX	=	Exhibits (e.g., written testimonies, letters, pictures, poems) submitted at the hearings.
QXXXXX	=	Questions asked during the hearing by recognized sources.
XXXXX	=	Numbers designating the order in which the comments were received.

The approximately 9,000 pages of comments received from about 2,200 individuals were reviewed, and specific issues, questions, and statements within each were identified. Each issue, question, and statement was identified by topic, and assigned a number (e.g., 2.2-1). Similar comments were frequently raised by a number of different reviewers. These were summarized into a single comment and response. Editorial comments were simply incorporated into the text of the final SEIS.

All letters, transcriptions of oral testimony (including question/answer sessions), and accompanying exhibits were electronically reproduced and are included in Volumes 6 through 13 of the final SEIS.

Figure 1 shows how the comments were handled from receipt to inclusion in the final SEIS.

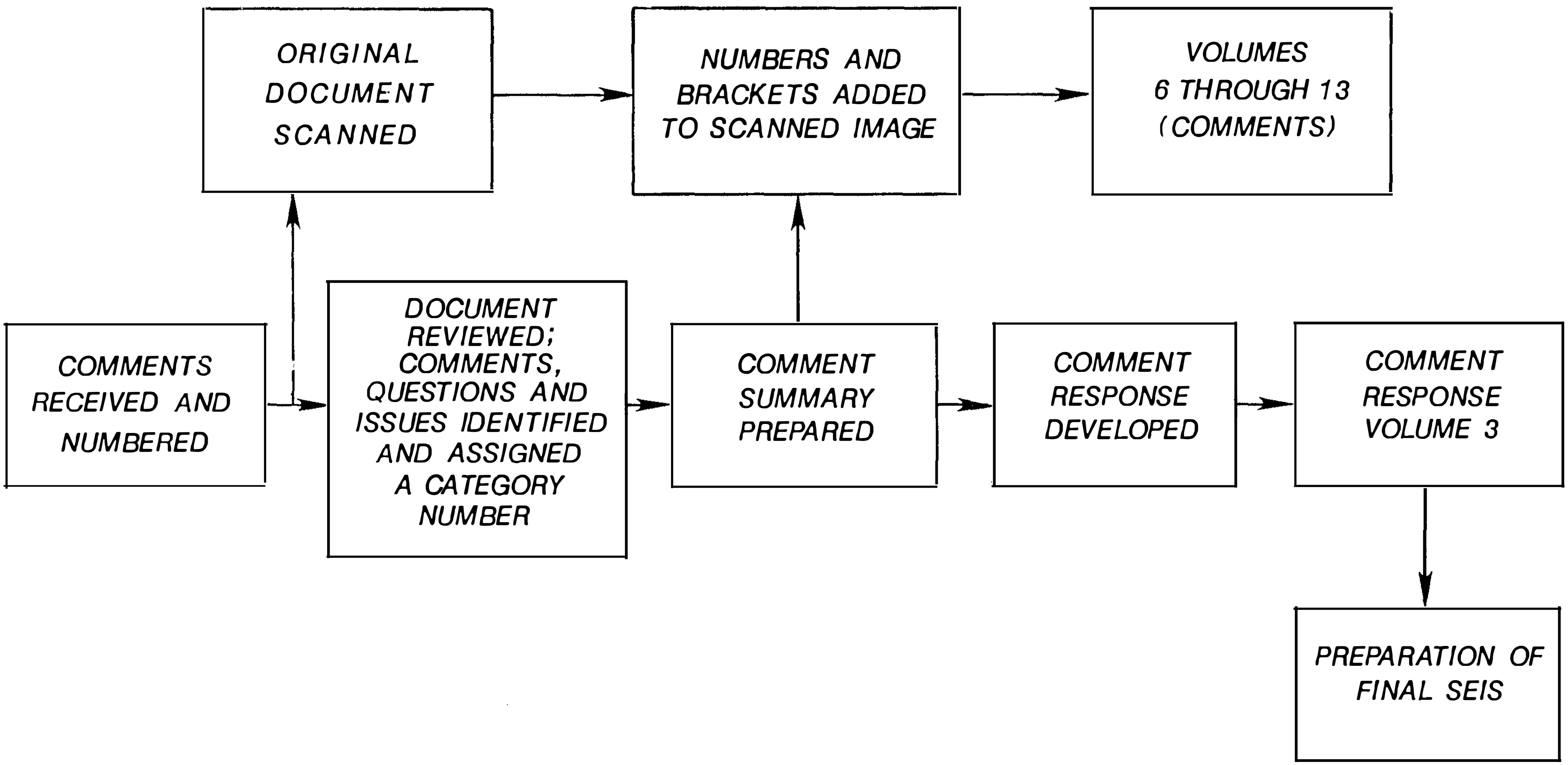

FIGURE 1
TREATMENT OF COMMENTS

FINDING RESPONSES TO COMMENTS

This volume is 1 of 13 volumes that make up the final SEIS for the WIPP Project. Volumes 6 through 13 reproduce the public comments received on the draft SEIS. The numbers and corresponding titles of each volume are as follows:

Volume No.	Title
-	Executive Summary
1	Final Supplement Environmental Impact Statement
2	Final Supplement Environmental Impact Statement - Appendices
3	Final Supplement Environmental Impact Statement - Public Comments and Responses
4	Final Supplement Environmental Impact Statement - Index A
5	Final Supplement Environmental Impact Statement - Indices B,C,D,E
6	Final Supplement Environmental Impact Statement - Oral Testimony (Testimony for hearings held in Atlanta, GA; Pocatello, ID; Denver, CO; and Albuquerque, NM)
7	Final Supplement Environmental Impact Statement - Oral Testimony (Testimony for hearings held in Santa Fe, NM)
8	Final Supplement Environmental Impact Statement - Oral Testimony (Testimony for hearings held in Santa Fe, NM)
9	Final Supplement Environmental Impact Statement - Oral Testimony (Testimony for hearings held in Santa Fe, NM; Artesia, NM; Odessa, TX; and Ogden, UT)
10	Final Supplement Environmental Impact Statement - Exhibits
11	Final Supplement Environmental Impact Statement - Exhibits
12	Final Supplement Environmental Impact Statement - Written Documents
13	Final Supplement Environmental Impact Statement - Written Documents

The indices located in Volumes 4 and 5 will help locate specific questions or statements in a letter, exhibit, or transcript of oral testimony, and the DOE's response. Numbers appear in the margins of Volumes 6 through 13 and refer to summary comments. Both the summary comment and the DOE's response are located under the comment number in Volume 3. In this way, each specific comment can be traced from the original to a summary comment and the DOE's response.

Index A (Volume 4) is an alphabetical listing of all individuals and organizations who submitted comments, either in oral or written form. To the right of each name is a list of all the comment numbers assigned to statements or questions made by the commenter and the DOE's response. The volume and page number where the testimony is located are also found in Index A. Indices B through D (Volume 5) are similar to Index A, with the exception that the names of the individuals and organizations are listed in the order that their comments were received. Index B is a listing of oral testimonies. Index C lists exhibits. Index D lists written documents. As in Index A, opposite each commenter's name is a listing of the summary comment numbers which identify specific comments extracted from that individual's or organization's submittal, and the volume and page number where an individual's reproduced comment is located.

Index E (Volume 5) provides a numerical listing of the summary comment and response numbers contained in Volume 3. Listed opposite each summary comment number are the submittal numbers of each individual or organization that made the specific comment that is addressed by the summary comment and response.

As an aid to the reader in locating information in Volumes 6 through 13, the following instructions are provided:

1. <u>To find your specific comment and the DOE response</u>

- Look in Index A in Volume 4.
- Find your name (names are in alphabetical order).
- Summary comments and responses are identified by numbers located to the right of your name.
- Find the summary comment number in Volume 3. (Comment numbers are listed in numerical order.)
- Beneath the summary comment number in Volume 3 will be a comment summary which represents your comment.
- The DOE's response to your comment is directly below the comment summary.

2. <u>To find the reproduction of your comments in Volumes 6 through 13</u>

- Look in Index A in Volume 4.
- Find your name (names are in alphabetical order).

- Find the volume and page number located to the right of your name.
- The reproduction of your comment will appear within the volume identified.

3. <u>To find the comments of others who made the same comment</u>

- Look in Index A in Volume 4.
- Find your name (names are in alphabetical order).
- Look under the Summary Comment/Response number heading.
- Find the Summary Comment/Response numbers that were extracted from your submittal.
- Look in Index E in Volume 5.
- Find the Summary Comment/Response number in Index E that was by your name in Index A. (Index E lists the comment numbers in numerical order.)
- Look at the document numbers opposite that comment number. (Each number identifies an individual who made a comment similar to yours.)
- Go to Index B in Volume 5 if the number begins with a TG, TP, TD, TO, TQ, TU, TS, TA, TT, or QT (e.g., TG00034, TU00645, QT00034).
- Go to Index C in Volume 5 if the number begins with EX (e.g., EX00110, EX00214).
- Go to Index D in Volume 5 if the number begins with WD (e.g., WD00468, WD00030).

- Indices B, C, and D (Volume 5) list the document numbers in numerical order.
- Find the name of the person or organization and the location of their reproduced comment.
- Look up the reproduced comment in Volumes 6 through 13 as appropriate.

1.0 **PREFERENCES FOR THE ALTERNATIVES ADDRESSED IN THE WIPP SEIS**

During a 90-day public comment period on the Draft Supplement to the 1980 Waste Isolation Pilot Plant (WIPP) Final Environmental Impact Statement (FEIS) (DOE, 1980), commenters stated preferences among three alternatives under consideration in this National Environmental Policy Act (NEPA) action. The alternatives being considered are the U.S. Department of Energy's (DOE) Proposed Action, No Action, and an Alternative Action. The Proposed Action is to proceed with the development of the WIPP in a phased approach. Under the No Action Alternative, transuranic (TRU) waste would continue to be retrievably stored. The WIPP would be decommissioned or put to other uses, as appropriate. Under the Alternative Action, bin tests would be conducted at a location other than the WIPP underground facility, and emplacement of TRU waste in the WIPP underground facility would be delayed until a determination is made of compliance with the U.S. Environmental Protection Agency (EPA) standards in 40 CFR Part 191, Subpart B (EPA, 1985b). In addition, commenters identified a number of alternatives not addressed in the draft Supplemental Environmental Impact Statement (SEIS).

The DOE has carefully reviewed the testimony, exhibits, and written comments received during the SEIS 90-day public comment period, which ended July 20, 1989. Nine hundred eighty-six oral testimonies were recorded. Four hundred five exhibits were entered into the hearing record, and 878 written documents were received during the comment period. Two petitions, each signed by more than 1,000 individuals, were submitted as exhibits during the public hearings and as written documents during the comment period.

The comments expressed in support of a preference for the alternatives identified in the draft SEIS are summarized below. Responses to these statements of preferences are not necessary.

SUPPORT FOR THE PROPOSED ACTION

1-1 Comment

Some commenters expressed support for the proposed phased development of the WIPP. Others supported the DOE's opening of the WIPP because of the potential economic diversification the facility would provide to the surrounding area. Numerous commenters supported the Proposed Action because it would minimize the adverse environmental impacts at DOE TRU waste retrievable storage facilities. Some commenters supported the phased approach based upon their expressed confidence in the DOE's capabilities in several areas: the quality of the data and scientific approach to its collection and analysis; the selection of an ideal geological formation for TRU waste disposal; safety and environmental considerations at the WIPP including training programs, technical expertise, and safety measures; and transportation of TRU waste to the WIPP.

SUPPORT FOR NO ACTION

1-2 Comment

Commenters supporting the No Action Alternative stated that the Proposed Action for the WIPP has the potential to pollute groundwater and spill radioactive materials during transport. They questioned the safety of the WIPP for future generations. Other commenters expressed concerns about transporting the TRU waste through their own towns, meeting safety standards for TRU waste disposal, the DOE's perceived lack of responsibility for the clean-up of accidents, the potential impacts on tourism and real estate, and the omission of the human error factor in determining the consequences of accidents. Still other commenters supporting the No Action Alternative stated that the DOE should stop producing nuclear material altogether and questioned the DOE's credibility with regard to operating the WIPP facility after recent developments at Fernald, the Rocky Flats Plant, and several other DOE facilities.

SUPPORT FOR THE ALTERNATIVE ACTION

1-3 Comment

Commenters supporting the Alternative Action stated that the WIPP facility must comply with the EPA standards prior to opening. Some stated that an impartial, independent body of scientists and technical experts should review all scientific, technological, and safety questions concerning the WIPP to ensure that the DOE is in compliance with EPA regulations. The credibility of the DOE was also questioned, and some commenters encouraged the DOE to avoid making hasty decisions and to stop putting political and financial gain above human life.

2.0 NATIONAL ENVIRONMENTAL POLICY ACT

2.1 1980 WIPP FEIS

2.1-1 Comment

The Environmental Evaluation Group (EEG), the Attorney General of the State of Texas, and other groups and individuals commented that the 1980 FEIS (DOE, 1980) on the WIPP was not adequate. One individual also commented on deficiencies of the 1980 Draft Environmental Impact Statement (DEIS). Several of the commenters stated that since the FEIS was not adequate, and because the draft SEIS builds upon the FEIS, the draft SEIS is also inadequate.

2.1-1 Response

The DOE disagrees with this comment. The adequacy of the 1980 FEIS was adjudicated in a Federal District Court in New Mexico. The court found that the WIPP FEIS was a comprehensive, good faith, objective and reasonable presentation of the subject area mandated by the NEPA, that it adequately informed the decisionmakers of the WIPP's potential effect on the human environment, and that it fulfilled the requirements of Sec. 102(2) (c) of the NEPA, 42 U.S.C. 4332 (2) (C), in regard to the WIPP project. (See Southwest Research and Information Center, Inc. vs. United States Department of Energy, Civil No. 81-0537-JB [D.N.M. 1984].)

2.2 SEIS SCOPING

2.2-1 Comment

Several individuals commented that the WIPP is not large enough to hold all of the DOE TRU waste.

2.2-1 Response

The commenters are correct. The WIPP as proposed would ultimately have the capacity to dispose of post-1970 defense TRU waste currently in retrievable storage and anticipated to be generated through the year 2013. The DOE does not now propose to dispose of pre-1970 buried TRU waste in the WIPP (see the response to comment 2.2-2).

2.2-2 **Comment**

Several individuals questioned the management of all DOE TRU waste, not just the retrievably stored waste generated since 1970. Several individuals commented that the DOE needs a plan which would include NEPA documentation, in order to handle all DOE radioactive waste (including low-level waste). Another commenter stated that waste generating facilities like the Special Isotope Separation Facility should not be constructed because they will generate additional waste. One individual asked what will be done with TRU waste once the WIPP is full and whether all the Rocky Flats Plant waste will go to the WIPP. An official of the State of Idaho commented that all waste in temporary storage at the Idaho National Engineering Laboratory should be removed and emplaced at the WIPP. Another commenter asked what would be done with TRU waste if the WIPP fails to open and what plans the DOE has for additional projects like the WIPP.

2.2-2 **Response**

The type of waste proposed to be disposed of in the WIPP underground facility is limited to TRU waste from defense programs generated since 1970. Therefore, the discussion of all DOE waste management activity is outside the scope of this SEIS.

The DOE has issued a draft plan entitled "Environmental Restoration and Waste Management 5-Year Plan" (DOE, 1989j), which addresses the process by which the DOE will proceed to consider its future waste management activities including management of buried TRU waste (see also the response to comment 3.1-7). Appropriate NEPA documentation will be prepared for the activities covered by that plan as well as other proposed projects which generate additional waste see also response to comment
2.2-3.

The WIPP has an anticipated operational life of 25 years. The DOE currently has no plans for additional projects like the WIPP for TRU waste disposal. However, during this 25-year period of WIPP operations, the DOE would develop options for disposal of TRU waste beyond the year 2013. During permanent disposal operations, the WIPP is expected to dispose of TRU waste (post-1970 through 2013) from 10 DOE generating facilities. All the Rocky Flats Plant TRU waste would go to the WIPP, as would all the Idaho National Engineering Laboratory TRU waste in retrievable storage.

As stated in Subsection 3.1.1, the WIPP design capacity is sufficient to encompass TRU waste generated from new or planned defense-related facilities (e.g., the proposed Special Isotope Separation Facility and the Modular High Temperature Gas Cooled Reactor) through the year 2013.

2.2-3 **Comment**

A number of commenters, including the Idaho Attorney General, stated that the DOE needs to perform a NEPA review of system-wide radioactive waste management and that this approach would provide a basis for decision-making on nationwide DOE waste management issues. The comment was also made that the SEIS should evaluate waste retrieval, certification, and processing activities at the generator/storage facilities. The commenters stated that to address these activities in separate NEPA documents precludes a comprehensive analysis of environmental impacts associated with the WIPP by improperly segmenting related actions.

2.2-3 **Response**

The DOE has issued a draft "5-Year Plan" (DOE, 1989j) discussing the process by which the DOE will proceed to consider its future waste management activities. Appropriate NEPA documentation for the waste management activities addressed in that plan will be prepared see also the response to comment 3.1-7.

The Proposed Action is to proceed with the phased development of the WIPP. The next phase would be a Test Phase (approximately 5 years). Based upon the data generated during the Test Phase and preliminary performance assessment, the DOE would determine what waste treatment, if any, would be necessary for the waste to be disposed of at the WIPP. Possible waste treatments are discussed in Subsection 6.4.

Prior to such a decision, the DOE would prepare appropriate NEPA documentation on the system-wide impacts of any proposed waste treatment and associated change to the Waste Acceptance Criteria (WAC) (DOE, 1989e). Such NEPA documentation would analyze the associated waste certification and treatment activities at the 10 facilities. Regardless, the need for additional NEPA documentation based on the new information developed during the Test Phase would be determined and the documentation prepared, if appropriate. In addition, the DOE will issue another SEIS at the conclusion of the Test Phase and prior to a decision to proceed to the Disposal Phase; such a SEIS would analyze the system-wide impacts (including those from retrieval, handling, processing, and transportation) of disposal of post-1970 TRU waste in the WIPP.

The FEIS, in Subsection 9.8, analyzes the environmental impacts of on-site waste retrieval and processing for shipment to the WIPP from the Idaho National Engineering Laboratory. This SEIS discusses, in Subsection 5.2.1 and Appendix P, site-specific information on the TRU waste retrieval and processing activities at representative DOE generator/storage facilities. The DOE believes that this information and analysis adequately represents the likely impacts of retrieving and processing TRU waste at all 10 facilities for shipment (under the current WAC) to the WIPP during the Test and Disposal Phases. The DOE recognizes that additional site-specific NEPA review may be required and, accordingly, NEPA documentation has been prepared and is planned (see the response to comment 5.1-1).

2.2-4 **Comment**

Comments were received addressing the scope of the SEIS analyses. One individual stated that the SEIS should describe waste minimization and volume reduction practices at DOE facilities and the projected effects of the optimal implementation of these practices. Others stated that the SEIS should describe any and all activities at the

Idaho National Engineering Laboratory and the Hanford Reservation regarding preparations for waste shipment to the WIPP. Another commenter suggested that the PREPP (Process Experimental Pilot Plant) operations should be addressed, as well as the DOE's plans to construct additional facilities at other generator facilities. The EEG stated that the DOE facilities are beyond the conceptual design stage for retrieval and processing facilities. Other commenters questioned the environmental impact of these operations.

2.2-4 **Response**

The purpose of this SEIS is to evaluate the environmental impacts of the WIPP in light of new geologic and hydrologic information available since publication of the FEIS in 1980. This SEIS also takes into account changes in the WIPP that are related to transportation, management of mixed waste, and the waste inventory. This SEIS analysis uses the best data available, makes conservative assumptions where extrapolations are required, and uses state-of-the-art models to analyze the results.

Waste minimization and volume reduction practices (e.g., supercompaction) for the newly generated TRU waste have lowered the estimated volume of waste for disposal at the WIPP. This is in contrast to the estimated waste volumes used for impact analysis. The DOE has implemented aggressive waste minimization and volume reduction programs at its generating facilities. These programs will effectively reduce the volume of waste that could ultimately be shipped to the WIPP. Subsection 6.4 identifies a variety of processes which are being evaluated or have been implemented at various DOE facilities for the purpose of waste minimization, volume reduction, and waste stabilization. Subsection 5.2 has been revised and Appendix P has been added in response to comments on retrieval and processing facilities.

Also see the response to comment 5.1-1.

2.2-5 **Comment**

The EPA commented that the DOE should prepare either another supplement or document, when the DOE decides to proceed with disposal, in order to demonstrate compliance with the EPA's environmental radiation protection standards in 40 CFR Part 191 (EPA, 1985b). The EEG was concerned that compliance with 40 CFR Part 191 was not demonstrated.

2.2-5 **Response**

The DOE intends to prepare a document to demonstrate compliance with 40 CFR Part 191 (EPA, 1985b), Subpart B, and confirm compliance with the RCRA and other regulations prior to a decision to proceed with the Disposal Phase. This document would be available for interested parties to review during the latter stages of the Test Phase. During the Test Phase, the need for additional NEPA documentation based on the new information developed would be determined and the documentation prepared, if appropriate. In addition, at the conclusion of the Test Phase, another supplement to the EIS would be prepared. If there were a determination of compliance and a favorable Record of Decision on the new SEIS, the WIPP would move into the Disposal Phase. Prior to this new SEIS, the DOE intends to conduct briefings and to issue publicly available reports that update the status of performance assessment activities. The first such briefing is scheduled for March, 1990.

2.2-6 **Comment**

The State of New Mexico and other commenters criticized the DOE's failure to include, in the draft SEIS, the alternative of constructing an interim storage facility for TRU waste from the Rocky Flats Plant and other DOE facilities pending commencement of WIPP operations. Commenters contended that the DOE recognized that long-term interim storage of TRU waste is a reasonable alternative to the WIPP.

2.2-6 **Response**

Storage of TRU waste from the Rocky Flats Plant, the Idaho National Engineering Laboratory, or other DOE facilities is not part of the Proposed Action to proceed with the development and operation of the WIPP (Subsection 3.1) to demonstrate the safe disposal of defense generated post-1970 TRU waste. Alternatives for storage of such TRU waste are not reasonable alternatives to the WIPP except as a part of the No Action Alternative.

Construction of a new storage facility is a separate action that could possibly be needed whether or not the phased development of the WIPP continues as proposed. The DOE is currently evaluating options for the storage of Rocky Flats Plant waste that exceeds its authorized storage limit. Such options for the next 3 years include other DOE storage facilities. Options for longer-term storage include U. S. Department of Defense facilities and potential commercial facilities as well as DOE facilities. Appropriate NEPA documentation will be prepared as part of this process.

This SEIS discusses the No Action Alternative of leaving TRU waste in retrievable storage facilities in Subsections 3.2.1 and 5.5. This topic is further elaborated on in the response to comment 5.2-2.

2.3 SEIS PREPARATION

2.3.1 DRAFT SEIS PREPARATION

2.3.1-1 **Comment**

Several commenters questioned the accuracy and consistency of some documents referenced in the draft SEIS because they have not been published and are still in draft form. One individual commented that the reference system is not explained and, thus, the flow of information is stopped. Several persons commented that it is not appropriate for the DOE to reference draft documents in the SEIS. Individuals complained that the copies of the reference documents provided to the libraries were of poor quality and/or not accessible to the public. Some commenters, including representatives from the States of Washington and Colorado, expressed concern over use of the draft Final Safety Analysis Report (FSAR) (DOE,1989a) as a reference in the draft SEIS for the WIPP. The Attorney General of Texas criticized the use of the draft FSAR in preparation of the draft SEIS because the final version of the document was not yet available to the public.

2.3.1-1 **Response**

The reference system employed in the draft SEIS is a conventional system typically used in NEPA documentation and in technical and scientific literature. Copies of most references submitted to reading rooms were of good quality. The few of poor quality were the best available reproduction and, although difficult to read, were legible.

The Council on Environmental Quality (CEQ) regulations on implementing NEPA procedures (40 CFR Parts 1500-1508) do not prohibit either the referencing or the incorporation by reference of draft documents. The requirement is that such referenced or incorporated material be "reasonably available" to interested persons within the time frame allowed for comment (40 CFR Part 1502.21). The DOE does not consider it necessary that all relevant documents be available in final form. The DOE relied on draft material only when, in its judgment, the document was close enough to final form such that any changes would not alter the DOE's conclusions. This is information complete enough to allow a reasoned choice among the alternatives.

All references including the draft documents cited in the draft SEIS were reasonably available to the public during the comment period. A list of all reading rooms and libraries where supporting documents were provided was in Appendix K of the draft SEIS. The public comment period of 90 days was adequate to review reference documents.

Also see the response to comment 2.3.2-3.

2.3.1-2 **Comment**

Several individuals commented that the draft SEIS is inadequate for a variety of reasons. General reasons included: 1) estimates are used rather than hard data, 2) estimates are overly optimistic and, in some cases, inaccurate, 3) computer modeling is biased, 4) critical studies have been deferred and data are inadequate, and 5) the draft SEIS is technically and procedurally flawed. More specific comments included: 1) the draft SEIS does not justify proceeding with the project, 2) the draft SEIS ignores probable changes in social and environmental conditions, 3) the draft SEIS contains several errors in mathematical calculations, and 4) the cracks above the ceilings and below the floors of the WIPP site are not discussed in the draft SEIS.

2.3.1-2 **Response**

Analysis of the entire WIPP program is a large, complex task because of the nature of the various components of the project. When approaching and solving such a complex task, there will always be differences of opinion among members of the technical community over which model to use, what input parameters are appropriate, and the timing of various studies. Over the years, the DOE has collected a large amount of data specific to the WIPP. In performing the environmental analysis for this SEIS, the DOE has used the most recent representative information available. (This information includes that provided by the EEG, independent scientists, and others. Refer to the response to comment 7.9-16 for an analysis of how the DOE considered this information in this SEIS and to Subsection 5.4.2.4, Analysis of Scenarios Initial Condition, as an example of how such information is included in the text.) Where data were not available, it was necessary to use engineering judgment in order to establish a value or parameter input. In its computer modeling and analytical techniques, the DOE was careful to use conservative assumptions. The validity of the assessments has been improved in response to public comments.

During the Test Phase, a series of gas generation tests using actual TRU waste would be performed underground at the WIPP. As stated in this SEIS, information on the rate and type of gases generated by the decomposition and interaction of the waste would provide important input parameters used in calculations to determine the long-term performance of the WIPP. The National Academy of Sciences WIPP Panel and the EPA recently conducted independent reviews of the gas generation tests and concluded that the series of tests proposed are warranted and should proceed (Parker, 1989; Guimond and Lowrence, 1989) (see Subsection 3.1.1.4 and Appendix O).

Long-term environmental changes and their potential impacts on the WIPP were assessed in the FEIS and the draft SEIS. Errors in the draft SEIS which were identified during the review process are corrected in this SEIS. Any cracks in the ceilings of underground openings are being mitigated by the installation of rock bolts. The cracks are not expected to affect the long-term performance of the repository (see Subsections 4.3.2.4 and 6.2 in this SEIS and the response to comment 7.7.2-1).

Prediction of long-term societal changes and potential impacts is highly speculative at best. As noted in Subsection 5.4, calculations of long-term consequences are based on current technologies, social patterns, agriculture, diets, etc., because there is no credible rationale for selecting a likely future among the unknowable possibilities during the thousands of years considered. In effect, the SEIS uses the present era to illustrate a possible future.

The DOE is rigorously complying with the procedures governing review of and public comment on this SEIS document as required under the NEPA process. The DOE extended the public comment period from 45 to 90 days and held public hearings in nine cities.

Considering all these factors, the DOE believes this SEIS provides an adequate basis for proceeding with the Proposed Action (see Subsection 1.3 for additional details).

2.3.1-3 **Comment**

Some commenters, including the EEG and the Attorney General of Texas, stated that the draft SEIS had many inconsistencies, especially with regard to the use of footnotes and units of measures on tables. More specifically, those concerns were:

- The units in Table 5.34 (micrograms/m^3) are missing (page 5-78).
- In Table 5.36, footnote "a" is missing (page 5-82).
- The units in Table B.2.2 are missing and contain seven-place accuracy for two thirds of the waste yet to be produced (page B-4).
- The units in Table B.2.3 have been omitted (page B-5).
- Table B.2.4 lacks a definition of "volume scale-up" (page B-6).
- Tables B.2.5 and F.11 lack units (pages B-8 and F-16).
- Table B.2.11 incorrectly describes waste mass and activity as "grams per drum" and "Ci per drum" (page B-17).
- Appendix "D" should instead be "E" (page E-5).
- The parameter in equation (18) should be listed at 10E-14 (page E-57).
- The summary incorrectly lists the chemical formula for methylene chloride (page G-4).
- Figure I.1.1 is incorrectly identified in the text (page I-7).
- Table I.1.3.1 does not clearly distinguish in referencing Pu-238 or Pu-239 (page I-13).
- The concentration and flux values in Table I.1.3.3 appear to be at least 20 percent too low.
- A reference to Table 5.7 is incorrect (page I-18).
- The void ratio stated is not clear (page I-15).
- The summary in Subsection 4.2.2 refers to feet while the charts are calibrated in meters (page 4-7 and 4-11).
- The term retrievable should be defined.
- References are not footnoted throughout Section 5.

- Tables throughout Section 5 do not have sources listed.

- Tables 5.2, 5.3, 5.6, and 5.7 cannot be studied without references (pages 5-10, 5-11, 5-20, and 5-21).

- Table 5.35 is not clear enough to be understood by the public (page 5-79).

- Table 3.3 should be changed to be consistent regarding all units (page 3-7).

- Subsection 10.3.1 is incorrectly referenced in the draft SEIS (page 1-1).

2.3.1-3 **Response**

All 209 tables in the draft SEIS have been reviewed in light of these comments and errors have been corrected. Although no tables were without any units of measurement, the units of measurement were not identified in a consistent location or manner in each table.

These tables have been modified to reflect the appropriate units, add footnotes, correct typographical errors, provide clarification, and identify sources. This SEIS has been modified to show English and metric units together, where appropriate.

The Glossary has been revised to incorporate "retrievable" and other terms.

For more technical information regarding these discrepancies, also see comments and responses 7.9.5-2, 7.10-13, 7.10-18, 7.14-9, 7.14-10, 7.14-15, and 7.14-24.

2.3.1-4 **Comment**

Members of the EEG noted that several documents referred to in the draft SEIS were not included in the reference lists (1978 contract establishing the EEG, public law establishing the EEG, Consultation and Cooperation Agreement, 5-year test plan, etc.).

2.3.1-4 **Response**

The DOE agrees with this comment. The reference lists in this SEIS have been corrected.

2.3.1-5 **Comment**

The EEG commented that only one of the references on page 9-4 of the draft SEIS has been documented and cited properly and that other references should be included as well.

2.3.1-5 **Response**

The DOE agrees with this comment. The references have been corrected.

2.3.1-6 **Comment**

The EEG noted that on page B-15, paragraph 1, the proper citation for the phrase "updated by WIPP, 1989" needs to be provided.

2.3.1-6 **Response**

The DOE agrees with this comment. The text has been modified to reflect the correct citation.

2.3.2 CONSIDERATION OF DRAFT SEIS COMMENTS

2.3.2-1 **Comment**

Comments were received concerning the draft SEIS review period. Individuals commented that the draft SEIS review period should be extended because they believe that the comment period was inadequate time to review such a large document and because some draft SEIS references were not available. Some commenters expressed gratitude for the opportunity to express their opinions and for the extension of the comment period. In addition, a general complaint was made by people who requested copies of the draft SEIS and either did not receive a copy or the copy they did receive was mailed too late for them to adequately review the document to their satisfaction.

2.3.2-1 **Response**

As part of the NEPA review process for the SEIS, the DOE has actively sought public comment and participation on the draft SEIS. The period for review and comment on the document was extended to 90 days based on reviewers' requests. In addition, public hearings were held in nine cities across the country when six hearings were originally planned (see Appendix H and responses to comments in Section 8.0).

The draft SEIS contained more than 350 references. Most of these references were mailed to the DOE reading rooms and libraries (see Appendix K) by April 20, 1989 (also see response to comment 2.3.1-1). About 24 additional references were shipped between May 3 and June 12, well before the July 20, close of the public comment period. Delays in mailing were encountered because of the difficulty in obtaining author releases, the need to avoid copyright infringements, and the nature of some of the references (i.e., books and periodicals that were available only from the publishers). The DOE believes that the delay in library/reading room receipt of these references did not preclude meaningful public analysis of the draft SEIS because of their availability more than 30 days before the close of the comment period, and the nature of the references (e.g., fundamental text materials).

The DOE mailed more than 1,400 copies of the draft SEIS to interested individuals and organizations across the United States. In addition, many local libraries and DOE public reading rooms received the draft SEIS (see Appendix K). Few commenters, relative to this large number of recipients, expressed a concern of late receipt of the draft SEIS. The DOE believes that the widespread distribution of the draft SEIS to libraries and reading rooms allowed for meaningful public analysis, especially given the length of the comment period (90 days).

2.3.2-2 **Comment**

Several individuals commented that the DOE should objectively consider comments prior to taking any action and that the draft SEIS review should not be a meaningless exercise in complying with procedural requirements of the NEPA. An Idaho, the Senator commented that NEPA requires environmental effects and alternatives to be analyzed in the decision-making process. Several commenters expressed frustration and certainty that the DOE was only considering these comments with "closed minds" or "deaf ears." The Attorney General of Texas stated that the DOE was "attempting to limit public input and to proceed through the NEPA process in a manner which virtually ensures that public comment will be ignored." A commenter stated that independent oversight entities' roles in the decision-making process must be clearly stated in the SEIS. One individual commented that the DOE has already decided what to do so the SEIS is not truly a decision-making document. These comments on the decision-making process are closely tied to comments on the DOE's credibility and ethics which are covered in comment and response 3.2-1.

2.3.2-2 **Response**

In soliciting public comments on the draft SEIS, the DOE has complied with the CEQ regulations in 40 CFR Parts 1500-1508 for the "procedural" provisions of the NEPA. These require, among other things, that agencies integrate the NEPA process with other planning and environmental review procedures and make "diligent efforts to involve the public." This has been accomplished through a 90-day public review period on the draft SEIS, public hearings in nine cities around the country, and responses to over 20,000 comments on the draft SEIS. All comments received were carefully evaluated, and responded to in this SEIS.

Also, the purpose of the SEIS is to address modifications proposed and new information developed since the 1980 FEIS. The DOE's proposal to proceed with the phased development of the WIPP in light of the new information and proposed changes addressed in this SEIS will be documented in a publicly available Record of Decision.

The roles of external oversight organizations are discussed in Subsection 10.3.

2.3.2-3 **Comment**

It was suggested that the SEIS should be delayed until the FSAR (DOE, 1989a) is finalized. Because technical issues regarding the SEIS are analyzed in depth in the FSAR, a comprehensive assessment of the environmental impacts is impossible without having it as a reference. The State of New Mexico also noted that the WIPP draft FSAR and draft Test Plan documents were not well coordinated with or within the draft SEIS and that the draft FSAR for the WIPP should include sufficient documentation that WIPP can be operated safely.

2.3.2-3 **Response**

This SEIS and the draft FSAR (DOE, 1989a) serve two separate functions for the WIPP project. This SEIS serves to assess the environmental consequences of the phased development of the WIPP and alternatives. Typically, the NEPA documentation for a project is completed before the FSAR is finalized. In the case of the WIPP, preparation of this SEIS began after significant progress on the FSAR had been made. As a result, this SEIS and the FSAR are being finalized at nearly the same time.

The draft FSAR has been prepared to satisfy the requirements of DOE Order 5481.1B Safety Analysis and Review System (DOE, 1988a) and the commitments made in the "Working Agreement for Consultation and Cooperation" (Working Agreement) (DOE, 1981c) between the State of New Mexico and the DOE. The purpose of the draft FSAR is to document that a systematic analysis of the potential hazards associated with operating the WIPP has been performed, that potential consequences have been analyzed, and that reasonable measures have been taken to control or mitigate the hazards.

The scope of the draft FSAR is to address hazards for the 25-year design life of the WIPP, acknowledging that the decision to operate the plant for 25 years has not been made and will not be made until the DOE can successfully demonstrate compliance with applicable regulations. The draft FSAR considers operations at waste throughput rates equivalent to the design basis with the general belief that lesser throughput rates and shorter operating periods are bounded by the design conditions.

SARs are controlled documents that are updated periodically. The designation "Final" is given to indicate that a Safety Analysis Report is for a facility that is ready to begin operating versus a "Preliminary" SAR which generally refers to a facility in the design or construction stage. As indicated above, FSARs must be amended to reflect significant changes in operations or in the factors that affect operation; the FSAR will be reviewed at least every three years.

The DOE envisions that reasonably foreseeable potential accident scenarios that might occur during the Test Phase, specifically during the bin- or alcove-scale tests as currently planned (see Appendix O), would be bounded by the accident scenarios of this SEIS. The DOE anticipates preparing addendums to the FSAR to specifically analyze Test Phase activities, including Test Phase modifications, retrieval activities, and decommissioning of the WIPP. These analyses would be reviewed to determine whether additional NEPA review is required by the CEQ regulations and the DOE guidelines for complying with the CEQ regulations (DOE, 1987f).

When information from the draft FSAR or draft Test Plan is utilized in this SEIS, the document has been referenced to assist the reader in determining the source of the information. The two draft documents have been coordinated with this SEIS to a large extent since all three documents have been developed in the same time frame. The DOE relied on draft material only when, in its judgment, the information was close enough to final form such that any changes would not alter the DOE's conclusions and complete enough to allow a reasoned choice among the alternatives.

A summary of the Test Phase experiments is included in Appendix O of this SEIS. See also the response to comment 2.3.1-1.

2.3.3 FINAL SEIS PREPARATION

2.3.3-1 Comment

A New Mexico State Senator, the State of Washington Department of Ecology, and the Attorney General of Texas (among others) commented on the preparation of the final SEIS. Comments were received that the DOE should issue a revised draft SEIS and hold additional public hearings and another public comment period. It was also stated that a second draft SEIS is required because risk assessment assumptions are not fully explained and supported. A redrafted SEIS was recommended to evaluate the impacts of volume changes at the Rocky Flats Plant. Comments were made to the effect that the SEIS should not be finalized until waste transport container testing and certification and public disclosure of results are completed.

2.3.3-1 Response

The DOE believes that the draft SEIS was adequate to permit meaningful public analysis and does not agree that revising and reissuing the draft SEIS for public comment is necessary. The EPA gave the draft SEIS an EC-2 rating. This rating indicates that the EPA has environmental concerns and that more information is requested. The EPA system includes the qualitative categories LO, EC, EO, and EU (signifying lack of objections, environmental concerns, environmental objections, and environmentally unsatisfactory, respectively). A number is assigned to the category to indicate that there is adequate information (1), that additional information is required (2), or that there is insufficient information (3). The EPA did not request reissuance of the draft SEIS. The risk assessment assumptions are more fully explained in this SEIS.

The impacts of waste volume minimization at the Rocky Flats Plant are bounded by the analyses in this SEIS. Also, the effects of supercompaction and its impacts are discussed in Subsection 5.2.2.

In regard to the use of the TRUPACT-II container for transporting waste, the DOE has obtained a certificate of compliance from the U.S. Nuclear Regulatory Commission (NRC) for the container.

2.4 DRAFT SEIS DISTRIBUTION

2.4-1 Comment

An individual commended the DOE for making copies of the draft SEIS and supporting documents readily available to the public. Another person questioned how certain locations were chosen to receive WIPP documents.

2.4-1 Response

The DOE provided copies of the FEIS, draft SEIS, and the reference documents to all DOE public reading rooms. Copies of the FEIS and draft SEIS were sent to the State library which handles government publications in each of the 23 States potentially affected by WIPP operations. Copies of the FEIS, draft SEIS, and references were also sent to community libraries in the host State, New Mexico (see Appendix K).

Also see the response to comment 2.3.2-1.

2.5 SEIS PUBLIC HEARINGS

2.5-1 Comment

Several individuals commented that the public review period should be extended and that additional public hearings are warranted. Additional hearings in Utah; Amarillo, Texas; and Roswell, New Mexico were specifically requested. Others questioned the DOE's method of deciding where to hold hearings. Some commenters expressed gratitude for the opportunity to voice their views at the hearings and supported the DOE for providing the opportunity for public comments on the draft SEIS. Several commenters, including an elected official of the State of New Mexico, stated that notification of speaking times at public hearings was not adequate and, several Commenters objected to the way the hearings in Santa Fe, New Mexico (one of nine locations where hearings were held) were conducted.

2.5-1 Response

The DOE extended the public comment period to 90 days and sponsored public hearings in nine locations in seven States (see Appendix H). Briefings were held for State governmental officials in 20 States. In addition, there were Federal Register notices, press releases, and dozens of public service radio and newspaper announcements to publicize the hearings. Hearing locations were selected on the basis of public interest demonstrated in particular geographic areas. In all respects, the DOE met or exceeded the CEQ public involvement requirements in 40 CFR Part 1506.6.

Also see the responses to comments 8-6 and 8-7.

2.6 COUNCIL ON ENVIRONMENTAL QUALITY REGULATIONS

2.6-1 Comment

Commenters focused on the scope of the NEPA with respect to WIPP documentation and stated that the DOE had provided the necessary documentation with the FEIS; therefore, commenters questioned the need for the draft SEIS. A State Senator from Idaho commented that the NEPA requires analysis of the environmental effects of alternatives and their influence on the decision-making process.

2.6-1 Response

This SEIS was prepared to address changes in the understanding of hydrogeologic characteristics of the WIPP site as they relate to long-term repository performance and to address several changes in the Proposed Action (see Subsection 1.4) since the 1980 FEIS was published. The DOE believes that all of the requirements for NEPA implementation contained in the CEQ regulations (40 CFR Parts 1501-1508) have been followed and that this SEIS is a necessary and useful document.

2.7 RECORD OF DECISION

2.7-1 Comment

One commenter noted that, if the decision to proceed with the WIPP as a repository is yet to be made, then the 1981 Record of Decision should be withdrawn.

2.7-1 Response

The DOE proceeded with construction of the WIPP based on the 1981 Record of Decision (DOE, 1981). It is unnecessary and inappropriate to withdraw this Decision. The DOE will issue a new Record of Decision documenting its decision on implementing the Proposed Action or the alternatives analyzed in this SEIS.

2.8 COOPERATING AGENCY

2.8-1 Comment

It was commented that the DOE did not adequately include the U.S. Bureau of Land Management (BLM) as a "cooperating" agency in the preparation of the draft SEIS.

2.8-1 Response

The DOE does not agree with this comment. The BLM was involved in the preparation of this SEIS at the request of the DOE as provided for in the CEQ regulations in 40 CFR Part 1501.6. The U.S. Department of Interior also commented on the draft SEIS according to the requirements of 40 CFR Part 1503, as well as on this SEIS before it was published. See Subsection 10.2.3 for additional details.

3.0 **POLICY**

3.1 DOE AUTHORITY AND RESPONSIBILITY

3.1-1 Comment

Senators from New Mexico and Idaho, the Carlsbad Department of Development, and others commented positively with regard to the issue of Public Health and Safety. They expressed confidence that the WIPP site is an appropriate location to emplace TRU waste as the nation's first permanent nuclear waste disposal site. They also expressed confidence in DOE professionals who are responsible for making the WIPP "as safe as man can build and design it." One commenter stated that the probability of injury from waste transportation and emplacement was orders of magnitude less than injury or death from other sources (e.g., auto accidents). Several commenters noted that no one can guarantee that waste disposal at the WIPP is "risk free," although it is much less risky than shallow land burial of TRU waste at existing facilities. The commenters are aware that environmental and safety concerns must be adequately addressed and not compromised, but as one commenter stated, ". . . further unnecessary delays may hamper waste management efforts."

3.1-1 Response

Since the mid-1970s, the DOE and various external oversight organizations have intensively studied the WIPP project and the consequences of its planned operations. The DOE is actively evaluating the WIPP as a potential long-term, environmentally sound solution to the disposal of the TRU waste which is currently stored on the surface at several DOE facilities. Before the WIPP becomes a permanent disposal facility for TRU waste, the DOE is committed to complying with all other applicable environmental and health and safety requirements. The decision regarding whether to use the WIPP as a permanent repository would be made following completion of a proposed Test Phase and appropriate consultations with New Mexico and other agencies and organizations. Also see the response to comment 3.1-2.

3.1-2 Comment

Several hundred comments were received expressing various degrees of general concern about the impacts of WIPP waste transportation, emplacement, retrieval, and operations on public health and safety and/or the environment. The comments can be grouped in the following categories:

1) The WIPP is not safe.
2) The WIPP should not be opened until proven safe.
3) There are many unknown factors about the safety of the WIPP.

4) What the DOE says about health and safety is not credible.
5) The WIPP can never be made safe.
6) Health and safety concerns have not been adequately addressed.
7) The WIPP will not be safe until it complies with EPA standards in 40 CFR Part 191 (EPA, 1985b), RCRA, and other laws and regulations.
8) The WIPP poses a risk to present and future generations, New Mexico, the nation, and the Earth in general.
9) Highway improvements promised by the DOE have not been made, thus jeopardizing the safety of the public.
10) The DOE has not provided an adequate level of community emergency response.
11) Increased cancer rates of communities surrounding existing DOE facilities prove the DOE is a threat to public health and safety.

Opinions on the public health and safety issue varied widely; the following are representative:

- The WIPP has no proven safety record.
- The DOE is "rushing" the opening of the WIPP, putting the WIPP on a "fast track."
- The DOE is not "leveling" with the public on safety issues.
- WIPP safety should be "guaranteed" for thousands of years (up to 240,000).
- The WIPP should be delayed until it is 100 percent safe.
- The opening of the WIPP is a political decision and forfeits public health and safety.
- The DOE and the States must insure safe transporation of TRU waste.

Many comments expressed anxiety, uncertainty, and apprehension about the health and safety issue.

3.1-2 **Response**

The DOE is extremely cognizant of health and safety concerns relating to WIPP waste transportation, emplacement, long-term isolation, and (if necessary) retrieval. Numerous analyses which pertain to both the health and safety of workers and the general public have been conducted. These include the 1989 draft FSAR (DOE, 1989a) and this Supplement to the 1980 FEIS.

Secretary of Energy James D. Watkins' 10-point initiative for environmental protection and waste management of June 27, 1989, includes the following health and safety measures:

- Resetting of priorities to reflect that safety and health issues are more heavily weighted than production.

- Allowing direct access by States hosting DOE nuclear facilities to information pertaining to implementation of State monitoring programs.

- Modifying criteria for awarding DOE contractor fees to reflect increased emphasis on environment, safety, and health.

- Strengthening the environment, safety, and health capabilities of DOE line managers.

- Appointing an independent panel to restructure the DOE's epidemiology program, including a National Academy of Sciences (NAS) Committee to oversee epidemiology research requests.

- Forming of a "blue ribbon" panel of recognized experts from industry, academia, and government to review current plans for demonstrating the WIPP's technical and operational adequacy.

The overall health and safety status of the WIPP will be evaluated by the ability of the facility to comply with a wide range of environmental and health and safety laws, regulations, and agreements including but not limited to:

- The EPA Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Waste (40 CFR Part 191) (EPA, 1985b)

- The Federal Land Policy and Management Act (FLPMA) of 1976, 42 U.S.C. 1714 et seq.

- The Resource Conservation and Recovery Act (RCRA), 42 U.S.C. 3251 et seq.

- The Clean Air Act, 42 U.S.C. 7401 et seq.

- The Clean Water Act, 33 U.S.C. 1251 et seq.

- The NRC Certification of TRUPACT-II (certified August 30, 1989)

- The Agreement for Consultation and Cooperation between the DOE and the State of New Mexico of November 27, 1984, as amended.

These requirements are discussed in Subsection 10.1.

The DOE is fully committed to compliance by the WIPP with all applicable environmental, safety, and health requirements at the local, State, and Federal levels. No decision will be made to commence the Test Phase or to operate the WIPP as a permanent waste repository until all necessary compliances have been assured. Even then, the DOE will make a decision only after appropriate consultations with the State of New Mexico, the BLM, the EEG, the NAS, and other "oversight" organizations as discussed in Subsection 10.3.

3.1-3 **Comment**

A considerable number of comments were received concerning compliance by the WIPP with the EPA Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes (40 CFR Part 191) (EPA, 1985b). Comments were received from the New Mexico Congressional delegation, the EPA, the New Mexico Department of Energy, Minerals, and Natural Resources, the Environmental Evaluation Group (EEG), and a member of the Albuquerque City Council. Many commenters requested that the DOE not emplace any TRU waste in the WIPP, including during the proposed Test Phase, until Subpart B of the standards (remanded by a U.S. Court of Appeals in Natural Resources Defense Council [NRDC] vs. EPA) are repromulgated.

3.1-3 **Response**

The WIPP will comply with the EPA Standards for Management and Storage of TRU waste (40 CFR Part 191, Subpart A) (EPA, 1985b) and any other applicable regulations upon receipt of waste at the WIPP for any purpose in accordance with the second modification to the Agreement for Consultation and Cooperation between the DOE and the State of New Mexico (8/4/87). The facility will demonstrate compliance with the Standards for Disposal (40 CFR Part 191, Subpart B) (EPA, 1985b) and any other applicable regulations prior to any decision to utilize the WIPP as a permanent TRU waste repository. Since this topic is complex and requires a full discussion, Subsection 10.2.4 has been revised in response to these comments.

The EPA standards, including the recent court decision referred to in some comments, are discussed in Subsection 10.2.4. As stated in the Subsection, 40 CFR Part 191 is divided into two parts: Subpart A, "Standards for Management and Storage," and Subpart B, "Standards for Disposal." Subpart A sets limits on annual radiation doses to the public during storage operations at a disposal facility, while Subpart B establishes five different sets of requirements related to permanent disposal or long-term isolation.

A key requirement of Subpart B is that projected releases of radioactivity to the "accessible environment" (atmosphere, land surface, surface waters, and oceans) be limited to amounts specified in the standards. There are separate requirements to protect the public and ground waters for 1,000 years following disposal. The containment requirements of 40 CFR 191.13 require that radioactive waste disposal systems be designed to provide a "reasonable expectation" that cumulative releases of radionuclides over 10,000 years will not exceed levels specified in the standards (Appendix A, Table 1). Thus, the EPA standards specifically provide for "substantial uncertainties" in projecting system performance [40 CFR 191.13(b)]. Performance assessments are required to ascertain if the Subpart B standards can be met.

As a result of a lawsuit against the EPA brought by the Natural Resources Defense Council (NRDC v. EPA, 824 F2d 1258), a U.S. Court of Appeals on August 4, 1987 vacated and remanded to the EPA Subpart B of 40 CFR Part 191 for reconsideration and repromulgation. The DOE has agreed with the State of New Mexico to comply with Subpart A of the standards upon initial receipt of waste at the WIPP and to continue performance assessment planning as if Subpart B remained effective. The performance assessment is part of the Test Phase described in Subsection 3.1.1.4 and Appendix O.

The EPA has prepared a "working draft" of modifications to 40 CFR Part 191. A proposed rule may be published in the Federal Register as early as mid-1990, although at present it is not possible to estimate a date for a final rule.

The DOE will comply with Subpart A of the 40 CFR Part 191 standards during the entire WIPP operational period (including the Test Phase) from the commencement of receipt of waste through closure and decommissioning of the facility. Compliance with Subpart A at the WIPP consists of three discrete activities:

1) During the WIPP design phase, performance predictions were made and are currently being updated to ensure the adequacy of facility design and operational planning. The FSAR (DOE, 1989a) will contain these performance predictions based on the most current information on waste characteristics.

2) An operational environmental monitoring plan for the WIPP has been prepared. This plan details Subpart A compliance activities and includes effluent monitoring, dose assessment, and radiological monitoring in accordance with DOE Order 5484.1 Chapter III (DOE, 1987a) and Draft DOE Order 5400.3 (DOE, 1988c). These orders specify reporting requirements and radiation protection requirements for all DOE facilities.

3) Subpart A compliance will be documented in a manner similar to that required by the DOE to demonstrate compliance to Subpart H of 40 CFR Part 61. The Annual Site Environmental Report will include an assessment of doses resulting from facility operations.

The DOE must demonstrate compliance with Subpart B of the standards prior to WIPP being designated as a disposal facility. The objective of the Test Phase is to provide additional data that would be used in a performance assessment that would allow a determination to be made of the long-term performance of the disposal system in accordance with the requirements of the standard. As discussed in Subsection 3.1.1.4 and Appendix O, bin-scale and alcove-scale tests would be conducted in order to provide needed data for the performance assessment calculation process. The tests are designed to yield data on the production, depletion, and composition of gases, as well as data on the behavior of transuranic constituents in Salado and Castile brines. The NAS has recently reviewed the gas generation tests proposed in support of performance assessment and has concluded that the bin-scale and alcove-scale tests "are warranted and should begin without delay." This comment was echoed by members of the Blue Ribbon Panel.

The emplacement of a limited amount of waste in the WIPP during the Test Phase would not signify that the DOE has determined the WIPP to be a permanent disposal facility. During the Test Phase, the waste would be fully retrievable. A decision as to whether or not to retrieve the waste emplaced during the Test Phase would be made when the results of WIPP's compliance with the EPA standards are known. Assuming that the WIPP complies with Subpart B of the standards, and successfully satisfies all other applicable regulations, it would qualify to become a permanent repository for TRU waste, including waste used in the Test Phase. Should the DOE ultimately decide that the WIPP cannot meet the EPA standards or other regulatory requirements, the test waste would be retrieved and placed into storage, and the facility would be decommissioned or put to other uses as appropriate.

Also see the response to comment 2.2-5.

3.1-4 **Comment**

Several commenters stated that the DOE's "unsubstantiated claims" regarding national security should not dictate opening the WIPP before the NEPA process is completed; that the DOE uses "vague" national security claims to invite political pressure to open the WIPP; and that the national security claim has no basis in fact. One individual commented that the institution of the WIPP itself breaches national security by risking the welfare and safety of the general population. A few commenters felt that, by delaying the opening of the WIPP, the national security is being jeopardized.

3.1-4 **Response**

All required NEPA documentation will be completed prior to opening of the WIPP. In addition, the DOE is committed to demonstrating compliance with all applicable environmental, health, and safety regulations. For additional information on the DOE's commitment, see the response to comment 3.1-2.

The language in Subsection 1.1 of the draft SEIS to the effect that delay in use of the WIPP could adversely impact national security was intended to illustrate that the absence of a disposal solution for TRU waste could in the long-term adversely impact nuclear weapons production and, therefore, national security. Because of the confusion created by the use of this phrase, the reference to national security implications in Subsection 1.1 has been deleted in this SEIS.

3.1-5 **Comment**

Several commenters raised questions regarding financial responsibility in the event of an accident or incident resulting in a release of radioactive materials. Questions addressed potential transportation accidents as well as releases from WIPP operations. Others commented that it is not acceptable that the DOE and its contractors are indemnified from financial liability by the Price-Anderson Act.

3.1-5 **Response**

The Price-Anderson Act would apply to any nuclear accidents involving the operation of the WIPP or any nuclear accidents involving the shipment of waste to the WIPP. However, the act applies to nuclear accidents generally, not just to the WIPP. Under the Act, coverage would apply to any accident in which there is harm or damage caused by the hazardous properties of the radioactive materials, including harm or damage caused by a release of radioactivity. Coverage extends to "precautionary evacuations." The Act indemnifies "any person" who may be liable. "Any person" includes not only DOE contractors and subcontractors, but also a State, county, or city. Thus, if a court determines that an accident resulting in a release of radioactivity occurred because a State, county, or city failed to maintain a road properly, place appropriate traffic signs, etc., the State, county or local government would be indemnified under the Price-Anderson Act.

The amount of coverage under the Act is approximately $7.3 billion per incident. If liability is found in excess of the amount provided, the Act states that the President of the United States shall submit to Congress a plan to establish a funding mechanism for the full and prompt payment of all valid claims.

All shipments of waste to the WIPP are covered both by private insurance maintained by the trucking company transporting the waste and by the provisions of the Price-Anderson Act. To cover a traffic accident in which there is no damage or precautionary evacuation caused by radioactivity, Dawn Trucking Company, the company awarded the contract to transport waste to the WIPP site, is required by the DOE to carry a $5,000,000 insurance policy should the company be liable for damage to persons or property.

Objections to the provisions of the Price-Anderson Act should be directed to the United States Congress. Additional information is available in Appendix C.

When the Congress enacted the 1988 Amendments to the Price-Anderson Act, it specifically considered the advisability of indemnifying DOE's contractors from financial liability through the Price-Anderson Act. The Congress addressed this issue by determining that, to ensure accountability of indemnified contractors, those contractors would be subject to statutory penalties for violations of DOE nuclear safety rules, regulations and orders.

3.1-6 **Comment**

A number of comments were directed at the perceived need for "oversight" of all WIPP-related activities by Federal and State agencies as well as "independent" scientific organizations and citizen groups. The NAS, Nuclear Regulatory Commission (NRC), EEG, EPA, and the University of New Mexico were most frequently nominated for WIPP oversight roles. One commenter suggested an oversight committee composed of one member from each State in which a DOE generator facility is located. Another comment suggested the formation of an "international" group to monitor the WIPP. One person stated that the WIPP legislation should be changed so that the NRC will have oversight over the project.

3.1-6 **Response**

The WIPP oversight and consultation role is addressed in detail in Subsection 10.3. Current and planned oversight, consultation, or regulatory roles are as follows:

- Environmental Protection Agency. The EPA has regulatory authority with regard to the Resource Conservation and Recovery Act (RCRA), the Clean Air Act, the Clean Water Act, and has established standards for the management and disposal of TRU waste (40 CFR Part 191) (EPA, 1985b). These acts and regulations are discussed in more detail in Subsections 10.2.1, 10.2.2, 10.2.4, and elsewhere.

- State of New Mexico. As discussed in Subsection 10.3.2, the State has a broad oversight and consultation role under the DOE-New Mexico "Agreement for Consultation and Cooperation" between the DOE and the State of New Mexico. This agreement was mandated by the WIPP authorizing legislation in Public Law 96-164. The State also has a consultation role under the "Supplemental Stipulated Agreement Resolving Certain State Off-Site Concerns Over WIPP," which resulted from a 1981 lawsuit by the State against the DOE. The Consultation and Cooperation Agreement has been amended several times.

- Environmental Evaluation Group (EEG). The EEG was established in 1978 as an independent technical and scientific oversight entity and has been intensively involved in every aspect of WIPP design, construction, and planned operation. The EEG operates under the auspices of the New Mexico Institute of Mining and Technology, through action of the Governor and a subsequent contract amendment. This arrangement was later mandated by Public Law 100-456.

- New Mexico Environmental Improvement Division (NMEID). The NMEID has regulatory authority over the WIPP in the areas of water quality, air quality, and solid/hazardous waste management.

- New Mexico Radioactive and Hazardous Waste Committee. This eight-member committee, created in 1979 by the New Mexico Legislature, reports to the full legislature on any recommendations for legislation concerning the WIPP and radioactive materials transportation under the Hazardous Materials Transportation Act.

- Department of Transportation (DOT). The DOT regulates hazardous and radioactive materials transportation under the Hazardous Materials Transportation Act.

- Nuclear Regulatory Commission. The NRC has certified the TRUPACT-II container for shipments to the WIPP and will certify the remote-handled (RH) waste canisters.

- National Academy of Science (NAS). The WIPP Panel of the NAS was formed to review scientific and technical aspects of the WIPP in such areas as: geochemistry, hydrogeology, statistical modeling, health physics, public safety, facility engineering, and systems engineering. The NAS WIPP Panel's oversight has included review of the proposed Test Plan. The NAS provides information to the Congress regarding its WIPP oversight role.

- Advisory Committee on Nuclear Facility Safety. Organized under provisions of the Federal Advisory Committee Act (Public Law 92-463), the Committee advises the Secretary of Energy regarding the safety of DOE facilities, including the WIPP.

- "Blue Ribbon" WIPP Review Panel. Under an initiative by the Secretary of Energy, a "Blue Ribbon Review Panel" was formed by the DOE with recommendations from the Governors of Idaho, Colorado, and New Mexico. The Panel is composed of experts from industry, academia, and government who are reviewing the WIPP's technical and operational adequacy.

- Mine Safety and Health Administration (MSHA). Although it has no formal jurisdictional role, the MSHA conducts periodic health and safety inspections of WIPP mining operations under a Memorandum of Understanding (MOU) with the DOE.

The DOE believes that these various legal requirements and institutional arrangements provide valuable and effective oversight of the WIPP. In addition, various New Mexico college and University faculty members have played, and will continue to play, at least an informal consultation role. Although the DOE is continuing to work with all transportation "corridor" States on resolving transportation issues, the DOE has no plans to establish an oversight committee of representatives from all affected States or an international group.

3.1-7 **Comment**

Several individuals commented that the WIPP is only a partial solution to the nation's nuclear waste management problems, and that there is a need for the DOE to develop a comprehensive plan to deal with all nuclear waste. It was also suggested that the DOE formulate a comprehensive waste management program as part of a national energy policy. One commenter urged that the DOE coordinate civilian and defense waste management programs.

3.1-7 **Response**

The DOE agrees with these comments.

As mandated by the Energy National Security and Military Applications of Nuclear Energy Authorization Act of 1982 (Public Law 97-60), the DOE developed a comprehensive Defense Waste Management Plan (DWMP) which was submitted to the President in May 1983. A key component of the DWMP was the eventual elimination of open-ended storage.

In August 1989, the first annual Environmental Restoration and Waste Management Five-Year Plan was submitted to the Congress and the Nation (DOE, 1989j). The Five-Year Plan is the DOE guidebook for environmental restoration of its nuclear-related waste sites and for compliance with applicable regulations. As is stated in the foreword of the

Five-Year Plan, the plan was " . . . developed to set DOE's strategy and activities for dealing with the wastes connected with this [the DOE] complex. The scope of the Five-Year Plan encompasses three discrete compliance-related activity areas: Corrective Activities, Environmental Restoration, and Waste Management Operations. 'Corrective Activities' denotes activities necessary to bring active and standby facilities into compliance with local, State, and Federal regulations. 'Environmental Restoration' includes the assessment and cleanup of surplus facilities and inactive sites. 'Waste Management Operations' is concerned with the treatment, storage, and disposal of wastes generated as a result of ongoing operations at the facilities."

Regarding the WIPP, the DOE is also aware of comments made by the Blue Ribbon Panel that call for system-wide integration of waste management activities. In response to these comments and comments on the draft SEIS, the DOE has initiated a task force to examine such system-wide issues as waste certification, storage needs, and other institutional planning issues. The results of the activities of the task force will be integrated into appropriate WIPP project activities.

In addition, the DOE is developing a national energy strategy. Among the issues to be considered in the strategy is environmental protection. In the Secretary of Energy's statement on this subject (July 26, 1989), he notes that " . . . the American people . . . demand that we do a better job of reducing harmful emissions, managing hazardous waste . . ."

The DOE is currently investigating a site in the tuff formations of southern Nevada for a geologic repository for the disposal of the high-level waste from commercial power plants and defense programs.

Also see the responses to comments 2.2-2 and 2.2-3.

3.1-8 **Comment**

A large number of commenters urged the DOE to make a "responsible decision" with regard to the WIPP. Many stated or implied that the opening of the WIPP is based on political maneuvering rather than on technically or scientifically informed judgments, and that the DOE's financial commitment to the WIPP has resulted in: 1) inertia that will not allow responsible decisions to be made, and 2) the WIPP being on a "fast-track." Many commenters expressed that this was the DOE's opportunity to "do it right" and to win back the respect and trust of the public. Others made pleas to the DOE's moral obligation to humanity, and to the preservation of the Earth.

3.1-8 **Response**

The DOE recognizes it has a broad responsibility to the public. The DOE is implementing a plan to fulfill its responsibilities for environmental protection and public health and safety with regard to DOE defense programs in general and to the WIPP in particular. On June 27, 1989, Secretary Watkins announced a 10-point initiative to ensure that public health and safety issues are given greater consideration than production goals at DOE facilities. As a result, the DOE is:

1) Beginning negotiations with States hosting DOE nuclear facilities to allow direct access and to improve monitoring capabilities.

2) Modifying the criteria for awarding contractor fees to reflect increased emphasis on environment, safety, and health.

3) Establishing independent "tiger teams" to conduct environmental compliance assessments.

4) Improving the way in which the DOE complies with National Environmental Policy Act (NEPA) documentation requirements and coordinates NEPA activities with governors of States which host DOE facilities.

5) Establishing a new management team within the DOE Office of Defense Programs to emphasize safety over production.

6) Strengthening the environment, safety, and health technical capabilities of line managers within the DOE organizational structure.

7) Appointing an independent panel to help restructure DOE's epidemiology programs, including creating a NAS oversight committee to oversee epidemiology research requests.

8) Establishing a comprehensive epidemiological data repository containing information on past and present DOE workers that can be used by any qualified researcher.

9) Requiring that milestones for achieving full compliance with occupational safety and health administration standards be included in the Defense Facilities Modernization Five-Year Plan.

10) Accelerating clean-up of DOE facilities by allocating an additional $300 million in Fiscal Year 1990 for activities consistent with the Environmental Restoration and Waste Management Five-Year Plan (DOE, 1989j).

Included in the 10-point initiative announcement was a decision that the WIPP would not open until the Secretary deems it safe and other key non-DOE reviewers are satisfied. A "blue-ribbon panel" of recognized experts from industry, academia, and government has been formed to review current plans for demonstrating WIPP's technical and operational adequacy. The NAS has been asked to advise the DOE on the adequacy of the geotechnical test program. Thus, the DOE is implementing significant initiatives to foster public confidence in DOE programs and assure responsible decision making.

This information is also contained in Subsection 10.1.

3.1-9 **Comment**

A number of comments were received from State agencies and elected officials on the need for coordination between the DOE and individual States. Most of the comments in this category were directed to various elements of TRU waste transportation, a major issue of concern to the States through which waste shipments would pass if transportation to the WIPP begins. These elements include, but are not limited to:

- scheduling of waste shipments
- notification of waste shipments
- in-route inspections of tractors, trailers, and cargo
- identification, selection, and use of safe parking areas and alternative transportation routes
- emergency response and cleanup (training and equipment)
- DOE's role as compared with roles of other Federal, State, regional, and local agencies
- need for clarity on timing of shipments from various sites
- compliance with State transportation regulations.

Many comments from New Mexico addressed the need for a highway bypass around the City of Santa Fe and the DOE's commitment to provide financial assistance for this project. New Mexico commenters also requested that the DOE provide financial assistance for general highway improvement. Other commenters expressed concern about waste shipments from Los Alamos National Laboratory to the WIPP site and the need to comply with all State transportation regulations.

California commenters were concerned about the timing of waste shipments from Lawrence Livermore National Laboratory and the Nevada Test Site, site-specific NEPA documentation, recognition of the "unique features" of the Los Angeles metropolitan area, and various forms of waste transportation coordination.

Colorado commenters were concerned about traffic conditions, inclement weather during waste transport, the need for more local and State authority over transportation, compliance with the Colorado Nuclear Material Transportation Act, the total number of WIPP shipments passing through Colorado, accident mitigation, compliance with RCRA transportation requirements, and the policy-making process.

Oregon commenters insisted that no TRU waste shipments be made through Oregon until each county has an emergency response plan in place.

3.1-9 **Response**

The DOE appreciates the concerns raised by these commenters. Accordingly, coordination with "corridor" States on transportation planning is continuing and will be accelerated. Additional information on transportation issues is available in Appendices C, L, and M and the responses to comments in Catagories 7.3 and 7.12, and the response to comment 5.1-1.

3.1-10 **Comment**

A large number of commenters, including two Senators, identified certain general issues that they stated must be resolved before the DOE opens the WIPP. Issues raised include: compliance with EPA regulations, application for a RCRA permit, providing adequate protection of public health and safety, national security implications, the establishment of oversight groups, the need for safe transportation routes, certification of shipping casks, trained first response people, qualified shippers, the need for interim storage facilities, and the implementation of the No Action Alternative. Other commenters cited NEPA and RCRA and TRUPACT licensing as issues that need to be resolved before the WIPP opens.

3.1-10 **Response**

The DOE recognizes that several major areas of concern, such as those identified by the commenters, must be satisfactorily addressed before waste can be received at the WIPP. The DOE has formulated a decision plan for the WIPP that integrates all steps to be completed in order to ensure that waste can be emplaced in the repository for the Test Phase in a manner protective of human health and the environment. This plan has been presented to appropriate State and Congressional officials and other parties for comment.

WIPP decision making continues to be an open process involving consultation and cooperation with many entities including the EPA, the State of New Mexico, the EEG, the NAS, and the Blue Ribbon Panel. Health, safety, and environmental issues pertaining to the WIPP will not be compromised. The areas of concern identified in the comment are addressed in more detail in responses to comments throughout this volume. The topic or subject area is identified in the Table of Contents of this volume.

3.2 DOE CREDIBILITY AND ETHICS

3.2-1 **Comment**

Several hundred commenters, including the Attorney General of Texas, Senators and Representatives from the States of New Mexico and Idaho, members of the New Mexico State Senate and House of Representatives, a member of the Colorado State Senate, city council members from cities in New Mexico, two mayors from cities in New Mexico and Colorado, and an Indian Tribal representative, questioned the honesty, integrity, and conduct of the DOE and the Federal government in general with regard to the WIPP, specifically. The most common concerns included:

- WIPP and non-WIPP information that was intentionally not disclosed or was misleading, incomplete, or biased.

- Concerns about the lack of public information on existing structural deficiencies at the WIPP (i.e., cracks).
- The lack of confidence in the DOE's ability to effectively manage a nuclear waste operation, exemplified by problems at the Fernald, Savannah River, Rocky Flats, and Hanford facilities, as well as failures of non-nuclear technology.
- The perceived attitude that environmental and human health and safety considerations were of little or no importance to the DOE in either the short- or long-term future.
- Concerns that the DOE is seeking waivers to environmental laws because they cannot comply with them.
- The lack of accountability and, therefore, responsibility for actions taken by the DOE, the Federal government, and contractors.
- The suspicion that the WIPP would open because it is politically and fiscally expedient and, thereby, would avoid meeting safety standards.
- Lack of confidence that the DOE would report a spill if it occurred.

A few commenters stated that the DOE is being honest and forthright about the WIPP and that the facility is safe, having been engineered and constructed by competent, intelligent people.

3.2-1 **Response**

The DOE recognizes that there is a credibility problem due to public perceptions of previous and ongoing DOE operations at various facilities around the country. The DOE is implementing a significant program to provide environmentally responsible direction and foster public confidence in DOE defense programs in general and in the WIPP in particular. On June 27, 1989, Secretary Watkins announced a 10-point plan to ensure that public health and safety issues are given greater consideration than production goals. The 10-point program is discussed in more detail in Subsection 10.1 and response to comment 3.1-8.

3.3 **STATE AUTHORITY AND RESPONSIBILITY**

3.3-1 **Comment**

Several commenters questioned the State of New Mexico's role and posture with regard to the WIPP. One questioned why the New Mexico State government was "allowing" the WIPP to proceed. Another suggested that some independent group evaluate the WIPP to ensure an unbiased analysis. The State of New Mexico requested that the

DOE develop a detailed plan for management and control of the WIPP withdrawal area during WIPP's operational life and after decommissioning of the facility and that this plan be developed in consultation with the State of New Mexico and the BLM.

3.3-1 <u>Response</u>

The State of New Mexico's participation in the design, construction, and operation of the WIPP has been established by various written agreements between the DOE and the State. These are discussed in Subsection 10.3.2. All existing and future plans for operation and decommissioning either have been or will be reviewed by the State.

The WIPP was authorized by Congress in Public Law 96-164 which requires, among other things, that the DOE "consult and cooperate" with the State of New Mexico on WIPP-related health and safety concerns. There is in place a "Supplemental Stipulated Agreement Resolving Certain State Off-Site Concerns Over WIPP" and a detailed "Agreement for Consultation and Cooperation" with the State. The Consultation and Cooperation Agreement has 11 major articles addressing a wide variety of environmental, health, and safety issues.

The DOE is committed to rigorous compliance with these agreements and consults regularly with the New Mexico Environmental Improvement Division (EID), the New Mexico Legislature's Radioactive and Hazardous Waste Committee, and the EEG. The latter is an independent WIPP oversight agency. Since the WIPP is a Federal project, the State of New Mexico does not have veto authority over its design and operation.

A management plan as requested by the State is provided for in several land withdrawal bills. The DOE supports such proposed management plans. A discussion of the roles and responsibilities of external oversight organizations is included in Subsection 10.3.

3.3-2 <u>Comment</u>

Various State officials, including the Governor of Idaho, and the State of California Energy Commission commented on State concerns about and State responsibility for TRU waste shipments to the WIPP, and their relationship to the DOE. Commenters from Idaho generally supported expediting the opening of the WIPP and discontinuing future shipments of TRU waste to the Idaho National Engineering Laboratory from the Rocky Flats Plant. One Idaho commenter claimed that the DOE had provided assurance that TRU waste would not be disposed of in Idaho and that pre-1970 waste would be "cleaned up." Several lawmakers urged that the DOE prepare both Idaho National Engineering Laboratory-related "programmatic" and site-specific NEPA documentation.

A California commenter pointed out the need for State "oversight" of waste preparation, certification, and packaging, in view of investigations of alleged improprieties at the Rocky Flats Plant. Oregon, Idaho, and Washington have apparently authorized a "Pacific States Committee" to ensure inspection of TRU waste shipments. A Colorado commenter inquired about accident mitigation, alternative transportation routes, avoiding

TRU shipments during peak traffic hours, and authority to inspect shipments during transit through Colorado.

3.3-2 **Response**

Under existing regulations, States have broad authority to participate in ensuring safe transport of TRU waste to the WIPP. Examples of States' roles include the right to designate shipment routes (following DOT guidelines), the responsibility of being the first responder to a transportation accident and the authority to serve as the on-scene response manager, and the right to conduct inspections of shipments at the point of origin, destination, or in route.

To reinforce and clarify States' roles and responsibilities, the DOE has been working directly with the states to resolve transportation issues. An example of this interactive relationship is a prospective Cooperative Agreement between the DOE and the Western Governors Association. Under this contractual arrangement, the states along the western corridor of routes to the WIPP would be performing analyses and addressing issues in the areas of accident prevention, emergency response and public information. The DOE expects to enter into similar arrangements supporting transportation-related activity by the states along other transportation routes to the WIPP.

The DOE has never intended that TRU waste which is currently in retrievable storage at the Idaho National Engineering Laboratory be permanently disposed of there, or elsewhere in Idaho.

Investigations are underway to provide a basis for long-term management decisions regarding buried pre-1970 waste at Idaho National Engineering Laboratory. Appropriate NEPA documentation is expected to be completed in 1991.

3.3-3 **Comment**

A few commenters made reference to Idaho Governor Andrus' efforts to ban the continued shipment of Rocky Flats Plant waste to the Idaho National Engineering Laboratory. Some stated that they supported the stand because it added impetus to establishing a waste repository.

3.3-3 **Response**

The DOE has been working closely with Governor Andrus and Governor Romer of Colorado to resolve the Rocky Flats Plant waste issue. However, the DOE does not support an Idaho "ban" on Rocky Flats Plant waste as a method of expediting the opening of the WIPP, nor would opening the WIPP necessarily resolve the Rocky Flats Plant waste storage issue. Also see the response to comment 5.4-4.

3.3-4 **Comment**

Some citizens of New Mexico stated that there has been an alarming lack of democratic process regarding the WIPP, in that citizens have not been afforded the opportunity to vote or have an impact on WIPP matters.

3.3-4 **Response**

The DOE disagrees with this comment. Opportunities for public comment and public participation in the WIPP decision-making process have been much greater than those for similar projects sponsored by other governmental agencies. Federal projects such as the WIPP, duly authorized by Congress, are not subject to public referenda. However, opportunities to present views to elected representatives who have voted on matters concerning the WIPP have been provided on numerous occasions. The New Mexico delegation of the Congress has been very active with regard to the WIPP. The "democratic process" has been continually at work.

The DOE has conducted the following public information and public participation activities regarding this SEIS for New Mexico citizens and elected officials:

- Notice of draft SEIS preparation (February 17, 1989)
- Notice of draft SEIS availability (April 21, 1989)
- 90-day public comment period on draft SEIS (April 21, 1989 - July 20, 1989)
- New Mexico Congressional Briefing (April 11, 1989)
- New Mexico State government briefings (February 3, 1989, April 19, 1989)
- Local New Mexico government briefings:
    - Albuquerque - May 15, 1989
    - Santa Fe - May 17, 1989
    - Carlsbad - May 18, 1989
- Native American meetings:
    - Council of Energy Resource Tribes - March 6, 1989
    - National Council of American Indians - March 7, 1989
- Environmental Evaluation Group meeting - February 3, 1989
- Public information meetings
    - Carlsbad - June 19, 1989
    - Roswell - June 19, 1989
    - Hobbs - June 21, 1989

- Public Hearings
  - Albuquerque - June 13-14, 1989
  - Santa Fe - June 15-16-17, 1989
  - Artesia - June 21, 1989

All public meetings and hearings were preceded by newspaper advertisements and radio public service announcements. Almost 9,000 pages of public comments were received by the DOE on the draft SEIS. The comments are summarized and responded to in this SEIS. Also, seven public hearings were conducted in New Mexico and elsewhere on the 1980 WIPP FEIS.

3.4 LEGISLATIVE MANDATE AND WIPP MISSION

3.4-1 Comment

Several commenters asked where the authority to construct the WIPP originated and why this effort was pursued. Others expressed concern about continuing WIPP activities, and questioned whether it was wise to expect the WIPP to contain the waste for thousands of years.

3.4-1 Response

A DOE predecessor agency, the Energy Research and Development Administration (ERDA), began initial WIPP site investigations under authority of the Atomic Energy Act. These activities were funded in ERDA's general authorization acts in 1975 and 1976; the WIPP first appeared as a line item in the 1977 authorization act. The mission of the WIPP was authorized by Public Law 96-164 in 1980 to provide a research and development facility to demonstrate the safe disposal of radioactive waste resulting from U.S. defense activities and programs. Thus, the purpose for the WIPP was determined by Congress, which has also approved all appropriations for construction.

The location near Carlsbad was selected following extensive field investigations and an exhaustive examination of the alternatives discussed in Sections 3 and 4 of the October, 1980 WIPP FEIS (DOE, 1980). The DOE's Record of Decision, published on January 28, 1981 (46 FR 9162) (DOE, 1981b), concluded that the Los Medanos site in southeastern New Mexico would be acceptable for long-term disposal of TRU waste. The environmental consequences of continued phased development of the WIPP are analyzed in this SEIS. The DOE's decision on implementation of the Proposed Action or alternatives will be documented in a Record of Decision.

3.5 HIGH-LEVEL RADIOACTIVE WASTE PROGRAM

3.5-1 Comment

Several individuals representing companies within the commercial nuclear power industry emphasized the benefits in technology and experience to be gained from the WIPP. The commenters stated that even though radioactive waste from the commercial nuclear power industry will not be stored at the WIPP, the expertise and knowledge gained at the WIPP will be readily translatable to developing the high-level nuclear waste repository at Yucca Mountain, Nevada.

3.5-1 Response

Certain technologies and the expertise gained from various elements of the WIPP project may be applicable to the high-level radioactive waste program at Yucca Mountain, Nevada. The DOE will continue to assess the two waste management programs and transfer applicable technologies and expertise.

3.6 NUCLEAR WEAPONS PRODUCTION AND NUCLEAR DETERRENCE POLICY

3.6-1 Comment

A U.S. Congressman from New Mexico, a local elected official, and many individuals commented that the production of nuclear arms should be discontinued immediately. Others commented that the production of weapons diverts resources from health care, environmental restoration, and other beneficial activities. Many observed that the WIPP would not be needed if arms production ceased.

Many commenters urged a cessation in the generation of nuclear (radioactive) wastes in one of two contexts: 1) an outright ban against nuclear waste generation (e.g., "stop producing any more nuclear waste"), or 2) a moratorium on nuclear waste generation until the waste can be rendered "harmless" or a safe method of disposal can be found. Except by implication, many in this group of commenters did not call for curtailing all nuclear weapons production and nuclear power generation per se.

Another commenter recommended stopping all radioactive waste generating processes until an absolutely safe disposal method is developed and eliminating the need for products and services that create radioactive waste. The commenter suggested this might be accomplished through investigation of solar power and other alternative energy sources, as well as recycling and energy conservation.

3.6-1 Response

The question of whether the U.S. should continue to produce nuclear weapons is beyond the scope of this SEIS. This is a matter of national policy, determined by the executive and legislative branches of the Federal government. The DOE does not establish this policy. It is true that weapons production resources could be applied to other beneficial activities, but the allocation of those resources is determined by elected representatives, not the DOE.

It is not true that the WIPP would be unnecessary if arms production stopped immediately. A long-term solution would still be needed for TRU waste in temporary storage at DOE facilities.

The complete cessation of nuclear waste generation is not practical. The DOE is not the only generator of nuclear waste. Medical organizations, academic research institutions, and the nuclear power industry (private) generate a significant percentage of the waste. Thus, cessation could negatively affect the medical, research, and utility industries in the United States. However, it is DOE policy to reduce and minimize radioactive waste generation at all of its facilities through the use of new processes or technologies.

3.6-2 **Comment**

Several individuals commented that the DOE should abandon plans to develop the WIPP and instead, store radioactive waste aboveground at the site of generation until more effective ways to manage waste are developed. Others commented that money should be spent to decontaminate existing polluted sites and to research alternative energy sources and alternative waste management methods, rather than to develop the WIPP.

3.6-2 **Response**

The alternative of leaving waste at the current storage facilities is evaluated in the FEIS and in this SEIS as the No Action Alternative (see Subsections 3.2 and 5.5). For additional information see the response to comment 5.2-1.

3.7 APPLICABLE REGULATIONS

3.7-1 **Comment**

Several individuals and groups provided comments regarding the applicability of the RCRA to the WIPP, the status of the project in complying with RCRA requirements, and the adequacy of the treatment of the RCRA in the draft SEIS. Several people stated that the DOE would be in violation of the RCRA if it were to receive radioactive mixed waste at the WIPP prior to obtaining a permit to do so under RCRA. One individual asked about the consequences of operating the WIPP under interim status authorization. Others commented that the DOE's plans for mixed waste characterization are not adequate. Some commented that the draft SEIS misrepresents the history of the RCRA's applicability to mixed waste. Some asked how the DOE would comply with the RCRA, if compliance with 40 CFR Part 191 (EPA, 1985b) is not demonstrated, but waste retrieval turns out to be impossible. Others asked about the cost of compliance.

3.7-1 **Response**

The applicability of the RCRA to the WIPP and the DOE's compliance strategy is discussed fully in Subsection 10.2.1. The hazardous component of DOE-generated radioactive waste which also qualifies as hazardous waste under RCRA is subject to regulation under the RCRA. The DOE is committed to compliance by the WIPP with all applicable environmental regulations including RCRA requirements such as those pertaining to transporting, handling, and emplacing radioactive mixed waste. The four major compliance issues are: 1) interim status authorization, 2) land disposal restrictions, 3) waste characterization, and 4) final RCRA permitting. Costs of compliance are unknown and are beyond the scope of this SEIS. Any waste emplaced during the Test Phase would be fully retrievable and handled consistent with the applicable RCRA requirements. Also see the responses to comments 3.7-2, 3.7-3, 3.7-4, and 3.7-5.

3.7-2 **Comment**

Several individuals commented on the RCRA No-Migration Variance Petition (DOE, 1989k) which the DOE has submitted to the EPA for the WIPP. Comments focused on the following points:

- General (i.e., nonspecific) opposition to the granting of the petition
- Adequacy of the petition
- Adequacy of waste characterization in regard to the petition
- How approval of the petition might impact the scheduled opening of the WIPP
- Description of the intent and purpose of the petition
- Description of the petition review process and opportunities for public input.

3.7-2 **Response**

The 1984 Hazardous and Solid Waste Amendments (HSWA) include a prohibition on the land disposal of hazardous waste [RCRA Section 3004(d)]. "Land disposal" is defined under the amendments to include any waste placement (storage <u>or</u> disposal) in land management units including salt dome formations, salt bed formations, underground mines, and caves. Thus, the WIPP qualifies as a land disposal unit. The HSWA requires that levels or methods of treatment (treatment standards) be established for groups of chemical and toxic wastes that would diminish a waste's toxicity, or reduce the likelihood that a waste's hazardous constituents would migrate in the environment. The amendments prohibit the land disposal of those wastes listed as not meeting the treatment standards according to a schedule of statutory deadlines ending May 8, 1990. Since some TRU mixed waste contains chemical constituents subject to the land disposal restrictions, some portion of the TRU mixed waste intended for emplacement at the WIPP would be subject to these restrictions. Several options are available under the regulations for accommodating these restrictions.

The DOE is currently pursuing a "no migration" variance from the land disposal restrictions. The RCRA regulations provide that the disposal of hazardous waste that does not meet the treatment standards is acceptable if a petitioner can demonstrate to the EPA "to a reasonable degree of certainty, that there will be no migration of hazardous constituents from the disposal unit . . . for as long as the wastes remain hazardous." "No migration" variance petitions to allow the land disposal of prohibited wastes are governed by 40 CFR 268.6.

The DOE submitted a petition for a no-migration variance to EPA headquarters on March 3, 1989. After a thorough review process, and prior to making a final decision on the petition, the EPA will publish a notice of its proposed decision in the Federal Register. The notice will discuss the EPA's technical basis for the decision and provide opportunity for public comment.

Granting of such a variance by the EPA would mean that DOE defense program facilities could ship and have emplaced in the WIPP, radioactive mixed waste that would otherwise be prohibited from land disposal. If the no migration variance is not granted, the DOE will consider other ways to comply with the EPA regulations. These might include treating waste in accordance with existing land disposal restriction treatment standards or proposing alternative approaches in accordance with established EPA procedures.

Subsection 10.2.1 has been modified to reflect this information.

3.7-3 Comment

One individual commented that uncertainties in regulatory requirements are delaying the implementation of sound waste management practices.

3.7-3 Response

The DOE has committed to the WIPP's compliance with the RCRA and with Subpart A of 40 CFR Part 191 (EPA, 1985b) and any other applicable regulations before any waste is received at the WIPP, and to the implementation of a Test Phase to gather data in order to demonstrate compliance with Subpart B of 40 CFR Part 191, prior to commencing the Disposal Phase. Even though these delays may be viewed by some members of the public as unfortunate, the DOE is committed, as a matter of policy, to the WIPP's complying with all applicable local, State, and Federal laws and regulations intended to protect public health and safety and the environment (See Subsection 10.1).

3.7-4 Comment

A commenter stated that the final SEIS should include a discussion of DOE procedures for meeting RCRA Part "B" permitting requirements at the WIPP. It was also stated that the DOE should comply with the RCRA by characterizing the waste and obtaining the RCRA permit before any waste is accepted on the site.

3.7-4 **Response**

The DOE is committed to the WIPP's complying with all applicable RCRA requirements. RCRA issues in need of resolution are detailed in Subsection 10.2.1. The DOE has completed all the necessary requirements to qualify the WIPP for "interim status" under the RCRA and parallel New Mexico requirements. The DOE has submitted a RCRA Part A application to the EPA and the State of New Mexico and will submit Part B of the permit application under 40 CFR Part 264, Subpart X to the State once it receives authority for a mixed waste program from the EPA. (Subpart X pertains to "miscellaneous" hazardous waste management units.) As permitted by the RCRA regulations, the WIPP may receive waste under interim status before a final RCRA permit is granted (see Subsection 10.2.1).

Waste characterization data exists for waste currently generated. Waste characterization for TRU waste that has been in storage for a number of years is based upon knowledge of the process from which the waste was derived, consistent with 40 CFR 262.11(c)(2). This characterization through process knowledge is being supplemented with a sampling program of the wastes to be used in the proposed bin-scale tests. Subsection 5.2.1 and Appendix P have been modified to reflect this sampling program.

3.7-5 **Comment**

Many commenters, including the Attorney General of Texas, were critical of the WIPP's failure to comply with environmental regulations such as the Safe Drinking Water Act (SDWA), the NEPA, and the Clean Air Act (CAA). More specifically, these commenters expressed concern that the DOE appeared "reluctant" to see a connection between its NEPA duties and obligations under other environmental laws, and has failed to address impacts which could result from the emplacement and subsequent migration or release of waste from the WIPP. Additional comments questioned the DOE's intent to seek appropriate permits for the activities regulated by the Safe Drinking Water Act (Underground Injection Control Program) and by the Clean Air Act (National Emissions Standards for Hazardous Air Pollutants program), and noted that the draft SEIS does not adequately describe these future activities.

3.7-5 **Response**

In response to these comments, Section 10.0, "Environmental Regulatory, Institutional, and Oversight Requirements," has been revised extensively to reflect the DOE's commitment to compliance by the WIPP with all applicable requirements of Federal, State, and local environmental protection laws. Subsection 10.1 provides an overview of "Regulatory Compliance Commitment and Strategy."

4.0 NEED AND PURPOSE

4.1 NEED

4.1-1 Comment

A number of individuals protested the selection of New Mexico as the site for the WIPP. One commenter inquired: "Why should New Mexico accept what Idaho and Colorado reject?" Another commenter suggested that New Mexico has been designated as the nation's "nuclear toilet." Reasons offered by commenters for WIPP being located in New Mexico included:

- The State's Hispanic and Native American populations
- New Mexico's image as a "third world State"
- Attraction of the WIPP to an economically depressed area (Carlsbad)
- The concept that New Mexico has low income, low population, barren land, and impoverished people.

One commenter claimed New Mexico has been "victimized by Easterners." Many of these comments were expressed with considerable emotion.

4.1-1 Response

The selection of the WIPP site approximately 26 miles east of Carlsbad, New Mexico, was not based on any of the factors suggested by the commenters. The site selection process, described in detail in Subsection 2.2 of the 1980 WIPP FEIS (DOE, 1980), listed a number of criteria used in the selection process, including:

• Depth of salt	1,000-2,500 feet
• Thickness of salt	At least 200 feet
• Lateral extent of salt	Sufficient to protect against dissolution
• Tectonics	Low historical seismicity, no salt-flow structures nearby
• Hydrology	Minimal groundwater
• Mineral potential	Minimal
• Existing boreholes	Minimum number
• Population density	Low
• Land availability	Federal land preferable

The WIPP site meets or, in most cases, exceeds these criteria. With the exception of mineral potential (oil, gas, and potash), none of the criteria were based on social, political, or economic factors. Population density (in the site vicinity) is a safety factor, not a political consideration.

4.1-2 **Comment**

Several people questioned why New Mexico should receive waste generated outside of the State and suggested that each State generating waste should have to dispose of its own waste.

4.1-2 **Response**

The decision to develop the WIPP as a research and development facility to demonstrate the safe disposal of radioactive waste from defense activities (up to 6.45 million cubic feet) was made in 1981 and was based in part on the analyses provided in the FEIS. The characteristics necessary to provide long-term isolation in a geologic repository are highly specific to certain geohydrologic formations which are limited in number and not necessarily located in states here the waste is generated.

4.1-3 **Comment**

Several commenters, including the Attorney General of Texas, believed that the need for the WIPP has not been demonstrated. Their comments included the statement that the DOE is fabricating the need for the WIPP, first, through its own FEIS (DOE, 1980) and 1981 Record of Decision (DOE, 1981b); second, by citing interim waste storage problems at the Idaho National Engineering Laboratory and their effect on the Rocky Flats Plant; and third, by identifying an adverse impact on nuclear weapons production.

4.1-3 **Response**

The DOE does not agree with these comments. The WIPP is proceeding as mandated by Congress, based on a need to demonstrate safe disposal of radioactive waste generated by the nation's defense installations, not because of short-term storage "problems." The opening of the WIPP could solve short-term storage problems at the Rocky Flats Plant only _if_: 1) it were to open prior to the Rocky Flats Plant exceeding its storage limit under its RCRA permit, and 2) the volume to be accepted at the WIPP during the Test Phase were high enough to accommodate waste generated in excess of the permitted limitations (see Subsection 3.1.1.4 and Appendix O). Neither condition appears likely.

Subsection 1.1 has been modified by deleting the reference to national security that was in the draft SEIS (also see the response to comment 3.1-4).

As stated throughout this SEIS and publicly by the Secretary of Energy, the WIPP will open only when all regulatory requirements are met.

4.1-4 **Comment**

One individual commented that the preparation of the SEIS is worthwhile because much has been learned about the WIPP since publication of the FEIS and that decisions regarding the project should be based on the best information available.

4.1-4 **Response**

The DOE agrees.

4.2 PURPOSE

4.2-1 **Comment**

A few commenters, including a U.S. Senator from New Mexico, reiterated the purpose of the WIPP as a method to demonstrate the safe disposal of defense-related TRU waste. Two commenters believed the facility does not solve any waste disposal problem because the waste does not "go away."

4.2-1 **Response**

The DOE determined in the 1981 Record of Decision (DOE, 1981b), that, based upon a comparison in the FEIS (DOE, 1980) of alternative TRU waste disposal methods, geologic disposal was the best option available. The objective of geologic disposal is not to make the waste "go away", but rather to isolate the waste from the accessible environment for a very long time.

5.0 PROPOSED ACTION AND ALTERNATIVES

5.1 PROPOSED ACTION

5.1-1 Comment

The Idaho Attorney General and other Idaho officials, the Western Interstate Energy Board, the State of California Energy Commission, and the EPA commented to the effect that Subsection 3.1.1, and other sections of the draft SEIS, should be revised to clarify which DOE generator facilities propose to transport contact handled (CH) or remote-handled (RH) TRU waste to the WIPP. The commenters requested a schedule of shipments as well. Commenters made distinctions between waste shipments proposed during the Test Phase and those proposed during the period of permanent emplacement. Commenters also pointed out that Subsection 3.1.1 of the draft SEIS proposed the WIPP as a permanent repository for waste from four DOE facilities: Idaho National Engineering Laboratory, Rocky Flats Plant, Savannah River Site, and Hanford Reservation. However, the commenters stated that the draft SEIS evaluated environmental impacts of transportation and repository performance from 10 DOE generator facilities, including an additional 6 sites: the Los Alamos National Laboratory, the Nevada Test Site, the Oak Ridge National Laboratory, the Argonne National Laboratory-East, the Lawrence Livermore National Laboratory, and the Mound Laboratory (draft SEIS Subsection 5.2.2). According to the commenters, the draft SEIS also stated that appropriate site-specific NEPA documentation would be prepared in the event that waste from the six additional facilities is transported to the WIPP for permanent disposal. Commenters requested a schedule of shipments from the six additional sites. Lastly, commenters wanted to know why additional NEPA documentation is necessary.

5.1-1 Response

Subsection 3.1 has been revised to clarify that the DOE expects that post-1970 TRU waste would eventually be shipped to the WIPP from the 10 DOE facilities listed in Table 3.1.

The WIPP FEIS (DOE, 1980) analyzed the operational impacts of the WIPP assessing a total inventory of TRU waste to be received at the WIPP over its 25-year operating life of approximately 6.2 million cubic feet of CH waste and 250,000 cubic feet of RH waste. In Subsection 9.8, the FEIS analyzed the environmental impacts of on-site waste retrieval and processing for shipment from the Idaho National Engineering Laboratory to the WIPP. Retrieval and processing impacts were not evaluated for any other facility. The transportation analysis in Section 6 of the FEIS considered waste shipments to the WIPP from the Idaho National Engineering Laboratory, Hanford Reservation, Los Alamos National Laboratory, Savannah River Site, Rocky Flats Plant, and Oak Ridge National Laboratory. Transportation of waste from the Nevada Test Site, Argonne National

Laboratory-East, Lawrence Livermore National Laboratory, and the Mound Laboratory were not considered in the 1980 document.

This SEIS analyzes the cumulative environmental impacts of shipping and emplacing post-1970 TRU waste from 10 DOE defense facilities during the WIPP's 25-year operating life. For conservatism, the quantity is assumed to be the design capacity of a total CH inventory of 6.2 million cubic feet and a RH inventory of 250,000 cubic feet. The impacts associated with transporting, receiving, and permanently emplacing waste from all 10 facilities are conservatively "bounded" by this SEIS analysis. The initial shipments during the Test Phase would originate at the Idaho National Engineering Laboratory and the Rocky Flats Plant. Beyond this, actual "timing" of shipments from each of the 10 facilities is not known at this time.

Appendix P and Subsection 5.2.1 discuss current plans and potential impacts at DOE facilities for retrieval, handling, and processing TRU waste for shipment to the WIPP. The status of NEPA documentation is also discussed. Also see the responses to comments 2.2-3 and 5.1.1-2.

5.1-2 **Comment**

A number of commenters expressed general concerns about the Proposed Action. Several were concerned that the WIPP would be used to store or dispose of high-level radioactive waste and commercial radioactive waste (e.g., from nuclear power plants.) One commenter wanted to know which proposed changes to the original 1980 Proposed Action were addressed in the draft SEIS. Other commenters had a variety of concerns: 1) that the Proposed Action was the most "lethal" alternative; 2) that it was not known how to retrieve the waste; and 3) that certain waste processing facilities are not addressed in the draft SEIS. One commenter inquired if high-curie content waste from the Hanford Reservation would be shipped to the WIPP. There was also a general concern that the WIPP opening was being held to a rigid time frame.

5.1-2 **Response**

The Proposed Action is to proceed with the WIPP as described in the 1980 FEIS (DOE, 1980) and as modified by changes addressed in Subsection 3.1 of this SEIS, which include: 1) changes in waste sources, TRU waste volume, and TRU radioactive waste inventory; 2) consideration of hazardous chemicals in TRU waste; 3) changes in waste packaging (redesign of the TRUPACT) and transport; and 4) implementation of a modified Test Phase. Under Public Law 96-164, the mission of the WIPP is to demonstrate the safe disposal of waste produced by national defense activities. The DOE is no longer proposing to conduct high-level waste experiments at the WIPP. The following address other general concerns:

- The WIPP will not operate if it poses an unacceptable level of risk to public health and safety and the environment.

- The technology for waste retrieval has existed for some time and is described in Subsections 8.10 of the FEIS and 2.5 of this SEIS.

- The purpose of providing a discussion of the waste treatment technologies that may be available as mitigation measures has been clarified (see the responses to comments 7.15-7 and 7.15.3-4).

- There is no current proposal to transport high-curie content waste to the WIPP from the Hanford Reservation; however, limited amounts of high-curie content TRU waste are expected to be shipped to the WIPP from the Savannah River Site (Subsection 3.1.1.1).

The WIPP is not being rushed to meet a rigid schedule or inflexible deadline. On June 27, 1989, Secretary of Energy James D. Watkins stated that the WIPP will not receive waste until all (health and safety) questions have been answered satisfactorily. Secretary Watkins' plan for the WIPP includes the participation of various oversight groups discussed in Subsection 10.3.

5.1-3 **Comment**

A number of favorable comments were received in support of the WIPP. Representative comments referred to the WIPP as "a far better approach than any interim or permanent surface option" and upheld the site as being without problems and "thoroughly analyzed."

5.1-3 **Response**

The DOE believes that further study is warranted, although the DOE appreciates the comment.

5.1-4 **Comment**

State of Idaho and the National Park Service requested clarification of waste management procedures at the Idaho National Engineering Laboratory, including the statement on page 5-7 of the draft SEIS that TRU waste being sent from the Rocky Flats Plant to the Idaho National Engineering Laboratory would be maintained in interim storage in containers intended to be contamination-free for 20 years.

5.1-4 **Response**

The DOE's practice for many years has been to store TRU waste in such a way that it can be readily retrieved in an intact, contamination-free condition for 20 years. The routine monitoring and surveillance conducted on waste in retrievable storage is intended to discover situations wherein the future integrity of the TRU waste containers is in doubt. Containers are replaced or overpacked in these cases to ensure continued contamination-free storage.

5.1-5 **Comment**

Commenters identified issues or questions that they felt should be addressed in the draft SEIS. These included describing the Site and Preliminary Design Validation Program, describing the amount of RCRA waste more fully, defining "retrievable storage," discussing the likelihood and consequences of a tornado hitting the WIPP, addressing the impacts of emplacing high-curie and high-neutron waste, disclosing the quantity of waste used during the Test Phase, discussing whether or not buried TRU waste will be emplaced at the WIPP, explaining why the 1987 Integrated Data Base (DOE, 1987b) was used in the draft SEIS analyses, and discussing why the neutron dose was not addressed in the FEIS.

5.1-5 **Response**

All of these issues are addressed in the FEIS (DOE, 1980) or this SEIS:

- The Site and Preliminary Design Validation Program was addressed in Subsection 8.2.1 of the FEIS.
- The quantity of RCRA waste as discussed in Appendix B.3 of this SEIS is based on the best available information.
- The definition of retrievable storage is included in the glossary of this SEIS.
- The effects of a tornado on the WIPP is described in Subsection 9.5.3.3 of the FEIS.
- The impacts from the emplacement of higher-curie and higher-neutron waste in the WIPP are considered as part of the source term used in the impacts analyses of Section 5 of this SEIS.
- The likely quantity of waste to be used during the Test Phase is discussed in Appendix O of this SEIS.
- As noted in Sections 1 and 3 of this SEIS and in the response to comment 2.2-1, the Proposed Action does not consider pre-1970 buried TRU waste.
- The 1987 Integrated Data Base (DOE, 1987b) (Subsection 3.1) was selected because at the time the analyses were performed for the draft SEIS, it provided the best available data.
- Neutron dose was not considered in the FEIS because the high-neutron TRU waste was not yet identified as a source for WIPP disposal; it has been considered in this SEIS.

5.1.1 **CHANGES TO THE PROPOSED ACTION**

5.1.1-1 **Comment**

The EEG, EPA, and others expressed concerns about the proposed Test Phase. Representative comments were:

- The draft SEIS did not address the possible adverse impacts of the Test Phase on human health and the environment.

- The draft SEIS did not provide enough detail about the Test Phase which is one of the primary proposed changes in the WIPP project since the 1980 FEIS.

- The draft SEIS failed to discuss options available if the Test Phase performance assessment fails to demonstrate the ability of the WIPP to comply with the EPA standards in 40 CFR Part 191 (EPA, 1985b).

- There is a need for independent peer review of the Test Phase plan and accompanying responses to scientific groups such as the EEG and the NAS.

Other commenters questioned other aspects of the Test Phase program such as the costs of the Operations Demonstration. Several commenters stated that there is no valid scientific evidence that justifies the emplacement of waste for a five-year experimental Test Phase. Commenters also suggested that the NAS, an independent scientists review panel, and the EEG are in the best position to determine whether waste experiments are justified. These commenters also stated that, because these groups of scientists offered an unfavorable review of the Test Phase plan, the validity of the plan is not supported. Some commenters went on to suggest that computer modeling and controlled laboratory tests which simulate nuclear waste storage and handling conditions would be safer and more cost-efficient than waste emplacement and retrieval. Other commenters questioned whether a five-year Test Phase would provide sufficient and accurate data to demonstrate the safe disposal of waste. General comments were that the Test Phase is a "ploy" to get waste into the WIPP. Conversely, several commenters stated that permanent isolation of waste 2,150 feet below the surface is a "likely" solution to the problem of TRU waste. These commenters felt that the project should be tested with actual waste to provide an accurate evaluation of the program. One commenter felt that a phased approach was "prudent and cautious." Another commenter urged that raw waste be placed in the WIPP to validate the experiment.

5.1.1-1 **Response**

The WIPP and its planned operations have been under intense study since the mid-1970s. WIPP development has always proceeded under a "phased" approach. Through the WIPP, the DOE is actively evaluating a potential long-term, environmentally sound solution to the disposal of post-1970 defense generated TRU waste.

The Test Phase is described in Subsection 3.1.1.4. Appendix O has been added to this SEIS and provides additional details on the experiments to be conducted during the Test Phase. Considerable discussion is provided for the performance assessment, the bin-scale tests, and the alcove-scale tests. The "Draft Final Plan for the Waste Isolation Pilot Plant Test Phase: Performance Assessment" (DOE, 1989b) is available for public review. Costs for the Operations Demonstration are beyond the scope of this SEIS.

The DOE believes that this SEIS adequately addresses the impacts associated with conducting the Test Phase. Because the specific quantity of waste proposed for the Test Phase is evolving, this SEIS conservatively analyzes the impacts associated with emplacing waste constituting up to 10 percent of the WIPP's design capacity. The impacts of using lesser quantities are bounded by the analysis in this SEIS. Furthermore, analytical methods used to calculate all potential impacts were similarly conservative in other aspects. Potential adverse environmental impacts are more than "bounded" by the impact analyses contained in both the FEIS (DOE, 1980) and this SEIS.

The DOE has considered the option of obtaining the Test Phase data using simulated waste materials. The DOE believes that simulated waste would not adequately duplicate the TRU waste characteristics to assist in reducing the significant uncertainties that exist regarding how actual waste characteristics influence repository performance over time. The DOE agrees with the need for independent review. Subsection 10.3 has been revised to more clearly describe the regulatory agencies and independent organizations that are reviewing WIPP activities. The EPA, NAS, EEG, and all members of the "Blue Ribbon Panel" have reviewed the proposed Test Phase activities. None of these groups suggested using simulated waste, although some did question the need for the Operations Demonstration before demonstrating compliance with 40 CFR Part 191 (EPA, 1985b). As noted in Subsection 3.1.1.4, the actual amount of waste proposed for the Test Phase is likely to be less than that assumed for purposes of analysis in this SEIS.

The initial plans for the proposed Test Phase call for the emplacement of approximately 0.5 percent by volume of the design capacity for Phases 1 and 2 of the alcove-scale tests and Phases 1 and 2 of the bin-scale tests. These bin-scale and alcove-scale tests would support assessment of compliance with the EPA Standard, 40 CFR 191, Subpart B, Sections 13 and 15, and the RCRA Land Disposal Restrictions, 40 CFR 268, Section 6. Additional tests would be defined based on the data acquired during the first two phases of the bin-scale and alcove-scale tests and to incorporate potential engineered alternatives.

In addition, the EPA has requested that the DOE monitor the performance of the WIPP by emplacing waste in two full-scale, instrumented, backfilled, sealed rooms after an appropriate demonstration of retrieval using simulated waste. Waste requirements for these two full-scale room tests would be approximately 1.5 percent by volume of design capacity. The DOE would conduct a feasibility evaluation to determine the best technical approach, scope, and timing of such monitoring. The DOE will consult the NAS WIPP Panel, the EPA, the State of New Mexico, and the EEG prior to initiation of such tests.

The TRU waste emplaced in the WIPP during the Test Phase would be fully retrievable after the Test Phase is completed. Waste retrieval is addressed in the "Waste Isolation Pilot Plant Waste Retrieval Plan," (DOE, 1989c). The waste retrieval plan addresses:

- Retrieval of alcove-scale and bin-scale test program waste
- Environmental sampling for radiological and hazardous chemical releases
- Establishment of contamination barriers
- Purging and ventilation of waste alcoves
- Transport of waste containers to the surface
- Preparation and loading of TRUPACTS
- Quality assurance for inventory control
- Training, monitoring, inspections, record-keeping, and emergency response.

The retrieval plan has been prepared to provide assurance that all of the essential requirements for waste retrieval have been included in the design of the Test Phase. The plan will be subject to external review.

This SEIS describes potential options if retrieval is necessary. It also describes the planning that the DOE is conducting if retrieval becomes necessary. Consequences of waste retrieval are addressed in the response to comment 7.12.4-14 and Subsection 5.2.3.1. Additional information on retrieval and the Test Phase plan has been added to Subsection 2.5 and Appendix O.

5.1.1-2 **Comment**

Several commenters contended that the draft SEIS is unclear on the waste inventory, types of waste, and the volumes of waste to be disposed of at the WIPP over the lifetime of the facility. Concerns were related to the radiological and hazardous chemical source term, the potential changes in the volume and composition of future TRU waste, and the reason for discontinuing plans to conduct high-level experiments at the WIPP.

5.1.1-2 **Response**

The proposed WIPP waste inventory, including sources, types, volume, and characteristics discussed in Subsections 2.3, 3.1, and Appendix B have been clarified in response to comments. Specific technical comments on waste inventories are addressed in the responses to comments in Section 7.9. The following briefly summarizes the status of these issues.

This SEIS utilizes the design capacity of 6.2 million cubic feet of CH TRU waste and 250,000 cubic feet of RH TRU waste to assess the potential impacts to human health and the environment from the operation of the WIPP. TRU waste volume projections through 2013 indicate a much lesser volume of waste will be generated (see Appendix B). The excess design capacity would accommodate unanticipated increases in TRU waste generation.

All waste proposed to be sent to the WIPP would be required to comply with the WIPP Waste Acceptance Criteria (DOE, 1989e) and the NRC and DOT packaging and transportation requirements.

The WIPP would store and/or dispose of only TRU waste derived from U.S. defense activities, such as research and development programs, plutonium fabrication, and recovery operations. Hazardous chemicals are often co-contaminants of this waste and, therefore, are included in the impact analysis in this SEIS.

The decision to eliminate high-level waste experiments at the WIPP was based principally on the decision, under the Nuclear Waste Policy Amendments Act of 1987, to discontinue further characterization of the Deaf Smith County, Texas bedded salt site for the disposal of commercial high-level waste. Because the salt medium is no longer proposed for high-level waste, such experiments are not required. This decision for high-level waste was independent of the proposal to store and dispose of TRU waste at the WIPP.

5.2 NO ACTION

5.2-1 Comment

Some commenters have suggested that neither the FEIS (DOE, 1980) nor the draft SEIS shows why the No Action Alternative is unacceptable. Others thought No Action would be a good choice until a better disposal method than the WIPP could be developed. In the interim, they suggested the existing storage facilities could be upgraded.

5.2-1 Response

The FEIS (DOE, 1980) and this SEIS, and documents referenced therein, have analyzed the environmental consequences of the No Action Alternative under several different assumptions and conditions. In general, they estimate that if the DOE would provide effective monitoring and maintenance of storage facilities, adverse health effects for the general public would be quite small, and the principal adverse effects, also small, would be related to occupational activity at the facility. Health effects would continue at such levels for the indefinite future under the hypothesis of DOE control. Eventually, however, perhaps after a very long time, an extraordinary event, such as a volcano, could disperse the waste and cause widespread radiation exposure, which could affect many human generations if the contamination were not cleaned up.

Alternatively, if the DOE were not to maintain effective control of storage facilities, the FEIS, this SEIS, and references estimate that intruders could receive substantial radiation doses, a situation that could persist for the indefinite future. Therefore, the No Action Alternative would require effective long-term institutional control to avoid such unwanted consequences.

It is believed to be imprudent and unfair to rely on institutional methods to control long-term hazards such as TRU waste pose. "Imprudent" because, despite the current society's best intentions, there are no means to assure that future societies will have the means and will to provide effective oversight. "Unfair" because long-term institutional control would burden future generations without their consultation or consent, especially if the current society had reasonable alternatives that it could have implemented to avoid the burden.

Such perspectives on long-term control are reflected in the EPA's two rulemakings for waste containing long-lived radionuclides. The EPA rules have explicitly limited reliance on institutional controls. For disposal of uranium mill tailings, the EPA stated ". . . that protection from the long-term hazards associated with radioactive waste should primarily rely on passive control methods" (48 FR 45936, October 7, 1983). For disposal of high-level and TRU waste, the EPA required that assessments of compliance with its disposal standards may not consider any contribution from active institutional controls for more than 100 years after disposal (40 CFR 191.14(a)). In both rulemakings, the EPA also urged that institutional controls should be provided for as long as useful or practicable as <u>supplements</u> to adequate physical control methods.

Therefore, consistent with these intentions, the WIPP authorization, and other major public policy determinations, the DOE believes sound environmental planning requires aggressive development of an effective disposal method for TRU waste that would minimize the need for institutional oversight. The FEIS considered alternatives to geological disposal; the DOE rejected them as either impractical or infeasible. The DOE believes the general conclusion in the 1981 Record of Decision (DOE, 1981b) (as stated above) remains correct. The Record of Decision's further determination to proceed with the phased development of the WIPP in bedded salt remains the DOE's Proposed Action in 1990.

5.2-2 **<u>Comment</u>**

There were a number of comments to the effect that the No Action Alternative was not adequately evaluated in the draft SEIS, and that there was no justification for proceeding with the WIPP, in lieu of leaving the waste in storage at existing DOE facilities. Furthermore, these commenters stated that the draft SEIS rejects the No Action Alternative prematurely and that TRU waste should continue in storage at existing facilities, pending further investigations of possible treatment/disposal technologies. Others commented that the environmental and safety hazards of continuing storage of TRU waste at existing facilities (e.g., the Idaho National Engineering Laboratory) should be further examined. Several commenters questioned the FEIS conclusion, cited in Subsection 5.5.8.1 of the draft SEIS, that TRU waste could continue to be stored at the Idaho National Engineering Laboratory for "several decades or a century," citing potential seismicity hazards. By contrast, one commenter challenged the basis for the draft SEIS Subsection 3.2.1 statement that the No Action Alternative "could result in the potential for long-term degradation of the environment and potential public health consequences at TRU generator and storage facilities."

5.2-2 **Response**

In response to these and similar comments, the No Action Alternative discussions in Subsections 3.2.1 and 5.5 have been revised. Also see the response to comment 5.2-1.

Briefly, the No Action Alternative means that no waste would be brought to the WIPP and the facility would be decommissioned. Essentially, this is a "status quo" alternative in that existing and newly generated TRU waste would require the continued use of existing facilities, as well as improvements, modifications, enlargements, and/or new storage facilities to provide adequate isolation of the waste and compliance with applicable regulations. Further, treatment facilities may be required for TRU waste containing hazardous constituents subject to land disposal restrictions in order to comply with RCRA. The No Action analysis considers only post-1970 waste, because the proposal to ship TRU waste to the WIPP involves only waste placed in retrievable storage after 1970.

In 1970, the Atomic Energy Commission adopted a policy requiring that TRU waste producing more than 10 nanocuries of alpha activity per gram be packaged and stored separately from other radioactive waste. Waste placed in retrievable storage since 1970 has been packaged in plywood boxes, 55-gal drums, or metal boxes and stored on asphalt "pads." These wastes are stored such that they can be readily retrieved in an intact contamination free condition for 20 years. Large volumes of waste are covered with plywood and plastic and vinyl sheeting and overlaid with 3 feet of soil. Some waste is stored in concrete warehouses, large metal storage containers, or inflatable buildings to provide weather protection to minimize degradation of the waste containers. A large percentage of the "pad"-stored TRU waste is located at the Idaho National Engineering Laboratory Radioactive Waste Management Complex.

The revised discussion of the No Action Alternative in this SEIS can be summarized as follows:

The TRU waste storage facilities require routine monitoring and maintenance to ensure public health and safety. This involves monitoring of air, groundwater, soil, and other environmental parameters. The continued use of existing DOE TRU waste storage facilities beyond their 20-year design life would require continued monitoring, more frequent retrieval, repackaging and re-emplacement, storage facility upgrading, and construction of new facilities for additional storage capacity for the currently stored and yet to be generated waste.

Most existing TRU waste storage facilities contain TRU waste co-contaminated with hazardous chemical constituents which are required to comply with the permitting and land disposal restrictions of the RCRA. Current storage containers would need to be retrieved and repackaged (or overpacked) as they begin to show signs of deterioration. Retrieved waste packages containing hazardous chemical contaminants would require storage in a RCRA compliant facility. These facilities will have space requirements that far exceed the current requirements.

The No Action Alternative conflicts with the WIPP mission as mandated by the Congress in Public Law 96-164, under which the WIPP is to provide "a research and development facility to demonstrate the safe disposal of radioactive waste resulting from the defense activities and programs of the United States." Thus, the No Action Alternative would thwart the objective of developing a long-term disposal method for defense TRU waste.

As noted in the 1980 FEIS (DOE, 1980), natural events could disrupt the waste storage facilities and cause a release of radionuclides. Scenarios for the Idaho National Engineering Laboratory involving waste disruption by explosive volcanic activity lead to the greatest impact. Volcanic zones near the Idaho National Engineering Laboratory were described as being active within the last 10,500 years with the potential for being active in the future. Impacts from an earthquake were projected to be substantially less than those resulting from volcanic activity. The FEIS also identified human intrusion into a waste site after institutional controls have lapsed as an important release scenario. Over a 50-year period, people living on the waste site could receive dose commitments several orders of magnitude greater than those resulting from volcanic activity. The Intermountain Seismic Belt and the Idaho Seismic Zone are the two major areas of seismic activity near the Eastern Snake River Plain in the general vicinity of the Idaho National Engineering Laboratory. The largest reported earthquake event in the Idaho Seismic Zone (7.3 on the Richter Scale) occurred approximately 40 miles northwest of Arco, Idaho (west of the Idaho National Engineering Laboratory's western boundary) on October 28, 1983. No structural or safety-related damage occurred at the Idaho National Engineering Laboratory.

5.3 ALTERNATIVES NOT CONSIDERED IN DETAIL

5.3-1 Comment

A number of commenters, including the State of Colorado and the Attorney General of Idaho, urged that the SEIS address a wider range of alternatives to the WIPP that might better protect public health and safety and the environment. Several commenters contended that the SEIS did not "rigorously explore and objectively evaluate all reasonable alternatives" as required by the CEQ regulations in 40 CFR 1502.14(a). Others argued that monies expended for the WIPP or the Strategic Defense Initiative ("Star Wars") would be better invested in seeking more creative alternatives for dealing with TRU waste or in cleaning up existing DOE facilities. Some commenters stated that the original FEIS (DOE, 1980) analysis of alternatives, now over 10 years old, is no longer adequate and needs updating to reflect current waste management technology. Examples of suggested alternatives to be evaluated include:

- Failure of the WIPP to meet applicable standards.

- Delay waste emplacement until land withdrawal is complete.

- Comprehensive TRU waste (including buried pre-1970 waste) disposal.
- Adopt the 1980 WIPP FEIS "preferred alternative," combine WIPP activities with the first high-level radioactive waste repository.
- Place TRU waste in "holes" in Nevada created by underground nuclear weapons testing.
- Launch waste into space by electromagnetic propulsion, unmanned rockets, or the space shuttle.
- Develop alternate retrievable storage facilities.
- Evaluate short, interim, and long-term aboveground storage facilities.
- Redesign WIPP for retrievable or temporary storage.
- Maintain waste destined for the WIPP on site where it can be safely monitored while alternatives are explored to store, treat, or neutralize waste at locations other than the WIPP.
- Explore on-site treatment and storage.
- Conduct the performance assessment with nonradioactive, simulated waste.
- Develop transmutation, neutralization, denaturing, detoxification, "recycling", vitrification, and other technologies to render the waste harmless.

5.3-1 **Response**

The DOE believes that the FEIS (DOE, 1980) and this SEIS evaluate all reasonable alternatives to the Proposed Action. Alternative waste disposal methods evaluated in the FEIS included: emplacement in deep ocean sediments; emplacement in deep drill holes; transmutation of long-lived radionuclides into short-lived radionuclides; ejection into space; and disposal in mined geologic media such as salt, igneous and volcanic rocks, and argillaceous rocks. With the exception of disposal in mined geologic repositories, none of the disposal options (e.g., transmutation, detoxification, ejection into space) are feasible with the current technology. Disposal in a geologic repository was identified as the best available method.

The alternatives analyzed in the FEIS included: No Action, the proposed WIPP facility, combining WIPP activities with the first available high-level waste repository, and a defense TRU waste facility constructed after consideration of alternatives to the present WIPP site. These alternatives were compared in a tabular fashion.

Incorporating and building on the FEIS, this SEIS examines the following alternatives:

- Implement the No Action Alternative, similar in most respects to the FEIS (see response to comment 5.2-2).

- Continue the phased implementation of the Proposed Action which was authorized by the 1981 DOE Record of Decision (DOE, 1981b), with modifications.

- Conducting only those tests that can be performed without emplacing waste underground until it is determined that the WIPP complies with applicable regulations.

The suggested continued storage alternatives are basically variations of the No Action Alternative described in the 1980 FEIS and reevaluated in this SEIS (see Subsections 3.2.1 and 5.5). Construction of a new storage facility is a separate action that could possibly be needed whether or not the phased development of the WIPP continues as proposed. The DOE is currently evaluating options for TRU waste storage. Such options for the next 3 years include other DOE storage facilities. Options for longer-term storage include Department of Defense facilities and potential commercial facilities as well as DOE facilities. Appropriate NEPA documentation will be prepared as part of this process.

If the phased development of the WIPP were not to continue as proposed, TRU waste would remain in retrievable storage (i.e., No Action Alternative). Waste would not be emplaced in WIPP until land withdrawal is complete. Buried, pre-1970 TRU waste is not part of the DOE's Proposed Action (see the responses to comments 2.2-1 and 2.2-2).

5.4 **DRAFT SEIS CONCERNS**

5.4-1 **Comment**

Commenters asked why the DOE selected the WIPP site in 1980 over alternative sites. Specific inquiries focused on determining why the WIPP site, in bedded salt, was selected as opposed to other geological formations.

5.4-1 **Response**

The site selection process was described in detail in Subsection 2.2 of the 1980 WIPP FEIS (DOE, 1980). "Alternatives for Geologic Disposal" are discussed in FEIS Subsection 3.3. Also see the response to comment 4.1-1.

5.4-2 **Comment**

Several comments were received asking whether the WIPP will be closed to the receipt of waste after 25 years, or whether shipments would be received after that period.

5.4-2 **Response**

The WIPP is proposed to receive approximately 6.45 million cubic feet of TRU waste over a 25-year period. Although it probably would be technically feasible to expand the WIPP beyond its current design basis, the DOE does not currently have plans to do so. Expansion would occur only after an appropriate NEPA analysis had been completed.

5.4-3 **Comment**

Commenters requested that the WIPP not be used for high-level waste storage. These comments were based on concerns of a geotechnical nature, potential retrieval problems, and amendments to the Nuclear Waste Policy Act.

5.4-3 **Response**

The DOE has withdrawn the 1980 proposal to conduct high-level waste experiments in the WIPP. DOE's decision was not related to the safety of emplacing high-level waste in the WIPP. The principal reason for the withdrawal was that the results of high-level experiments in salt would not be scientifically transferrable to the tuff medium prevalent at Yucca Mountain, Nevada, which Congress determined would be the only candidate site to be characterized for a high-level waste repository.

5.4-4 **Comment**

Commenters requested that the DOE discuss its plans for waste storage at those sites not now designated as TRU waste storage sites (i.e., Rocky Flats Plant, Argonne National Laboratory-East, Lawrence Livermore National Laboratory, Mound Laboratory) during the proposed 5-year Test Phase.

5.4-4 **Response**

Lawrence Livermore National Laboratory will continue to ship TRU waste to the Nevada Test Site for storage; Mound Laboratory and Argonne National Laboratory-East will store waste on site in compliance with regulatory requirements. The DOE is currently evaluating options for the storage of Rocky Flats Plant waste that exceeds its authorized storage limit. Such options for the next 3 years include DOE storage facilities. Options for long-term storage include Department of Defense facilities and potential commercial facilities as well as DOE facilities. Appropriate NEPA documentation will be prepared as part of this process.

5.4-5 **Comment**

Two comments were received regarding the No Action Alternative and the Environmental Impact Statement published for Special Isotope Separation Project in 1988 (DOE, 1988j). The commenters wanted to know how volcanic activity at the Idaho National

Engineering Laboratory could potentially cause a large release of stored TRU waste, yet be safe as a site for the Special Isotope Separator.

5.4-5 **Response**

The Special Isotope Separation Project would be constructed and operated over approximately 30 years, a period during which the probability of volcanic eruption is exceedingly low. In contrast, the analysis of the No Action Alternative of storing waste over the long-term at Idaho National Engineering Laboratory addressed an indefinitely long period, during which volcanic activity would be much more probable.

5.4-6 **Comment**

The Idaho Attorney General questioned whether waste from Argonne National Laboratory-East and Mound Laboratory can continue to be shipped to the Idaho National Engineering Laboratory without further NEPA documentation, since they are not part of the Proposed Action in the draft SEIS.

5.4-6 **Response**

Shipment of waste from Argonne National Laboratory-East and Mound Laboratory to the Idaho National Engineering Laboratory for storage is a continuing activity and not directly associated with the construction and operation of the WIPP. As such, the environmental impacts associated with these shipments are not addressed in this SEIS.

5.4-7 **Comment**

The Governor of Idaho and other Idaho officials questioned how much waste would be removed from the Idaho National Engineering Laboratory and shipped to the WIPP.

5.4-7 **Response**

The DOE proposes to ship all post-1970 TRU waste at the Idaho National Engineering Laboratory to the WIPP. The waste volume proposed for shipment to the WIPP is indicated in Tables 3.1 and 3.2 of this SEIS.

6.0 LAND WITHDRAWAL

6.1 ADMINISTRATIVE AND LEGISLATIVE LAND WITHDRAWAL

6.1-1 Comment

Most commenters preferred a legislative withdrawal of the WIPP site lands rather than an administrative withdrawal. Some commenters were opposed to an administrative withdrawal of public lands for the WIPP under any circumstances, viewing an administrative withdrawal as an illegal usurpation of Congressional power, as an attempt by the DOE to avoid a public referendum on land withdrawal, or as an unwarranted attempt to expedite land withdrawal. Other commenters, including the State of New Mexico, opposed an administrative land withdrawal in light of health, safety, and environmental concerns over compensation to the State of New Mexico and local governments. Others commented that the draft SEIS provided no technical or legal basis for an administrative land withdrawal.

Some commenters asked how the Department of Interior would evaluate the DOE's claims that national security concerns warrant land withdrawal. One commenter stated that administrative land withdrawal is not described or investigated in the draft SEIS.

Some commenters objected to either administrative or legislative withdrawal of public lands for the WIPP until all health and safety concerns are met. A few commenters objected to any withdrawal of the WIPP site lands on principle. The State of New Mexico expressed concern that either type of land withdrawal be crafted so as not to establish a reservation of water rights to the Federal government.

6.1-1 Response

Section 204 of the Federal Land Policy and Management Act of 1976 (FLPMA) (43 U.S.C. 1714) gives the Secretary of the Interior the general authority to make or modify withdrawals of public lands. A decision whether to issue a modified administrative land withdrawal for the WIPP will be made by the Secretary of the Interior. This decision will be made pursuant to FLPMA and the regulations set out in 43 CFR Part 2300. The BLM has participated as a cooperating agency in the preparation of this SEIS, and it will consider all public comments on land withdrawal submitted during the 90-day public comment period, as required by FLPMA and 43 CFR Part 2300.

The DOE has proceeded with the phased development of the WIPP under two successive administrative land withdrawals: the DOE conducted the Site and Preliminary Design Validation phase of the WIPP project pursuant to Public Land Order 6232, effective March 30, 1982 and commenced full construction pursuant to Public Land Order 6403, effective June 29, 1983.

Public Land Order 6403 does not allow the DOE to place radioactive waste upon the WIPP site lands for any purpose. The next phase of the Proposed Action, during which experiments would be conducted to determine whether the WIPP can be used as a permanent repository for defense-generated TRU waste, requires the receipt of TRU waste at the WIPP. Accordingly, the DOE has submitted an application to modify Public Land Order 6403 to permit the receipt of radioactive waste onsite for the Test Phase experiments. See Subsection 10.2.3 for a discussion of land withdrawal.

The phased development of the WIPP could continue under either an administrative or a legislative land withdrawal. The DOE continues to believe that legislation is the preferred method to achieve land withdrawal for the future phased development of the WIPP. The DOE will continue to encourage Congress to enact such legislation. At the same time, the DOE believes that the submission of an Application for administrative land withdrawal under FLPMA is appropriate as a parallel path of action. This SEIS will be provided to members of Congress and the Secretary of the Interior.

The Test Phase cannot commence until the WIPP site lands are appropriately withdrawn (see the response to comment 3.1-4).

The DOE is working with all appropriate regulatory agencies and advisory groups, including the EEG, the NAS, and the WIPP Blue Ribbon Panel to resolve any remaining health, safety, or environmental concerns pertaining to the WIPP. The DOE is committed to complying with all applicable Federal, State, and local health and safety requirements for the WIPP, irrespective of the type of land withdrawal under which the Proposed Action would proceed.

A withdrawal of public land for the WIPP site, whether legislative or administrative, would not alter the current status of water uses at the site or in the site vicinity or work to the disadvantage of existing water users.

6.1-2 **Comment**

The Department of the Interior requested that ". . . the final SEIS . . . address the social, economic, and national defense (if appropriate) impacts of the perceived time delay which would occur until Congress acts on a legislative transfer of land."

6.1-2 **Response**

Any delay in the opening of the WIPP pending the passage of a legislative withdrawal would result in social and economic impacts similar to those of the Alternative Action. Consequences of selection of the Alternative Action are discussed in Subsection 5.3.

The reference to national security in Subsection 1.1 of the draft SEIS has been deleted. See the response to comment 3.1-4.

7.0 TECHNICAL ISSUES

7.1 BIOLOGY

7.1-1 Comment

Commenters were concerned about the effect the WIPP is having upon the ecology of the area. One commenter cited a personal study of the prairie chicken near the WIPP site and stated that he did not believe that the WIPP was adversely affecting the local ecology.

7.1-1 Response

The DOE is conducting an ongoing biological survey of the WIPP area and adjacent lands. Dominant species of vegetation, small mammals, and breeding birds (especially song birds and raptors) are being studied qualitatively and quantitatively on both a seasonal and annual basis. It is interesting to note that the WIPP structures have provided a new habitat type for song birds such as flycatchers, and the population composition has changed since the start of the study in 1979 (DOE, 1989d). A change of this nature is neither unusual nor detrimental. Additional information is provided in Subsections 2.9.2, 2.9.3 and 5.1.

7.1-2 Comment

One commenter felt that the possible implementation of the No Action Alternative, and its related biological impact on the WIPP, was inadequately discussed in Section 5 of the SEIS, partially because the final status of the facility is unclear. This commenter asked whether another use of the site might also involve nuclear storage and commented that failure to compare the impacts of the No Action Alternative with the Proposed Action gives the No Action Alternative a negative flavor.

7.1-2 Response

None of the alternatives discussed in this SEIS would have significant adverse biological impacts. Under the No Action Alternative, the WIPP would be decommissioned or put to other uses. No specific uses have been established for the WIPP if it were to be decommissioned. The DOE will ensure that impacts to biological resources are kept to a minimum, regardless of the final use of the WIPP.

7.1-3 **Comment**

The EEG referred to page 5-2 of the draft SEIS, which states, "Salt levels . . . do not appear to inhibit plant species diversity or abundance" and commented that this statement "should be clarified to say that 'current' accumulations do not have an effect, unless soil salt concentrations are not expected to increase in the future as a result of WIPP operations." The EEG also stated that the phrase "do not appear" suggests that a detailed study has not been performed. Finally, the commenter wondered whether or not such a detailed study had been done.

7.1-3 **Response**

Salt accumulation studies have been performed at the WIPP since 1975. Initial studies were conducted as part of the WIPP Biology Program and were incorporated into the Ecological Monitoring Program in 1984 and are reported annually. The purpose of Subsection 5.1.1 is to discuss the findings of research conducted since 1980. Salt impact studies continue to reveal some short-range transport of salt dust from the salt piles. This material accumulates at or near the soil surface during the dry seasons in areas near the salt piles, but is flushed deeper into the soil during the rainy season, away from the root zone of most plants. The most recent annual report indicates that no salt is accumulating at the surface or in the top 75 centimeters of soil. Instead, salt is being flushed through the soil to the underlying caliche layer. The "flushing" of salt into the soil column occurs regularly, so long-term build up is not expected (Fischer et al., 1988). This information has been added to Subsection 5.1.1.

Vegetation surveys conducted in 1988 found reduced cover and density in all plots near the WIPP (Fischer et al., 1988). Since this is the first year in which this pattern has been observed, a trend cannot be determined. Salt studies would be continued through the Test and Disposal Phases, and any necessary mitigations would be implemented.

7.1-4 **Comment**

Comments were made regarding the modifications in field work schedules that were made to avoid disturbing the Harris and Swainson hawk nesting area. Commenters also wanted to know if these hawks are on the endangered species list.

7.1-4 **Response**

To protect the hawk nesting areas during particularly vulnerable periods of the nesting cycle, field crews altered their schedules so that work in the vicinity of a nest was conducted only during early morning or late evening hours, or else work was delayed until the period of vulnerability was over. Work schedules were altered on a nest-by-nest basis in close consultation with the DOE WIPP Ecological Monitoring Program. Neither the Harris or Swainson Hawk are on the endangered species list, but they are protected by Federal law.

7.2 SOCIOECONOMICS

7.2-1 Comment

Some 70 comments were received that concerned impacts on tourism as a result of various aspects of the WIPP project. In general, commenters stated that the presence of the WIPP project will have a negative effect on tourism in New Mexico and that the associated transportation of radioactive waste will negatively impact tourism in New Mexico and other States as well.

7.2-1 Response

The contention that the WIPP project and the associated transportation of radioactive waste will have a negative effect on tourism in New Mexico or other States is not supported by available data. The defense-related nuclear industry has existed in New Mexico for more than 45 years, and tourism has grown significantly over that period of time. Los Alamos National Laboratory, the National Atomic Museum, and the Trinity Site are examples of defense-related nuclear industry sites that attract tourism in their own right. For example, the National Atomic Museum entertained 208,550 visitors in 1988 with approximately 80 percent of these individuals having out-of-state or international origins. The Museum at Los Alamos National Laboratory was an attraction for 71,000 people in 1988. Records show that more than 80 percent of these visitors were from out-of-State and that 10 percent of all visitors were from other countries. The WIPP project has increased business-related travel to the Carlsbad area. Moreover, since tourism activity is defined relative to all types of travel (vacations, business meetings, personal visits, professional conferences, holiday excursions, etc.), the defense-related nuclear industry is a significant contributor to New Mexico's tourism activity. The DOE can find no objective study which supplies compelling information or data that would imply, suggest, or prove that the existence of a facility like the WIPP, or the transportation of materials like those that would be transported to WIPP would have an overall detrimental effect on the tourism industry.

Concerning comments which suggest or state that the effects of a transportation or storage accident will decrease activity in the tourism industry, the DOE has reviewed results from two cases referred to in some of the comments–The Three Mile Island (TMI) power plant incident and the Exxon-Valdez oil spill.

In the period following the Three Mile Island power plant mishap that began on March 28, 1979, the level of tourism increased in the Harrisburg-Middletown, Pennsylvania, area. This increase was reported as early as April 24, 1979, by the Wall Street Journal and a few months later in the September 24, 1979, U.S. News and World Report (page 55) in an article entitled "Curious Fallout at Three Mile Island" (Chaze, 1979). These initial reports were followed by numerous studies of various aspects of the impacts of the nuclear reactor mishap. One example study, coauthored by Anne D. Trunk (Member of the Presidents Commission on Three Mile Island) and Edward V. Trunk (Division of Science, Engineering and Technology, Pennsylvania State University), is the "Impact of the Three Mile Island Accident as Perceived by Those Living in the

Surrounding Community" (Trunk, A. D., and E. V. Trunk, 1983). This study, written 2 years after the mishap, reports on various aspects of perceived versus actual impacts. Concerning the impact on tourism, it supports the findings of other studies. The study states that tourism declined in the third month after the accident, but the total for the year showed growth over 1978. Moreover, the local industry attributed the early summer drop to factors other than the accident (national economic conditions and the gasoline shortage, for example). The Three Mile Island Visitors Center received 122,000 visitors in the 2 years following the mishap or about the same amount for the previous 9 years combined.

Most studies on the accident were completed within two to three years after the incident. For a longer term indicator of the change in tourism activity, the DOE requested the latest detailed employment data on the Harrisburg-Lebanon-Carlisle Metropolitan Statistical Area (MSA) of Pennsylvania–the Three Mile Island location. The detailed historical data are available for the first quarter of each year and the latest data are for 1987. From the first quarter of 1979 through 1987, total Covered Employment in Pennsylvania increased about 4 percent, while in the MSA it increased just less than 15 percent (Pennsylvania Department of Labor and Industry, 1987). (Covered Employment refers to that employment covered under the State unemployment insurance law. This is the only way State and national data are reported at a detailed sub-sector level.) In the MSA, four tourism-oriented economic sub-sectors were examined for growth. Hotels and Other Lodging Places employment shows a 24 percent increase over 1979. The Eating and Drinking Establishments employment is up 33 percent. Amusement and Recreation Services employment is up 61 percent. Finally, Air Transportation employment shows an 88 percent increase. Combined, these tourism indicators sub-sectors grew more than 36 percent, or about two and a half times that of total Covered Employment since the Three Mile Island accident. The employment data give impressive support to the findings of earlier studies.

Several comments on the potential impact of a WIPP-related accident on tourism cited the Exxon-Valdez oil spill as an example. Response to comment 7.2-26 provides current information on the Exxon-Valdez oil spill. In short, while some tourism-related businesses were negatively impacted, the initial losses were replaced by additional cleanup activity. The Alaska Tourism Marketing Council reported that State-wide tourism is up 2 to 3 percent over 1988 and lodging is difficult to obtain in the oil spill area (Adcock, 1989a).

The review of the two most cited examples of impacts from accidents affecting tourism shows no evidence of potential long-term negative impacts.

7.2-2 <u>Comment</u>

Several commenters stated that there would be a decrease in the value of real property if there were an accident while transporting waste or a breach at the WIPP site.

7.2-2 **Response**

The best evidence of the effect on property values of an accident involving nuclear material is a study conducted by Gamble and Downing, (1981) following the Three Mile Island nuclear power plant accident. This study found that the only measurable effect of the Three Mile Island accident was a temporary (1- to 2-month) decline in the number of residential property sales within a 10-mile radius of the plant. There was no measurable effect on property values anywhere within the study area.

Gamble and Downing used cross section and time series analysis of data on actual market sales of single family homes from 1975 through 1979 within a 25-mile radius of the Three Mile Island plant and within a control area located away from the plant. They found that the accident had no measurable effect on property values within the 25-mile radius study area, or in any direction (i.e., downwind) from the plant. There was also no effect on low, medium, or high value properties. Interviews with persons familiar with the local real estate market (real estate brokers, financial institution officials, and building contractors) corroborated the results of the statistical analysis.

Two somewhat less comprehensive, but statistically valid, studies confirmed the Gamble and Downing results. Neither J. P. Nelson (1981) nor N. E. Coulsen and R. P. Robins (1987) found any statistical verification for the proposition that property values had fallen following the accident.

Only one study was identified which found any measurable effect on property values. This study (Payne et al., 1985) found that older homes (those built before 1950) within a two-block (0.4 kilometer) radius of a site contaminated with nuclear waste suffered a loss of value after the contamination at the site was publicized by the local press. (The site, an inactive industrial property in West Chicago, Illinois, had been contaminated for approximately 50 years. However, the contamination was not widely known until it was publicized.) There was no effect on property values for newer homes within 0.4 kilometer of the site, nor was there an effect on the values of homes of any age from 0.4 to 1.6 kilometers of the site. Thus, this study suggests that there may be some effect on property values, at least for some classes of property, in close proximity to nuclear contamination.

A probable explanation for the general lack of an impact on property values may be found in a study by Goldhaber et al., (1985). They found that in order for property values to be adversely affected, people have to move away from the area, or not move into the area. That is, demand has to decrease. Goldhaber et al. found that following the accident at Three Mile Island, population mobility in the vicinity of the plant was essentially unchanged. A few young and relatively mobile people did leave the area following the accident, but they were replaced by others with essentially the same demographic characteristics as those that left. The overall effect was that there was no net out-migration to adversely affect the value of property.

The studies discussed above evaluated the effects on property values for properties close to, but not directly contaminated by, radioactive material. If a property were to be contaminated, and as a result rendered unusable for residential (or other) purposes, its value would be diminished.

7.2-3 **Comment**

Several commenters stated that the presence of the WIPP site or transportation to the site will cause adverse psychological impacts, particularly among people who live along transportation routes.

7.2-3 **Response**

The U.S. Supreme Court has ruled that consideration of psychological effects from fear of risks are outside the scope of an environmental impact statement, and they therefore are not addressed in this SEIS (U.S. Supreme Court, 1983).

7.2-4 **Comment**

Several comments were received regarding potential negative effects on businesses along the WIPP transportation route. Most of these comments concerned northern New Mexico. Other comments concerned southeastern New Mexico and were related to the effects of both waste transportation and disposal on the business environment. There were also comments that concerned the possible negative impact on businesses as a result of a WIPP-related accident.

7.2-4 **Response**

The DOE has not identified any evidence of potential significant adverse effect on businesses because of waste transportation through communities or the WIPP's location in New Mexico. New Mexico has been a location for nuclear research, development, and production for more than four decades. The positive business and economic effects of nuclear research and development are evident in communities associated with the National Laboratories and other Federal government facilities. Highways in New Mexico and in other States across the nation are currently used to transport radioactive and hazardous materials. There is no evidence to support the allegation that the mere existence of the WIPP or the transport of waste would have any significant negative impact on businesses.

A case study of the Three Mile Island nuclear reactor accident of March, 1979, showed no or minimal effect on the long-term economic activity level and a short-term increase in activity. (See the responses to comments 7.2-1 and 7.2-2 for additional information on the Three Mile Island study.)

7.2-5 **Comment**

Several commenters were concerned that economic development would suffer if the WIPP project opened and if radioactive waste were transported through the State. Some of the comments were concerned with the effects of an accident on economic development.

7.2-5 **Response**

The DOE has not identified any evidence that the WIPP project, including the transportation of radioactive waste, would have a measurable negative impact on economic development in the State. The New Mexico Economic Development and Tourism Department was contacted regarding this concern, and it stated that the WIPP would not have a negative impact on economic development in New Mexico (Adcock, 1989b).

The DOE has been and continues to be sensitive to economic development of host States. In New Mexico, the DOE has worked with State and local officials to transfer technology to the private sector, to help shape and improve higher education programs, and to institute research centers of technical excellence at the three State research universities. Many of the past and some of the current efforts in economic development have been positively influenced by the DOE's nuclear research and development installations. The nuclear industry, of which the WIPP is a part, has a record of positive economic development impacts on New Mexico (Adcock 1989b).

There is little information that addresses the effects of a transportation accident on economic development other than studies of the effects resulting from the Three Mile Island accident of March, 1979. Studies of the economy show no evidence of negative impacts on economic development of the areas near Three Mile Island. Employment data for the period between the first quarter 1979 and 1987 show the Metropolitan Statistical Area surrounding the Three Mile Island site to have increased at a rate of nearly four times the State (Pennsylvania) increase in employment (Pennsylvania Department of Labor and Industry, 1987). (Also see the responses to comments 7.2-1 and 7.2-2 for additional information on the Three Mile Island studies.)

7.2-6 **Comment**

A few commenters stated that the draft SEIS did not consider the cost of health care to persons exposed to radiation as a result of an accident.

7.2-6 **Response**

Any attempt to analyze the cost of health care for illness caused by exposure to radiation as a result of WIPP-related accidents would be highly speculative. Such costs would depend on the number of persons affected and the nature of their illness.

The Price-Anderson Act would apply to any nuclear accidents involving the operation of the WIPP or any nuclear accidents involving the shipment of waste to the WIPP. The amount of coverage under the Act is approximately $7.3 billion per incident which should be sufficient to cover any health care costs related to exposure to radiation as a result of an accident. Additional information on the Price-Anderson Act is available in Appendix C.2.3.6, and in response to comment 3.1-5.

7.2-7 **Comment**

A few commenters stated that a decrease in property values as a result of WIPP-related activities will decrease the value of loan portfolios of financial institutions.

7.2-7 **Response**

The significant decrease in the value of loan portfolios of financial institutions such as savings and loan institutions is premised on a general decrease in property values as a result of the WIPP. As indicated in the response to comment 7.2-2, there is no credible evidence that a general decrease in property values would result from transportation of waste or the operation of the WIPP, either with or without an accident. Therefore, there should be no resulting decrease in the value of loan portfolios.

7.2-8 **Comment**

Commenters expressed concerns that WIPP-related activities will result in a decrease in movie/video productions in New Mexico.

7.2-8 **Response**

The DOE realizes the importance of the movie/video industry to New Mexico and consulted with the New Mexico Film Commission (a State agency) on this concern. Movie production location (the main concern of the comment) is dependent on many factors, including the availability of technical and financial support, the cooperation of public agencies, the suitability of the location and amenities to the script, and net profit potential. While important as a State promotional activity, movie/video production in New Mexico is relatively small compared to other industries. Records of the New Mexico Film Commission show that during the past 5 years, some 290 projects (both film and video) have been partly or totally filmed in New Mexico. Total expenditures from these projects in New Mexico were about $92 million (or $310,000 per project). There is no evidence that the WIPP project has had negative effects on location decisions for movie/video production. If the phased development of the WIPP were to continue as proposed, this may be one of many factors considered in the location decision; but, there is no evidence that this factor alone would play a significant part in the location decision (Adcock, 1989c).

7.2-9 **Comment**

Some general and some very specific comments were received concerning the depth and scope of subject matter in the draft SEIS. While the specific comments addressed a variety of areas (sociocultural, community infrastructure, schools, social services, housing, tourism, etc.), the general theme was disagreement with the DOE about the requirements for socioeconomic analysis and subject matter in the SEIS.

7.2-9 **Response**

The DOE believes that the socioeconomic analysis presented in the 1980 FEIS and supplemented in this SEIS are of sufficient scope and depth for an EIS. The FEIS contained a full scope and in-depth analysis of the socioeconomic impacts projected through the construction and operational phases of the WIPP project. The analysis completed for the FEIS found no socioeconomic impacts that required mitigation on the part of the Federal government. The only marginal impact of concern was a projected tight housing market during the construction period. Even that concern did not require mitigation since the private sector was (1980) developing housing areas that could fill the expected demand. During the period since the FEIS, the two-county economy (Eddy and Lea Counties) suffered losses in oil and gas production and potash mining activity. These drops in "base industry" activity affected housing availability, and the projected tight housing market never materialized. The peak socioeconomic impact period for the WIPP (i.e., construction) has passed. The DOE has continued to work with local officials and for the past two years (1988 and 1989) has issued a public report on the annual economic impact of the WIPP project. The socioeconomic analysis presented in the 1980 FEIS was updated in the draft SEIS and is located in this SEIS in Subsections: 4.1.2, 5.1.2, and 5.3.2.

7.2-10 **Comment**

Several commenters asked about the social costs associated with the potential 8.3 deaths and 106 injuries which may result from traffic accidents during transportation of TRU waste to the site. Several commenters requested estimates of the economic costs of the projected maximum injuries and deaths.

7.2-10 **Response**

The costs associated with injury or death are not readily quantifiable. There is a considerable amount of literature in which economists have estimated the social costs of an early death caused by an accident. The empirical estimates of the "value of life" range from $82,000 to $14.5 million. However, the best estimates (from a methodological standpoint) place the value of life at $2 million to $3 million (Dillingham, 1987). (The values reported in Dillingham have been updated to current dollars.)

The social costs of the 106 injuries are difficult to estimate without an indication of the severity of the injuries. However, the value of lost productivity, medical expenses, and pain and suffering can be estimated from average damages awards in personal injury cases. According to data produced by Jury Verdict Research, Inc. in 1989, the average personal injury award in the U.S. in 1988 was about $402,825 (Dawson, 1988). At that average value, and if the 106 injuries are evenly distributed over 25 years, they would have a present value of about $33.34 million using a real discount rate of 2.0 percent.

7.2-11 **Comment**

One commenter stated that the WIPP would have a negative impact on retiree in-migration to New Mexico and the southeastern part of the State in particular.

7.2-11 **Response**

There is no indication that the WIPP project has had or would have an impact on overall retiree in-migration in southeastern New Mexico or elsewhere in the State. The DOE has reviewed the housing market in southeastern New Mexico for potential impacts from the WIPP. In the process of this review, retiree in-migration was noted. The Carlsbad Retirement Promotion Council recently (mid-1989) reported an upswing in the number of houses being sold to families from outside the local area for purposes of retirement relocation. At the time this "upswing" was occurring, the WIPP project construction was being completed and the proposed opening of the facility was very near. This upswing does not indicate a negative effect of the location of the facility in southeastern New Mexico.

7.2-12 **Comment**

Some commenters stated that community proximity to the WIPP route may result in a decline of investor interest, economic development, and municipal bond ratings.

7.2-12 **Response**

Municipal bond ratings are based on several factors. The most important of these factors are the strength of the local economy, the scope of the local government's powers to administer services and to raise revenues, the burden of local debt maintenance, the historical fiscal performance of the government, and the legal environment within which the debt is undertaken (Moody's Investors' Service, 1989).

Of these factors, the only one which would be affected by a decrease in economic development is the strength of the local economy. If the effect on development, tourism, or property values was significant, and if the other factors were not strong enough to overcome this effect, it is possible that a decrease in bond ratings could occur. However, because there is no credible evidence that proximity to the WIPP site would have an adverse long-term effect on these factors (see response to comment 7.2-5), there is no reason to believe that the WIPP would have an adverse effect on bond ratings, in New Mexico or elsewhere. Also see the responses to comments 7.2-1, 7.2-2, 7.2-4, and 7.2-5.

7.2-13 **Comment**

A commenter stated that the draft SEIS showed that the econometric model is maintained at Los Alamos National Laboratory and asked if it is available for inspection.

7.2-13 **Response**

The DOE believes that this question was raised because portions of the Los Alamos National Laboratory require special clearance for access. The model referenced in Table 5.1 of this final SEIS is also maintained at the Albuquerque Operations Office of the DOE and at the Agricultural Economics Department, New Mexico State University. The footnote on Table 5.1 has been changed in the final SEIS to list these two additional locations. The location at New Mexico State University does not have the access restrictions of the other two locations.

7.2-14 **Comment**

A commenter stated that transportation of nuclear materials would cause an increase in health insurance costs to individuals living along transportation routes.

7.2-14 **Response**

Health insurance costs are based on actuarial risk factors within a defined insured group incurring health care expenses. In order for insurance costs to increase, the risk to the insured group must measurably increase. The analysis and results presented in the SEIS indicate that the risk to individuals living along the transportation route is quite small. This risk would not be expected to substantially increase the risk that individuals along the transport route are already incurring. Therefore, insurance rates should not increase as a result of WIPP-related transportation.

Most health insurance is obtained through employment. The insured group is a group of employees. If the place of employment is located away from a WIPP transportation route, the only members of the insured group who would be affected by any increased health risks associated with proximity to a transportation route would be those who happened to live along the route. In this case, health insurance rates for the group would increase only if there were a large increase in risk to those living along a route. In fact, the increase in risk to those living along a route is very small. Therefore, there should be no measurable effect on the risk to an employee group with a place of employment away from a route.

Even in those cases where the place of employment is along a route, the increase in risk should be so small that it would have no measurable effect on health insurance costs.

Health insurance rates for persons who obtain health insurance through means other than their place of employment should not be affected since there is no significant increase in risk. Much health insurance is obtained through other identifiable groups such as veterans groups, chambers of commerce, etc. The increase in risk to these groups overall, as a result of some members living or working in proximity to a transportation route, would not be measurable.

Finally, even persons who obtain individual health insurance policies are categorized into a group (or groups) by insurance companies. Again, the increased risk to the overall group from proximity of some members to a transportation route is very small. And it is very unlikely that insurance companies would recategorize individual policy holders into those living along a transportation route and those living away from a route.

7.2-15 **Comment**

A commenter stated that there would be a negative effect from the WIPP because of additional road maintenance costs.

7.2-15 **Response**

TRU waste transport to the WIPP would not significantly add to truck traffic already on New Mexico highways. The maximum increase on any highway segment is expected to be about 5 percent. There is no reason to believe that this increase would create additional substantive road maintenance requirements. Regardless, the transport of waste to the WIPP will be subject to vehicle and fuel use fees and taxes. These fees and taxes are typically used for road construction and maintenance. The DOE will continue to work closely with the State of New Mexico to address transportation concerns.

7.2-16 **Comment**

Several commenters generally criticized the draft SEIS for not performing socioeconomic impact analyses of communities through which the waste transport trucks would travel. Some of the comments were concerned with both general impacts and accident-related impacts.

7.2-16 **Response**

The DOE believes that routine WIPP transportation activities would not significantly affect the socioeconomic structure of communities along the transport route because of the relatively few number of shipments spread over such a long time. Expenditures for truck transportation would average about $2 million annually (constant 1989 dollars). These expenditures would be spread across 23 States and numerous communities. It is unreasonable to assume that the projected level of expenditures at any one location would be a significant change to a community's economic activity level and therefore, there is no need for impact analyzes for specific communities. Similarly, there is no evidence to suggest that significant, long-term socioeconomic effects would result from a transportation accident. (See responses to comments 7.2-1, 7.2-2 and 7.2-5 for additional information.) Economic losses that might occur as a result of a transportation accident that results in a release of radioactivity would be subject to the provisions of the Price Anderson Act.

7.2-17 **Comment**

A few commenters stated that the socioeconomic analysis was limited to a two-county area instead of the entire State of New Mexico.

7.2-17 **Response**

The primary area of impact or regional area of influence used in both the FEIS and the SEIS were the two counties of Eddy and Lea, which constitute the southeastern portion of New Mexico. These two counties cover a reasonable radius (50 miles) for a commuting distance from the WIPP site. The socioeconomic analysis completed for the FEIS found no impacts in the two-county area that required mitigating action. On a State-wide basis, the relative socioeconomic impacts would be lower yet. At the time the draft SEIS was issued (April 1989), the peak period of construction had passed with no required mitigation action because of socioeconomic impacts. The analysis completed for this SEIS did not project impacts during the Disposal Phase that were significant additions or losses to the WIPP-related level of economic activity of the mid-1980s. Thus, as was the case in the FEIS, there is no compelling reason to provide a State-wide socioeconomic analysis.

7.2-18 **Comment**

A few commenters stated that the WIPP would create few permanent jobs and many of those jobs would go to non-local workers.

7.2-18 **Response**

During the Test Phase, the WIPP would directly employ about 650 persons in the Eddy and Lea county area. Indirect and induced employment would bring the area total up to a range of 1,650 to 1,800 jobs. When full operation has been reached, direct employment would be about 680 persons, and indirect and induced jobs would number about 930. Jobs directly supported by the WIPP have been, and will continue to be, filled by both local and non-local people. Indirect and induced jobs are filled primarily by local workers.

7.2-19 **Comment**

A group of commenters stated that the retail gross receipts for Carlsbad dropped from $151.2 million in 1981 to $141.6 million in 1987. They asked if this was the stabilizing effect on the local economy of WIPP mentioned on page 5-3 of the draft SEIS.

7.2-19 **Response**

During the period from 1981 through 1987, the Carlsbad community was suffering from decreases in two of its major base industries–oil and gas production, and potash mining. The drop in retail gross receipts from $151.2 million to $141.6 million is not surprising and would have been even greater if the WIPP construction had not occurred. During the referenced period, unemployment in Eddy County rose from 4.5 percent to a high of 14.1 percent in 1986. The number of unemployed individuals increased by about 2,100 (1986). The New Mexico Department of Labor employment statistics show that mining (includes oil and gas extraction) employment dropped from 4,848 (annual average) to 2,727 (annual average) in 1987. During this same time period, construction employment in Eddy County, mainly related to the WIPP and Brantley Dam, fluctuated but not the significant reductions experienced in mining employment. In 1981, annual average construction employment in Eddy County was 1,397, dropping to 1,148 in 1984, rising to 1,430 in 1986, and again dropping to 1,109 in 1987 (major construction on both the WIPP and Brantley Dam was completed by the third quarter of 1987). While the construction activity of the WIPP and Brantley Dam aided the economy, they did not completely offset the losses in the mining industries. Nevertheless, both the construction of the WIPP and Brantley Dam helped stabilize the local economy–particularly in Carlsbad.

7.2-20 **Comment**

A few commenters stated that the DOE's use of the I/O model has been roundly criticized and that reliance on the model was inappropriate. The phrase "roundly criticized," was attributed to comments made during preparation of the FEIS by the commenters and the State of New Mexico. The commenters stated that the I/O model 1) overestimated impacts because of large amounts of excess capacity in the depressed two-county area, 2) contained counterfactual assumptions that new investment and employment patterns will trace those of the economy at the time that the coefficients were estimated, and 3) assumed an interindustrial structure which does not exist in the two county area. The commenters also suggested that a lower peak direct-employment level than the projected "just fewer than 1300" on page 9-48 of the FEIS constitutes false calculations by the I/O model used for the FEIS.

7.2-20 **Response**

The criticisms of the I/O model process are not substantiated, nor does the supporting material cited by the commenters reasonably support the criticisms.

In reference to the State's disagreement with the 1981 version of the regional I/O model, the treatment of State and local government sectors was revised in 1987. Information from the New Mexico Department of Taxation and Revenue and data from several other State departments were used to generate tax revenue and expenditure coefficients currently used in the regional modeling process. Since the 1987 revision, study, real tax rates for at least two major taxes (Gross Receipts and Income Taxes) have increased. Thus, the current revenue coefficients are most likely conservative.

The FEIS and the draft SEIS, as well as other annual studies by the DOE's Albuquerque Operations Office (Adcock et al., 1989a; Adcock et al., 1989b) have been careful to implicitly acknowledge the potential for excess capacity in the regional economy. In these studies, indirect and induced impacts on employment have been labeled "jobs supported," while direct impacts on employment have been termed "jobs created." The draft SEIS does not imply that total employment has or will increase by the total impact on jobs. The model does not overestimate employment impacts.

The employment patterns used in the model are based on actual data collected by the New Mexico Department of Labor. The criticism related to the patterns of "new investments" appears to refer to the mix of capital, materials, and labor represented in the structure of the I/O model. The model uses national averages that are sensitized to a study region through a process of relating specific economic sector size to input demands of an industry-specific production function. Simply stated, the model accounts for smaller-than-average or lack of specific industries in a region (Eddy and Lea Counties) by restricting the percentage of product input that can be bought in the region. The impact from new investments would be study-region-specific and related to average requirements for a product unit and regional availability. Both the national averages for the production functions and the data used to make the regional adjustments were the latest data available at the time of the I/O model construction (mid-1988 through mid-1989).

The interindustrial structure assumed in the regional I/O model for Eddy and Lea Counties is based directly on an analysis of the current types of businesses and employment levels, with the exception of the agricultural sector(s). This analysis is used to determine the amount of industry in the region and as input to establishing the industrial linkages of the region. The analysis is precise and is completed at a "four-digit level" of the Standard Industrial Classification Code (SIC Code) as used by the New Mexico Department of Labor. The agricultural sector(s) size delineation for the model is based on crop and livestock data from publications of the Agricultural Extension Service of New Mexico State University. In short, the economic structure used in the I/O model is based on the latest data at time of modeling and is unique to the region (Eddy and Lea Counties) being modeled.

The commenter's statement that the failure of the peak construction employment impact to reach a level of just less than 1,300 is a demonstration of the false calculations of the model is an erroneous conclusion. As with all major construction projects, the projected construction schedule which dictates the manpower at a construction site is subject to change as a project progresses. In the case of WIPP construction, the projected schedule used in the FEIS had a peak that was higher than that experienced as construction proceeded. Since the multipliers derived from the I/O model are static and linear, the lower peak and average employment levels would simply mean lower proportional total impacts. Thus, an actual lower peak or average construction employment has no connection with the level of accuracy of the I/O model itself. However, the lower peak or average employment levels than projected would usually mean that any positive impacts from the project (WIPP) activity would be less than projected. On the other hand, most negative impacts (such as community infrastructure demands, local government revenue lags, traffic congestion, etc.) would also be lessened. In the FEIS projections, socioeconomic impacts erred only slightly on the high side, but the root of the error was not the I/O model. Moreover, since with the slightly higher socioeconomic projections in the FEIS there were no mitigating actions projected to be required, the lower peaks and average impacts had no significant negative impacts either.

7.2-21 **Comment**

A group of commenters objected to the use of constant 1990 dollar values to represent economic impacts for an approximate 5-year period starting in 1989.

7.2-21 **Response**

Many of the economic impact values are quoted in constant 1990 dollars so that the reader can see expected changes in real dollar valued impacts. This is a usual and accepted practice for dealing with multiple time periods subject to inflation. The referenced comment concerns the use of constant 1990 dollars to represent a set of values beginning in 1989 or in the year before 1990. This again is a usual and accepted practice in order to maintain values in real (without inflation) terms. A constant inflation rate of 3.5 percent annually was assumed in establishing the constant 1990 dollar values.

7.2-22 **Comment**

Several commenters stated that the WIPP has benefitted or will benefit the New Mexico economy.

7.2-22 **Response**

These comments in support of the WIPP are noted.

7.2-23 **Comment**

One commenter inquired about a study of the impact of the WIPP on tourism prepared by the New Mexico "Tourism Department" in 1980.

7.2-23 **Response**

A considerable effort was made to find this study. Since the comment stated that the study was a project of the "Tourism Department," the following contacts were made with the State of New Mexico in an attempt to obtain the document.

- Tourism Division, Economic Development and Tourism Department, Tourism Division Director and other staff, July 19, 1989 and July 21, 1989 (Adcock, 1989d)

- State Archives and Records, records staff, July 27, 1989 and July 28, 1989 (Adcock, 1989e)

- New Mexico State Library, Librarian, July 27, 1989 (Adcock, 1989f)

- Economic Development Division, Economic Development and Tourism Department, several long-time employees, July 27, 1989, July 28, 1989 and August 1, 1989 (Adcock, 1989g)

It is not clear if a study was ever completed. The State Archives and Records office would have a copy if a final report was issued. None of the agencies contacted could locate a copy. Additional comments and information on tourism impacts can be found in the responses to comments 7.2-1, 7.2-4, 7.2-5 and 7.2-6.

7.2-24 **Comment**

Several comments were received concerning a recommended disclosure statement for the sale of property in Santa Fe, New Mexico. The comments stated or indicated that the statement was recommended by the Santa Fe Board of Realtors. Another commenter indicated he was awaiting a response from the insurance company that provides his errors and omissions insurance telling him what expertise it requires from him regarding the disclosure of hazards that exist for those individuals who live on the WIPP route.

7.2-24 **Response**

On July 22, 1989, Mr. William McKinstry, Executive Vice President, Santa Fe Board of Realtors, was contacted in his office. Mr. McKinstry stated, "The Board does not now and has not in the past recommended a disclosure statement regarding WIPP or the transportation of radioactive wastes through Santa Fe." Mr. McKinstry also stated that the Board had listened to speakers who may have suggested that such a disclosure statement be recommended, but the Board had taken no action to recommend such a document (Adcock, 1989h).

Transportation of materials to the WIPP site is not inherently different from transportation of other hazardous materials (nuclear or non-nuclear) over public rights of way. (If anything, transportation to the WIPP site would be safer than general transportation of hazardous waste.) Since current shipments of hazardous waste do not require special expertise on the part of real estate agents or brokers in order for them to obtain errors and omissions insurance, there is no reason to expect that real estate agents or brokers would require special expertise of WIPP-related transport.

It can also be noted that at this time, there is no general requirement that real estate agents or brokers disclose to potential buyers information about WIPP transportation routes. Since there is no reason to expect a general decline in property values as a result of the WIPP (see the response to comment 7.2-3), there is no reason to expect that real estate agents or brokers would incur additional liability as a result of the WIPP. Therefore, the WIPP should have no effect on errors and omissions insurance.

7.2-25 **Comment**

Several commenters compared the Exxon-Valdez oil spill effects on tourism in Alaska to the potential effects of an accident in the transportation of radioactive waste to the WIPP. The commenters stated that, as a result of the oil spill, tourism in Alaska was down 40 percent, and millions of dollars had to be spent to increase tourism.

7.2-25 **Response**

The comparison of the Exxon-Valdez oil spill to a potential accident in the transportation of radioactive waste to the WIPP site is inappropriate. There is no reason to believe that the spread of radioactive waste from a potential accident could remotely approach the distance or scope of this oil spill. However, in response to the comparison presented in the comments on the draft SEIS, the DOE has compiled the following information.

On July 19, 1989, the Alaska Tourism Marketing Council was contacted (Ms. Karen Cowart, Administrative Assistant to the Executive Director) (Adcock, 1989a). The Council is a public/private agency supported by the State of Alaska and tourism-oriented businesses. This organization reported that Alaska tourism is enjoying a "healthy season." Overall, tourism is up 2 to 3 percent. This information was confirmed in a July 20, 1989, telephone call to Mr. Bob Miller, Executive Director of the Council (Adcock, 1989a). Mr. Miller also stated that the recent media campaign was supported by a $4 million grant from Exxon to offset "the image [of Alaska] presented by the nightly news."

Initially, as a result of the oil spill, there were cancellations of reservations for hunting/fishing lodges and boat charters. Shortly after the accident, loss of tourism was replaced by increased business in travel-related activities (lodges, hotel/motels, charter boat, etc.) as a result of the cleanup effort. In the short-term (1 to 2 years), the volume of some individual tourism activities near the oil spill area may decrease. However, because of the additional travel business volume brought on by the cleanup and the active advertising campaign, no decrease in total travel is expected.

7.2-26 **Comment**

A few commenters stated that the draft SEIS should have considered the negative effect of the permanent denial (to mining) of mineral resources at the WIPP site.

7.2-26 **Response**

The final SEIS discusses in Subsection 5.1.3 and Section 9.0 the irreversible impact on mining of mineral resources at the WIPP site. The DOE currently owns or is negotiating the purchase of the subsurface rights. The DOE has compensated the leaseholders for the rights it now owns and is negotiating for the remaining 1,600 acres within the no mining activity zone surrounding the WIPP site. The remaining leases are a small part of the total leaseholdings of a major potash company now operating near the WIPP site. The buy-out of these leases should not cause a change in current employment levels for that company. The DOE foresees no significant impact on mining as a result of the withdrawal of subsurface rights for WIPP purposes.

7.2-27 **Comment**

Several commenters stated that support for the WIPP in the Carlsbad, New Mexico area is, or is not, out of economic desperation. Some commenters maintained that the support for the WIPP represented an act of economic desperation on the part of people worried about the local economy. Other commenters stated that the Carlsbad economy is healthy, and their support for the WIPP is not out of economic desperation.

7.2-27 **Response**

The DOE is aware of the diverse opinions regarding support for the WIPP.

7.2-28 **Comment**

One commenter made note of a study that indicated that New Mexico receives a great deal of Federal spending but ranks low among the States in terms of income levels and high in terms of the percentage of the population below the poverty level.

7.2-28 **Response**

The WIPP will not eliminate poverty in New Mexico. However, the WIPP would provide jobs which pay better than the average for New Mexico. Therefore, it would raise average incomes in the local area, although State-wide the effect would be small.

7.2-29 **Comment**

Several commenters doubted the credibility of some of the WIPP's critics, stating that such objections are exaggerated, misleading, emotional, and contradictory.

7.2-29 **Response**

Comments noted.

7.2-30 **Comment**

A few commenters stated that the costs of transporting waste to and probably from the site were not included in the draft SEIS.

7.2-30 **Response**

The costs of transporting waste are somewhat dependent on the final shipping schedule, waste source location and quantity of waste received during certain time periods. As a general measure, the following information and projections are available. The DOE has a contract with the Dawn Trucking Company of Farmington, New Mexico, for $5.8 million over a 3-year period. This includes start-up costs and equipment purchases. Actual expenditures would depend on timing of shipments and quantity of equipment needed. Annual transportation costs during the Disposal Phase would range between $1.8 and $2.0 million, depending on schedules and quantity shipped. Over the proposed life of the WIPP project, the shipping costs would range between $40 and $50 million in constant dollars. The economic impact from transportation on any location would be insignificant because the greatest level of annual impact would be about $2 million spread across several communities.

7.2-31 **Comment**

Many commenters stated that significant economic impacts would result in New Mexico and elsewhere just because individuals would be afraid of the potential risks associated with transporting waste to and operating the WIPP. These commenters stated that these fears would reduce tourism and cause a decrease in property values, business activity, economic development, movie/video production, and increase health care costs in New Mexico. The commenters stated that these impacts should be evaluated in the final SEIS.

7.2-31 **Response**

The U.S. Supreme Court has ruled that the impacts resulting from fears of potential risks are beyond the scope of the NEPA (U.S. Supreme Court, 1983). The potential impacts from fears of risks associated with the WIPP activities are not evaluated in the final SEIS. The impacts to the economic areas identified in the comment as a direct result of a change in the physical environment associated with the WIPP activities are discussed in the responses to comments 7.2-1, 7.2-2, 7.2-4, 7.2-5, 7.2-6, and 7.2-8.

7.3 TRANSPORTATION POLICY

7.3-1 **Comment**

A commenter wanted to know why it was necessary to ship transuranic (TRU) waste to the WIPP and if it would be safer to leave radioactive materials where they are now stored.

7.3-1 **Response**

This SEIS analyzes the impacts of proceeding with the phased development of the WIPP as a research and development facility to demonstrate the safe disposal of defense TRU waste generated since 1970 as authorized by Congress. The proposed action necessarily involves the transport of TRU waste to the WIPP since the waste that might be ultimately disposed of at the WIPP is currently in storage or will be generated at facilities other than the WIPP. The SEIS also analyzes the no action alternative which would not involve transportation of waste to the WIPP. Additional information is available in responses to comments and in Subsections 5.2 and 5.5.

7.3-2 **Comment**

Commenters wanted to know what security measures would be taken against possible terrorism involving a shipment of TRU waste and why these issues were not addressed in the draft SEIS.

7.3-2 **Response**

The mass and integrity of the TRUPACT-II packaging, combined with the relatively small quantities of radioactive material per TRU waste shipment, make these shipments poor targets for terrorism and sabotage. The analysis in the FEIS (DOE, 1980) pointed out the difficulty of scattering enough of the waste material to create a major health hazard. This analysis concluded that more damage would be done by the explosives used to breach the TRUPACT-II than from the radioactive materials released. This analysis remains valid and there was no need to update it in this final SEIS.

Federal regulations provide for a "graded safeguards" approach for the protection of all special nuclear materials which includes but is not limited to plutonium and TRU waste. "Graded safeguards" is the concept whereby the greatest amount of control and protection is afforded to the types and quantities of special nuclear materials that can be most effectively used to build a nuclear explosive. Whereas all nuclear materials are afforded some level of protection, the level of security that is provided to a shipment of TRU waste, which contains small amounts of hard-to-recover special nuclear materials, is considerably less than the level of protection that is provided to a shipment of weapons grade plutonium.

All shipments of TRU waste would be carefully measured by state-of-the-art nuclear materials measurement devices which assure that all waste containers would contain only low levels of special nuclear materials. This measurement would be taken before the shipment leaves those areas of the facility where the greatest levels of physical protection are afforded. The waste containers would be sealed to assure that the waste materials would not be disturbed or altered. Subsequent to measurement and prior to shipment, the seals on these containers would be checked to assure that the integrity of the waste container or its contents would not be disturbed.

Additional security measures now available include the TRANSCOM satellite tracking system, which monitors the position and status of shipments en route to the WIPP. This would make it difficult for the theft of a shipment to remain undetected for long. Drivers would also be required to maintain visual contact with the shipment at all times (even during meal stops) and to be in two-way telephone communication with the WIPP Central Coordination Center.

The drivers would also be trained in how to respond to threats of sabotage or terrorism and how to handle incidents that might occur. Although the probability of acts of sabotage or terrorism involving TRU waste shipments cannot be predicted, the DOE has incorporated important deterrents in the TRU waste transportation program to counter such actions. These deterrents reduce the attraction of using TRU waste shipments as targets for sabotage or terrorism.

7.3-3 **Comment**

Oregon's Hanford Advisory Board commented as follows:

> Cleanup of U.S. defense wastes is a national program. The U.S. DOE is responsible for the cleanup. The risks of TRU waste accidents are imposed on local, State and Tribal governments by the U.S. DOE. Therefore, the costs of accident prevention, emergency preparedness and response, and public information must be borne by U.S. DOE.
>
> [The draft] SEIS addresses only two of Oregon's 50 transport safety recommendations. However, it's reassuring to know that Oregon's transport safety concerns are being addressed in another forum--namely, the Western Governor's Association (WGA).
>
> [The Board and Advisory Committee], . . . [w]ithout U.S. DOE's attention to the WGA report, would find this impact statement unacceptable. We are not particular about who secures a firm and reliable commitment from U.S. DOE on transport safety–so long as that commitment is forthcoming.

7.3-3 **Response**

The DOE has obtained a copy of the WGA's Report to Congress--Transport of Transuranic Wastes to the Waste Isolation Pilot Plant--State Concerns and Proposed Solutions (WGA, 1989), and has evaluated its recommendations. The DOE found that nearly all the recommendations have been considered in this SEIS and are addressed in mitigating actions. Additional mitigations to ensure the safe transport of TRU waste are presented in Subsections 3.1.1.3 and 6.2, and Appendices C, D, L, and M. Those not addressed in this SEIS were discussed with the WGA at a DOE/WGA Transportation meeting in November 1989. More information on transportation-related costs is provided in the response to comment 7.12.9-6.

The WGA report (WGA, 1989) emphasized several key recommendations for accident prevention. This final SEIS addresses each of these concerns:

1) WGA: Ensuring high quality drivers and carrier compliance with regulation and contract requirements.

   SEIS: A new appendix, Appendix M, details the trucking company management plan and contract, and explains driver qualification and training requirements, equipment standards and inspection programs, route management procedures, and procedures for emergencies.

2) WGA: Independent inspections of drivers, vehicles, and shipping containers.

SEIS: The DOE will cooperate with State vehicle inspection procedures and will establish a preoperational program of "dry run" transports from each facility to the WIPP. These "dry run" trips will be made in cooperation with affected States and will provide an opportunity to test emergency response capacities as well as independent inspection procedures.

3) WGA: Keeping shipments off the road during bad weather and road conditions.

SEIS: Trucking company dispatchers, with access to satellite weather information, will manage transports to avoid bad weather situations by either postponing transports which will encounter bad weather, or, if a trip has already been initiated, directing the driver to the nearest safe parking area until the trip can safely resume.

4) WGA: Safe parking during abnormal conditions.

SEIS: The DOE has reached agreement with the U.S. Department of Defense (DOD) to use DOD facilities along the WIPP routes for emergency parking areas. Additional areas need to be identified, and the DOE is requesting that corridor States submit additional areas for consideration.

5) WGA: Advanced notice of shipments.

SEIS: The TRANSCOM satellite tracking system, available to States and Tribes, will provide information about future shipments up to 7 days prior to the planned departure date.

6) WGA: Access to information on shipment status.

SEIS: The affected States and Tribes will be given access to the TRANSCOM satellite tracking system, which includes options for tracking transport vehicles, bill of lading information, advanced shipment information, and an emergency checklist system.

7.3.1 WASTE PACKAGING

7.3.1-1 Comment

A U.S. Congressman, the Zuni Pueblo, and local government officials expressed their desire to see the DOE label the waste transportation containers, because it would be prudent to have these containers labeled in the event of an accident.

7.3.1-1 **Response**

The transport of TRU waste to the WIPP would be made in properly labeled and placarded NRC certified packages which would meet all applicable DOT and NRC requirements.

7.3.1-2 **Comment**

Well over 50 commenters, including officials from the States of Nevada and Colorado, expressed concern that neither the TRUPACT-II (transport packaging for the CH TRU waste) nor the NuPac 72B (transport packaging for the RH TRU waste) were certified by the NRC, although the draft SEIS states that both packagings would be used to ship TRU waste to the WIPP. Some commenters were uncertain if the DOE would obtain certification before using the packagings and who the certifying authority would be. Those who were aware that the packagings would be certified wanted to know what the certification process would involve as well as the certification schedule for the TRUPACT-II and the NuPac 72B. Finally, many commenters wanted to know how certification ensures the protection of public health and safety.

7.3.1-2 **Response**

In an agreement with the State of New Mexico, the DOE committed that all TRU waste going to the WIPP would be transported in Type B packages certified by the Nuclear Regulatory Commission (NRC). The TRUPACT-II is a reusable packaging which was certified by the NRC on August 30, 1989 to comply with all applicable regulations of 10 CFR Part 71. The NuPac 72B package (intended for the transport of RH TRU waste) has not yet received NRC certification, but it will meet NRC regulations (10 CFR Part 71) just as the TRUPACT-II did and be certified as a Type B Package for RH TRU waste before the DOE will use it to transport RH TRU waste to the WIPP.

The certification process requires that a formal safety analysis report (SAR) describing the packaging system, the analysis and the tests performed to demonstrate that the proposed design satisfies the standards, together with a quality assurance program, be submitted to the NRC.

Demonstrating acceptable package performance under the hypothetical accident conditions of impact, puncture and fire for a Type B package is only one step in the certification process; the NRC must be convinced that the packaging fulfills all of the regulatory requirements and meets the intent of the safety regulations. (Please refer to Appendix L for more detail on the "hypothetical accident conditions.") A safety analysis report for the TRUPACT-II packaging was submitted to the NRC in March 1989 (DOE, 1989f). A safety analysis report is currently being prepared for the NuPac 72B cask. The NuPac 72B cask is a scaled-down version of the NuPac 127B package which has been certified by the NRC as a Type B package. (The 125B is being used to transport the Three Mile Island nuclear power plant core debris.) Hence, analysis will be the primary method of demonstrating compliance with regulations for the 72B cask.

The intent of packaging regulations is to provide the protection required to ensure public safety during normal transport and in accident situations. The regulations are designed so that the integrity of the package and the safety of the public do not depend solely on procedures, but are inherent properties of the design. The NRC certification criteria for Type B packagings are extremely stringent. The candidate packaging design must demonstrate resistance to mechanical- and thermal-related threats from a sequential series of tests (called the hypothetical accident conditions), in addition to the evaluations for normal transportation conditions.

The NRC thoroughly reviews the safety analysis reports to determine whether the candidate packaging can be certified. Upon approval of the packaging design, the NRC issues a Certificate of Compliance which provides procedures for the fabrication, operation, and maintenance of the packaging, in addition to defining the allowable payload that can be transported in each package design.

Additional details on the certification process can be found in Appendix L.

7.3.1-3 **Comment**

The EPA commented that the SEIS should include a diagram of the standard waste box.

7.3.1-3 **Response**

A diagram of the standard waste box has been added to Subsection 3.1.1.3 of the final SEIS.

7.3.1-4 **Comment**

The EEG stated that the payload for the TRUPACT-II is "about 5,300 pounds" and that supercompacted wastes could violate the maximum gross shipping weight if fourteen supercompacted drums were shipped in a TRUPACT-II.

7.3.1-4 **Response**

The waste payload of a TRUPACT-II is 7,265 pounds. If all fourteen drums were of supercompacted waste, some load management would be required to ensure that the maximum gross shipping weight of 19,250 pounds (TRUPACT-II plus payload) would not be exceeded.

7.3.1.1 **TRUPACT-II**

7.3.1.1-1 **Comment**

Commenters asked how the WIPP could proceed, given the possibility of TRUPACT failures.

7.3.1.1-1 **Response**

The initial TRUPACT "failures" were in fact not failures, but rather they provided an understanding of the area of design that required reevaluation. As a result, minor changes were made to the TRUPACT design and the tests were repeated to show full compliance with NRC requirements. Since publication of the draft SEIS, the NRC has certified the TRUPACT-II for shipment of CH TRU waste to the WIPP.

Additional details on the TRUPACT-II can be found in Appendix L.

7.3.1.1-2 **Comment**

A large number of comments were received regarding the results from the TRUPACT-II testing program of the hypothetical accident conditions required for NRC certification. The majority of these concerns centered on reports that the packaging failed some of its certification tests and therefore is not adequately designed for the transportation of TRU waste.

In addition, the following more specific comments and questions were received regarding test conditions and procedures:

- Will the TRUPACT-II be modified once testing is completed?
- Has the DOE extrapolated the TRUPACT-II's response to the hypothetical accident tests to failure points?
- Do the test conditions adequately represent actual accident conditions?
- Identify accident conditions which correspond to the test conditions.
- A larger number of tests is needed to provide meaningful data.

7.3.1.1-2 **Response**

A regimen of full-scale tests and analyses has demonstrated that the TRUPACT-II satisfies the NRC certification requirements for a Type B packaging. Although some of the early testing failures led to design changes and enhancements of the packaging, the NRC has judged that any problems with the prototypes have been satisfactorily corrected. The NRC issued a Certificate of Compliance for the TRUPACT-II package on August 30, 1989. Details of the testing program are included in Appendix L.

As stated above, the TRUPACT-II design has been certified by the NRC as a Type B package and therefore must be fabricated to the NRC certified design. Modifications to the package would require a revision to the SARP and subsequent NRC approval. If the NRC determines that the proposed modification is significant enough to alter the packaging performance to the hypothetical accident conditions, additional testing or analysis might be required prior to approval.

An extrapolation of the TRUPACT-II testing to determine a failure point has not been performed because it is not a requirement of the NRC. The DOE believes that the testing program is of sufficient rigor to be protective of public health and the environment, and this testing to failure is not necessary.

The type, number, and conditions of the tests are dictated by the requirements of 10 CFR Part 71. The NRC in its regulatory capacity is responsible for establishing the requirements which qualify packages to transport radioactive materials, which includes assessing their ability to withstand real accident conditions. The DOE has the obligation to obtain NRC certification for all packages used to transport TRU waste to the WIPP. For details on the hypothetical accident conditions, the reader is referred to the response to comment 7.3.4.1-1, which includes a qualitative description of the engineering criteria used to determine the test parameters.

Additional details on TRUPACT-II tests are provided in Appendix L.

7.3.1.1-3 **Comment**

One person commented that according to Table B.3.1 of Appendix B of the draft SEIS, approximately 18 percent by weight of the TRU mixed waste will be in a combustible form, while in DOE-WIPP-88-018 (RCRA Compliance at the Department of Energy's Waste Isolation Pilot Plant), it is estimated that combustible waste will constitute 40 percent of the total volume of TRU mixed waste. The commenter stated that the reason for this discrepancy should be explained in the final SEIS.

Other commenters asked why the TRUPACT-II certification tests did not include the use of combustible waste to ensure protection of the public and environmental safety.

7.3.1.1-3 **Response**

The reasons for the differences in the amounts of TRU mixed waste in a combustible waste form reported in the draft SEIS and in the RCRA document in question (DOE, 1988a) include the following:

- The draft SEIS as well as this final SEIS reports TRU mixed waste by weight while the RCRA document was a preliminary estimate of the percentages of TRU mixed waste by container volume. Combustible waste forms weigh less than other waste forms such as sludges or metals, but they occupy a greater volume than other waste forms. In other words, it is difficult to make a direct comparison of the volumes and weights of various waste forms.

- The SEIS uses newly-generated waste from the Rocky Flats Plant and the waste from the Rocky Flats Plant that is currently in retrievable storage at the Idaho National Engineering Laboratory (see Table B.3.1, Appendix B of this SEIS) to estimate the risks associated with the transport and handling of TRU mixed waste. The RCRA document was a preliminary estimate of TRU mixed waste from all DOE generator and storage facilities that may eventually send waste to the WIPP.

- Table B.3.1 of this SEIS includes projections of the Rocky Flats Plant waste through the year 2013, while the quantities reported in the RCRA document only included projections through 1993.

- Waste form categories are selected by the generator facilities based on the amount of materials (e.g., glass, metal, paper) in a particular waste stream. Differences exist between generator facilities as to what is characterized as "combustible."

"Combustible" materials are defined in the WIPP Waste Acceptance Criteria (WAC) as those materials that will sustain combustion in atmospheric air when exposed to an ignition source of 1475°F for a period of 5 minutes (DOE, 1989e). Transport of combustible materials is not limited in the WAC, because they will not affect the safe handling or transport of TRU waste. For the TRUPACT-II testing, the payload was heated to approximately 100°F to simulate heat generated by the waste before being set on fire. The TRUPACT-II testing showed that after the container was exposed to a 1475°F fire for one-half hour, the maximum payload temperature was approximately 150°F. Combustibles will not ignite or sustain a fire at this temperature and therefore would serve no purpose for the tests. The results of the tests illustrate the large degree of insulation that the TRUPACT-II container provides.

7.3.1.1-4 **Comment**

A commenter asked why the TRUPACT-II containers were not tested for inner container pressurization, asserting that stresses on the container and leakage potential can increase with pressurization, and that tests with unpressurized containers do not replicate actual shipping conditions. Additionally, the commenter stated that the TRUPACT-II's would not be over-pressurized during testing to determine the consequences of accidents if pressures exceed 50 pounds per square inch (psi).

7.3.1.1-4 **Response**

The TRUPACT-II has been issued a certificate of compliance by the NRC, after demonstrating acceptable packaging performance for a Type B Package.

The impact and thermal tests were performed in accordance with the NRC regulations (10 CFR 71.73), which stipulate that test conditions be evaluated with the initial internal pressure of the containment system at the maximum normal operating pressure (50 psi for the TRUPACT-II), unless a lower internal pressure, consistent with the ambient temperature assumed to precede and follow the tests is more unfavorable.

For example, when the test conditions required the package to be chilled to -20°F before the 30-ft drop tests, the initial internal pressures were approximately 33 psi. All other drop, puncture, and fire tests required the package to be tested with an internal pressure of 50 psi. Since the TRUPACT-II packaging consists of an inner containment vessel and an outer containment vessel, impact and puncture testing was performed such that each of the containment vessels was subjected to pressure stresses. Some tests were done with both the inner and outer containment vessels pressurized, and other tests were done with just the inner containment vessel pressurized - in other words, whichever one provided the most unfavorable conditions for the test being performed.

In addition, both the outer and inner containment vessels of all the TRUPACT-II production units were pressurized to 150 percent of the normal operating pressure (or 75 psi), prior to the first use of the package. This requirement of the NRC regulations (10 CFR 71.85) verifies the capability of the system to maintain structural integrity at pressures over the normal operating range.

Additional details on the TRUPACT-II can be found in Appendix L and Subsection 3.1.1.3.

7.3.1.1-5 **Comment**

Members of the EEG commented that the draft SEIS incorrectly reported that the TRUPACT-I was a Type A package and requested a correction in the document. They added that it was a single-contained, vented, Type B package that could not have met the NRC requirements of shipments of plutonium in excess of 20 curies.

7.3.1.1-5 **Response**

This correction has been made.

7.3.1.1-6 **Comment**

A commenter said that the TRUPACT-II transporter is described as an NRC-approved Type B packaging, adding that both 10 CFR and 49 CFR are clear in stating that any package which contains plutonium is also a fissile package. This commenter wanted to know the fissile classification of the TRUPACT-II package.

7.3.1.1-6 **Response**

The TRUPACT-II is a fissile class I package.

7.3.1.1-7 **Comment**

A few comments were received regarding the tie-down system used to attach the TRUPACT-II packages to the trailers. The main concerns expressed centered on doubts about the safety of the system.

7.3.1.1-7 **Response**

The TRUPACT-II package, including the tie-down system, has been certified by the NRC and, therefore, has shown compliance with all applicable NRC and DOT regulations.

Specifically, the tie-down restraint applied to the TRUPACT-II packaging has been designed to satisfy the DOT requirements of 49 CFR 393.102 and the NRC requirements of 10 CFR 71.45. The Safety Analysis Report for the TRUPACT-II Shipping Package (SARP) (DOE, 1989f), given to the NRC in March 1989, provides the necessary analyses demonstrating how the TRUPACT-II tie-down system meets these regulations.

The TRUPACT-II transport trailer is a gooseneck, dropped bed design, which is commonly used in commercial fleet operations. The design has been adapted to the TRUPACT-II by using cam operated U-bolt tie-down devices to secure the packages to the trailer frame.

Additional details on the trailer, tie-down system, and other features can be found in Appendices L and M.

7.3.1.1-8 **Comment**

A commenter stated that even if accidents do not occur, decay heat could break down waste containers. The commenter cited a safety analysis report (SAR) that states that a temperature of 334°F could be reached in the center of a drum, causing sealed containers to burst or melt. The commenter also stated that the release of gallons of volatile and/or corrosive materials could have impacts on containment not foreseen by the SAR or the [draft] SEIS.

7.3.1.1-8 **Response**

The DOE disagrees with this comment on a number of points. First, the 334°F and allowable wattage cited in the comment refer to the category of waste of inorganic solids packaged in metal cans. There is no mechanism that allows this waste to generate gas that could burst the sealed containers. Second, even if the temperature of 334°F was achieved, the steel drum would not rupture and release its contents because the drums are provided with filtered vents. Third, under the WIPP Waste Acceptance Criteria (DOE, 1989e), as well as the NRC TRUPACT-II Payload Compliance Plan, "gallons of volatile and/or corrosive materials" (implying liquid contents) would not be permitted to be transported in the TRUPACT-II. Therefore, even if the 334°F temperatures occurred during transport, the integrity of the containers would not be compromised.

7.3.1.1-9 **Comment**

In addition to other commenters, the States of Colorado and Nevada criticized TRUPACT-II certification testing for not including a "crush test." Crush rather than impact, the commenters said, is described in the draft SEIS as "the dominate effect" expected in a truck accident. The commenters wanted to know why the DOE does not subject the TRUPACT-II to crush tests, despite the fact that the tests are required for NRC certification. One commenter also contended that under NEPA, the DOE is required to assess impacts of a worst case scenario, which for transportation would be a crush test. Commenters stated that a TRUPACT-II would probably not survive a crush type accident, and that its possible survival must be demonstrated.

7.3.1.1-9 **Response**

The statement regarding crush as the dominant effect (page D-65 of the draft SEIS) was confusing in that in the context of the draft SEIS it referred to the damage mechanisms for the drum containers within the TRUPACT-II. The statement has been deleted. For a package the size of a TRUPACT-II, crush is extremely unlikely. Also see response to comment 7.3.5.1-15 regarding requirements for accident analyses under NEPA.

The TRUPACT-II packaging has demonstrated compliance with the NRC regulations for a Type B package by meeting thermal and mechanical testing which simulate hypothetical accident conditions (detailed in 10 CFR 71) required by the NRC. In addition, the TRUPACT-II has met all other applicable NRC and DOT regulations, and has been issued a certificate of compliance by the NRC for the transport of CH TRU waste.

The hypothetical accident conditions used in testing the TRUPACT-II are based on engineering criteria and are not intended to duplicate actual expected accidents. Instead, they are designed to produce packaging damage equivalent to that observed in severe transportation accidents. In fact, it has been shown that for actual severe accident conditions with impact and fire, more than 99.5 percent of all accidents produce damage to the packaging less severe than these regulatory criteria (Dennis, 1978).

Although a dynamic crush test has been added to the proposed NRC regulations for Type B packages (Federal Register, Volume 53, No. 110, June 8, 1988, 21550), it would apply to those packages which are minimally vulnerable to damage in the drop test, but have a high potential for radiation hazard if package failure occurs. The NRC proposed crush test requirement would apply only to those packagings which weigh 1,100 pounds or less, possess a low density, and have a high radioactive material content. The net weight of a TRUPACT-II package is 12,250 pounds; therefore, it falls outside the criteria for when this test is required under the NRC proposed regulations.

Additional discussion of this subject can be found in Appendices D and L.

7.3.1.1-10 **Comment**

A commenter noted that a particularly troubling opportunity for human error involves the content of the waste package, adding that while care apparently has been taken to define possible combinations of waste that could lead to internal cask damage or dangerous chemical reactions, a potential loophole exists with respect to sealed containers of liquids. The commenter also noted that, in general, both the draft SEIS and the Safety Analysis Report for the TRUPACT-II packaging (SARP) (DOE, 1989f) discuss the impact of residual fluid in the waste drums or boxes, assuming it will be held to levels small enough to exert no consequences on the pressure, temperature, or containment of the TRUPACT-II, yet, sealed containers of 1 gallon or less are allowed as part of the waste. (TRUPACT SARP, [DOE, 1989f] Section 1.2.3.2.2.) Finally, the commenter stated that there is no limit on the liquid materials allowed in sealed containers, the materials used for sealed containers, or the number of such containers which a single drum or box may contain.

7.3.1.1-10 **Response**

A limit on liquid materials allowed in sealed containers exists because there is a limitation on the total volume of liquid materials allowed. The total volume of residual liquid in each standard waste box or a 55-gallon drum must be less than 1 volume percent of the waste container to be transported in the TRUPACT-II packaging. This limit would include the sealed containers of 1 gallon or less. This is stated in the TRUPACT SARP (DOE, 1989f), Appendix 1.3.7-9. Quantities of liquids in containers are readily detected and quantified by Real-time Radiography (RTR). RTR works extremely well for detecting free liquids due to its ability to view events in progress, such as wave motion. It should also be noted that, many waste streams contain no free liquids, and facilities such as the Rocky Flats Plant have more stringent limits than 1 percent by volume. Also see response to comment 7.11.4-2.

7.3.1.1-11 **Comment**

The State of Nevada and the Western Interstate Energy Board commented that the draft SEIS states that the DOE will decide to seek rail certification after it fully evaluates rail modes, and that the draft SEIS states that some changes may be required to support rail shipments. The commenters wanted to know the types of changes which may be required of them.

7.3.1.1-11 **Response**

The DOE has selected trucks as the mode of transport during the proposed Test Phase, but would continue to evaluate the efficacy of train transport for use during the proposed Disposal Phase.

To utilize TRUPACT-IIs for shipments by rail, the DOE's preliminary technical evaluation has identified two major areas which require further activity: 1) railroad car tie-downs, and 2) the TRANSCOM satellite communications system. There may also be issues on a smaller scale related to the analysis for determining payload control parameters during transportation.

The task related to tie-downs would involve the design and installation, on suitable railcars, of a fixture consistent with the tie-down arrangement reflected in the SARP for the TRUPACT-II (DOE, 1989f).

The activity related to the TRANSCOM would entail a test program to confirm system-receiving capability and accuracy.

7.3.1.1-12 **Comment**

A commenter asked what would happen in the event that a TRUPACT-II fell into a lake.

7.3.1.1-12 **Response**

As part of the certification process for a Type B package, the NRC regulations require that the candidate packaging design be subjected to an external pressure from submersion under water. To simulate the equivalent damage from this event, a packaging must withstand the external pressures resulting from submersion at 50 feet for an 8-hour period. For test purposes, an external pressure of water of 21 pounds per square inch gauge is considered to meet these conditions. Furthermore, the packaging should withstand these conditions in transport without loss of containment or increase in external radiation level to an extent which would endanger the general public or those involved in rescue or clean-up operations.

The TRUPACT-II package has been certified as a Type B package by the NRC for the transport of CH TRU waste, and has therefore successfully complied with the immersion test requirement. Acceptable package performance was demonstrated to the NRC by analysis for the immersion test. The NuPac 72B cask will meet the immersion test requirements in addition to all other applicable regulations for Type B packages before the DOE will use it for RH TRU waste transportation to the WIPP.

Additional information is available in Appendix L.

7.3.1.1-13 **Comment**

A few comments were received suggesting that the puncture test of the TRUPACT-II prototypes conducted as part of the certification process was inadequate. The commenters stated that a 40-inch drop onto a 6-inch diameter bar does not seem to realistically reflect possible accident conditions.

7.3.1.1-13 **Response**

The tests performed on the TRUPACT-II were performed in accordance with NRC regulations (10 CFR Part 71) which were adopted after technical and public review. As part of the Type B testing requirements, a packaging must be subjected to a free drop from a height of 40 inches in a position from which maximum damage is expected, onto the upper end of a solid, vertical, cylindrical, mild steel bar mounted on an essentially unyielding, horizontal surface. The bar must be 6 inches in diameter and of a length to cause maximum damage to the package. For testing the TRUPACT-II packaging, the height of the puncture bar ranged from 24" to 48" depending on the orientation of the package.

The thermal and mechanical tests, as stated in NRC regulations 10 CFR Part 71 for a Type B packaging, must be applied to the same specimen sequentially. The order and type of tests are reasoned to be the order of environmental threat to the package in a real transport accident (i.e., impact and puncture followed by thermal exposure). More information on these tests can be found in Appendix L.

These hypothetical accident conditions used in Type B testing are based on engineering criteria and do not duplicate actual accidents but are designed to produce packaging damage equivalent to that observed in very severe transportation accidents. It has been shown that for actual accident conditions with impact and fire, more than 99.5 percent of all accidents produce less damage than the regulatory tests (Dennis, 1978). Details regarding this statistic can be found in the response to comment 7.3.6.1-4.

7.3.1.1-14 **Comment**

The statement was made that the draft SEIS indicates that the DOE has only completed tests on one TRUPACT-II prototype, the version that will handle 14 55-gallon drums, and that the other TRUPACT-II prototype, used for shipping boxes, has not yet been tested. Furthermore, the commenters stated that the draft SEIS does not mention testing for this second version of the TRUPACT-II, nor does the draft SEIS discuss how the DOE intends to move the old boxes presently stored at the Idaho National Engineering Laboratory to the WIPP, given that those boxes will not fit into the TRUPACT, requiring either that the DOE repackage that waste into new boxes, or build a third TRUPACT version to carry them. Finally, commenters said that the final SEIS should discuss plans for receiving certification and the construction of the different TRUPACT-II designs, in addition to addressing the potential need to repackage waste for transport.

7.3.1.1-14 **Response**

Under the current Certificate of Compliance issued by the NRC on August 30, 1989, the DOE is authorized to transport fourteen 55-gallon drums or two standard waste boxes (SWB) in the TRUPACT-II package. The SWB is a specially designed container which fits into the existing TRUPACT-II packaging. The SWB was not required to be inside the TRUPACT-II for the hypothetical accident conditions, since the NRC agreed that it would produce less damage to the TRUPACT-II cavity during testing than the two banded 7-packs of 55-gallon drums that were used. Should the DOE wish to transport an alternate type of secondary container in the TRUPACT-II other than the 55-gallon drums or SWB, it must apply to the NRC for an amendment to the Certificate of Compliance to include an additional type of secondary container. If significant design changes to the packaging are required, the NRC could require retesting before its approval is granted.

The existing boxes (fiberglass 4ft. X 4ft. X 7ft.) must be overpacked with a metal container to meet the WIPP Waste Acceptance Criteria (DOE, 1989e). The overpacked box dimensions (4.5ft. X 4.5ft. X 7.5 ft.) preclude shipment in the TRUPACT-II. Most of the waste from the old boxes presently stored at the Idaho National Engineering Laboratory would have to be repackaged into drums or SWBs for transportation to the WIPP. In all cases the repackaged waste must meet the TRUPACT-II payload criteria as stated in the Certificate of Compliance.

7.3.1.1-15 **Comment**

A few comments received suggested the need for additional testing of the TRUPACT-II and NuPac 72B, beyond the NRC requirements for Type B packagings.

7.3.1.1-15 **Response**

The tests required for certification are considered to be very stringent, thus, and protective of public health and the environment. It is not felt that additional tests are necessary. In an agreement with the State of New Mexico, the DOE made a commitment to transport TRU waste to the WIPP in NRC Type B certified packages. The TRUPACT-II is a reusable packaging for transport of CH TRU waste. On August 30, 1989, the NRC issued a certificate of compliance for the TRUPACT-II packaging, certifying that all of the applicable regulations for 10 CFR Part 71 had been met.

The NuPac 72B packaging (intended for the transport of RH TRU waste) has not yet received NRC certification, but it will be required to meet NRC regulations (10 CFR Part 71). The NUPAC 72B packaging must be certified as a Type B packaging for RH TRU waste before the DOE will use it to transport RH TRU waste to the WIPP.

7.3.1.1-16 **Comment**

A number of commenters questioned whether the DOE has adequately assessed the effects of gas generation from TRU waste in the TRUPACT-II package during transport, adding that information has been specifically requested regarding the effects of accumulated gases on the integrity of the package, the imposed limits or restrictions (if any) on gas generating sources, the identification of these gas generating sources (e.g., radiological, biological, etc.), and the use of recombiners.

7.3.1.1-16 **Response**

Gas generation from TRU waste has been thoroughly assessed in the SARP (DOE, 1989f) for the TRUPACT-II packaging. These analyses have considered both the effects of hydrogen gas generation, and pressure increase resulting from total gas generation. These analyses have demonstrated the payload to be suitably controlled, so that during transport, the package would be operated within the margins of safety established by the NRC regulations.

TRU waste shipped in the TRUPACT-II package can generate hydrogen through radiolysis of water and organic materials. This could lead to an increase in the hydrogen concentration within the TRUPACT-II package. The SARP (DOE, 1989f) limits the waste contents so that the hydrogen concentration in any void space within the package will not exceed 5 percent (by volume) during a 60-day period. The 5 percent limit was chosen because it is the lower flammable limit of hydrogen in air. A 60-day period is conservative, because the actual shipments are expected to require only 3 to 5 days. Therefore, since under very conservative conditions the concentration of hydrogen would remain under 5 percent, a hydrogen recombiner is not necessary.

The rate of hydrogen generation is dependent on the constituents and the activity present in the waste. A primary difference between shipping categories is the $G(H_2)$-value, which is a measure of how much hydrogen is produced for each unit of radiation absorbed by the waste. The amount of radiation absorbed is directly related to the decay heat. TRU waste shipped in the TRUPACT-II package could contain many different organic compounds, each with its own $G(H_2)$-value. In the SARP for the TRUPACT-II packaging, the DOE has calculated decay heat limits for shipping categories based on an effective $G(H_2)$-value for the waste type. The effective $G(H_2)$-values represent an upper bound on the rate at which hydrogen can be generated for a waste type. The maximum pressure in the TRUPACT-II package inner containment vessel (ICV) under normal conditions of transport was calculated for each shipping category in the SARP for the TRUPACT-II packaging (DOE, 1989f), and was shown to be considerably lower than the normal operating design pressure of 50 pounds per square inch. Additional details on TRUPACT-II gas generation safety measures can be found in Appendix L.

7.3.1.1-17 <u>Comment</u>

A number of commenters expressed concern over transporting the TRU waste to the WIPP in containers which they believe are not reliable or safe. Some commenters felt the safety of these containers has yet to be proven. Furthermore, the commenters asserted that the public will be endangered by transporting the TRU waste in these containers. In one case, a commenter said that the packagings were designed in terms of minimum height and weight criteria, thereby compromising the safety of the design.

7.3.1.1-17 <u>Response</u>

In an agreement with the State of New Mexico, the DOE agreed to transport TRU waste to the WIPP in Type B packaging certified by the NRC. The TRUPACT-II reusable packaging was certified as Type B by the NRC on August 30, 1989, to comply with all of the applicable regulations (10 CFR Part 71) for transport of CH TRU waste. No compromises to packaging safety were permitted in the TRUPACT-II design certified by the NRC. The NuPac 72B package (intended for the transport of RH TRU waste) has not yet received NRC certification, but it must meet NRC regulation 10 CFR Part 71 before the DOE will use it to transport RH TRU waste to the WIPP.

Proper packaging promotes safety during the transport of radioactive materials. The intent of packaging regulations established by the NRC and the DOT is to provide the protection required to ensure public safety. The regulations are designed so that, as far as possible, the safety of the public does not depend on procedures or human action, but is an inherent property of the packaging.

In order for the design of a packaging to be certified by the NRC, the applicant (usually the developer of the package) must submit to the NRC a formal safety analysis report for the packaging (SARP). This report describes the packaging system, the analyses, and the tests performed to confirm the packaging's acceptability. In addition, a quality assurance program is instituted during construction of the packagings and maintained during their actual use.

Since the TRUPACT-II and NuPac 72B packagings must be Type B, NRC-certified shipping containers, they must survive certain hypothetical accident conditions that demonstrate resistance to impact, fire, and water submersion. The ability of the packaging design to survive these accidents may be proven by full-scale testing, scale-model testing, or analysis. To be judged as surviving, Type B packagings must also meet a containment criteria following the hypothetical accident conditions as defined in 10 CFR Part 71.51.

Most transportation accidents are not severe enough to cause release of any contents from the various approved packagings because the environments encountered are below the design thresholds embodied in the regulations. In fact, for accident conditions from impact and fire, more than 99.5 percent of all accidents are less severe than these regulatory criteria (Dennis, 1978). (See response to comment 7.3.6.1-4 for more information on these data.)

A SARP is currently being prepared for the NuPac 72B cask. The NuPac 72B cask is a scaled-down version of the NuPac 125B package, which has been certified by the NRC as a Type B package (The 125B is being used to transport the Three Mile Island core debris.) Hence, analysis will be the primary method of demonstrating compliance with regulations for the 72B cask.

Additional details on the TRUPACT-II and NuPac 72B can be found in Appendix L.

7.3.1.1-18 **Comment**

Some comments were received pointing out that southern New Mexico has a high incidence of lightning strikes, and has the highest rate of deaths from lightning strikes in the U.S. The commenters questioned why the DOE had not tested the TRUPACT-II to ensure that the lightning strikes would not damage it and release radioactive materials into the environment.

7.3.1.1-18 **Response**

The hypothetical accident conditions for Type B packagings specified in the NRC regulations 10 CFR Part 71 to which the TRUPACT-II was tested do not include lightning strikes. (For more information on the full-scale testing of the TRUPACT-II packagings, please refer to Appendix L of this SEIS.) Even though this condition was not tested, damage to the containment boundary from a lightning strike is judged to be negligible. The stainless steel outer shell will conduct the lightning charge around the contents much as an automobile body protects car occupants from injury resulting from lightning strikes.

7.3.1.1-19 **Comment**

A number of comments were received pointing out the TRUPACT-IIs' capabilities in safely transporting CH TRU waste to the WIPP. These commenters expressed confidence that the design as well as the NRC's certification process for Type B packaging ensure that the TRUPACT-II would survive an accident. A group of commenters asked why, in fact, the TRUPACT-II had to be developed when waste has been safely transported in ATMX railcars for years.

7.3.1.1-19 **Response**

In developing the TRUPACT-II, the DOE fulfilled a pledge to the State of New Mexico to develop a state-of-the-art packaging for transporting TRU waste to the WIPP. The TRUPACT-II, which has received NRC certification, will provide additional protection that was not available from the ATMX railcars. The DOE believes that using the TRUPACT-II will provide adequate transportation safety and should ensure that there will be no release of TRU waste materials into the environment during transportation.

7.3.1.1-20 **Comment**

A commenter stated:

> The shipping casks for transuranic waste must withstand realistic transport accidents without releasing their contents. The HAC [Hanford Advisory Committee] believes that a design certified by the Nuclear Regulatory Commission (NRC) can achieve this objective. However, the HAC recommends:
>
> - "If flaws are found in the cask design, the design should be changed and tested again or analyzed again.
>
> - "The results of the full-scale tests should be extrapolated to the failure points to determine the margin to failure.
>
> - "The public must be confident that casks will withstand potential transport accidents. The design standards, tests, and test results should be told in terms that are easy to understand.

- "All transuranic waste casks should be built under NRC's stringent quality assurance program for spent nuclear fuel casks. This will ensure that transuranic casks meet design requirements.

- "Before each shipment, U.S. DOE should use all appropriate non-destructive testing techniques to inspect cask features that prevent releases (such as the seals). Casks should be inspected for compliance with design requirements. Features that do not comply should be replaced."

7.3.1.1-20 **Response**

The TRU waste transported to the WIPP would be in packages which meet all applicable NRC and DOT regulations. The final packaging design would be tested and analyzed prior to granting certification. In addition, the NRC assures that the DOE is complying with the operating controls and procedures of Subpart G and the quality assurance requirements of Subpart H of 10 CFR Part 71 before a certificate of compliance is issued for the proposed transportation container. On August 30, 1989, a certificate of compliance was issued by the NRC for the TRUPACT-II packaging. More information on the loading operation, maintenance, inspection (e.g. seals testing) and fabrication procedures, and the associated quality assurance program is provided in Appendix L of this SEIS.

Also, Appendix L details the physical description of the TRUPACT-II and the NuPac 72B in addition to providing information about the NRC certification requirements, including the testing procedures. The appendix includes information about the quality assurance programs used in the design, purchase, fabrication, handling, shipping, storing, cleaning, assembly, inspection, testing, operation, maintenance, repair, and modification of safety components for each of the packagings. Appended to the appendix is the NRC certification for the TRUPACT-II. Additional information is provided in the responses to comments 7.3.1.1-2 and 7.3.1.1-17. Although the DOE has not tested the TRUPACT-II for "failure," the consequences of such failure (i.e., the bounding case accident analysis) are included in Subsection 5.2.2 and Appendix D.

7.3.1.1-21 **Comment**

The State of Idaho commented that, "Specific site operations pertaining to waste transportation and certification of waste to WIPP WAC would be included as part of the Integrated Operations Demonstration. Which site(s) are to be designated as certifying sites? This could impact significantly the amount of waste transported on Idaho highways if Hanford, Rocky Flats, and Savannah River waste is certified at Idaho National Engineering Laboratory."

The commenter recommended that the DOE specify which site or sites will be certifying facilities and quantify the amount of waste to be certified there, saying that this will affect transportation-related exposure and accident scenario figures.

7.3.1.1-21 **Response**

Any shipments made to the WIPP will be made as if they were operational shipments, and must meet all the necessary criteria (i.e., transportation, WIPP WAC [DOE, 1989e]). It is the responsibility of each generator and/or storage facility to certify its own waste as being in compliance with the WIPP WAC and the requirements necessary for transport.

Each generator facility must obtain approval from the WAC committee that the measures they have in place can adequately assess the waste to determine whether it can be certified.

The facility is then responsible for certifying its own waste (with a WAC pre-approved program) to the WIPP WAC, as well as to the transportation requirements. No waste can be shipped in the NRC certified containers, unless these restrictions have been met. The WAC committee will audit these facilities regularly to ensure compliance with both the WIPP WAC and transportation requirements. The WIPP WAC are provided in Appendix A. An abbreviated discussion of the restrictions on the waste to qualify for transportation is provided in Appendix L.

7.3.1.1-22 **Comment**

A few commenters referred to p. 5-7, Subsection 5.2.1 of the draft SEIS, and asked if the TRUPACT-II containers will be used in the future for inter-DOE-facility shipments or will ATMX railcars and Type B overpacks continue to be used? The commenters also requested an explanation in the event that the TRUPACT-II's are not used.

7.3.1.1-22 **Response**

The TRUPACT-II packaging, which was certified on August 30, 1989 as a Type B packaging, is expected to replace the ATMX railcar for inter-DOE-facility CH TRU waste shipments.

7.3.1.1-23 **Comment**

A number of commenters questioned the ability of the TRUPACT-II design to transport CH TRU waste without leaking radiation. They expressed great concern that the TRUPACT-II O-ring sealing system is not capable of safely containing the TRU waste. In some cases, the commenters suggested that the TRUPACT-II is a vented package, and asked for total containment of the waste contents during transport. A few commenters provided suggestions for design modifications to the TRUPACT-II package. Some inquired about the process for informing local government officials of design modifications made by the DOE after the TRUPACT-II package has been tested and approved.

7.3.1.1-23 **Response**

The TRUPACT-II container is non-vented and has been designed and constructed to meet the NRC regulations for a Type B packaging in 10 CFR Part 71. The NRC issued a certificate of compliance for the TRUPACT-II packaging on August 30, 1989.

To meet the NRC regulations for Type B packagings, the TRUPACT-II container demonstrated acceptable package performance by successfully passing the required containment criteria upon completion of full-scale impact, puncture and fire testing. The containment criteria required both the inner and outer containment vessels to be leaktight to a leak-rate of 1×10^{-7} std cm3/sec or less, in accordance with standard ANSI 14.5-1987. By meeting this leaktight criteria, the O-ring sealing system for the TRUPACT-II packaging has proven to be capable of containment even after undergoing severe testing. The inner and outer containment vessel each contain two O-rings. In addition the inner containment vessel is equipped with a debris shield and a wiper O-ring to prevent particulate matter from contacting the containment seal. The debris shield and wiper O-ring were incorporated into the packaging design because one of the tests indicated that debris from package contents could become lodged under the O-rings.

The DOE does not arrange any special public involvement or process for informing local government officials of design modifications to the TRUPACT-II packaging after certification. However, any modifications to the packaging must have NRC approval. Prior to granting approval, the NRC may require a revision to the SARP. The SARP is available for public review in the NRC reading room. The NRC has the authority to audit the fabrication of these packagings to ensure that they are being constructed to the specifications identified in the certificate of compliance.

More information on the TRUPACT-II packaging, specifically, the double containment system of the inner and outer containment vessels, is available in Appendix L.

7.3.1.1-24 **Comment**

Commenters questioned if and how TRU waste containers were filtered.

7.3.1.1-24 **Response**

The container slated for transport of CH TRU waste to the WIPP, the TRUPACT-II, is a nonvented, doubly contained packaging which has been certified by the NRC as a Type B packaging. The secondary containers which are transported in the TRUPACT-II shipping package are either 55-gallon drums or standard waste boxes which contain the CH TRU waste. Each drum or standard waste box to be transported in the TRUPACT-II package may be vented through carbon composite filters of a specified material, capacity and hydrogen diffusivity. Many of the TRU waste generating facilities are presently using filters made by Nuclear Filter Technology Company in Boulder, Colorado.

7.3.1.1-25 **Comment**

A number of comments and questions were received regarding the controls the DOE plans to have for quality assurance programs in the testing, fabrication, maintenance, operation, assembling, and inspection of the TRUPACT-II and NuPac 72B TRU waste transportation packages. Some of the specific comments were:

- How does NRC certification guarantee the perfection of all the TRUPACT-II production units?
- What is the process for inspecting and auditing the operation, fabrication and maintenance of these packages?
- How are the O-ring seals for the TRUPACT-II packaging kept debris-free, so the packaging can be assembled correctly?
- Was the TRUPACT-II certification testing program monitored by an independent organization?
- The TRUPACT-II should be built to the same standards as spent fuel casks.

7.3.1.1-25 **Response**

As part of the application to the NRC for certification of the TRUPACT-II design, the DOE provided a description of the quality assurance program for the design, fabrication, assembly, testing, maintenance, repairs, modifications, and use of the package. The quality assurance requirements for packagings and transportation of radioactive materials are defined in the regulations 10 CFR Part 71 Subpart H. The NRC certified the TRUPACT-II design on August 30, 1989, thereby judging the quality assurance program submitted by the DOE to adequately meet the regulations of Subpart H.

Audits and inspection for all facets of the TRUPACT-II program are performed by the NRC, the DOE, the operating contractor for the WIPP (Westinghouse), and the manufacturer of the TRUPACT-II.

More information on the TRUPACT-II quality assurance program is provided for the reader in Appendix L.

The O-ring seals for the TRUPACT-II are checked at the time of assembly by performing a leak-test on each vessel once the lid is installed onto the body. This post-assembly test verifies that the O-rings in both the inner and outer containment vessel are in place, and functioning properly. For more information on the O-ring seals the reader is referred to Appendix L.

The EEG was present during most of the TRUPACT-II certification testing program. This included the drop, puncture, and fire testing, as well as the post-test leak-rate testing. The NRC also observed portions of the testing program. In addition, several tests were performed with the local media present.

The fabrication of the TRUPACT-II packagings must adhere to the quality assurance program approved by the NRC. Because both the TRUPACT-II packagings and NRC certified spent fuel casks must meet the criteria of 10 CFR Part 71, the same standards for quality assurance will be used to construct the TRUPACT-II packagings as in spent fuel cask programs.

7.3.1.1-26 **Comment**

Several commenters, in the State of Nevada, questioned whether analyses for chemical compatibility between the waste forms and the TRUPACT-II container had been performed. A request was made that this SEIS describe actions to be taken to eliminate chemical compatibility problems.

7.3.1.1-26 **Response**

In the safety analysis report (SARP) for the TRUPACT-II packaging (DOE, 1989f), an evaluation was made of the chemical compatibility between 1) the approved contents within individual waste drums or standard waste boxes, 2) the drums or standard waste boxes of different contents, and 3) the contents of the TRUPACT-II package and the package itself. This evaluation resulted in no significant chemical interactions which would affect the integrity of the container.

However, to ensure that there is no degradation of the packaging over its service life, the inner containment vessel of the TRUPACT-II will be examined annually to verify that stress corrosion is not occurring. The condition of the O-rings is verified before each shipment through visual inspections and leak testing.

Appendix L of this final SEIS describes the operation and maintenance procedures that preclude the occurrence of chemical interactions.

7.3.1.2 Comment category was intentionally left blank.

7.3.1.3 NuPac 72B

7.3.1.3-1 **Comment**

Members of Oregon's Hanford Advisory Board asked specifically about Hanford double shell tank waste which contains high concentrations of TRU waste. They stated that this material was destined for the High Level Waste Vitrification Plant. They also said that it appeared that the vitrified waste might be classified as high curie content, RH TRU waste. They further stated that the draft SEIS did not address this possibility. Finally, they added that safe transport of this vitrified waste to the WIPP was of specific interest to Oregon, and that waste inventory changes and appropriate transport for vitrified waste should be described in the final SEIS.

7.3.1.3-1 **Response**

Hanford Reservation double shell tank waste is classified as high-level waste and is not intended to be emplaced in the WIPP. However, if after vitrification this waste were to be reclassified as RH TRU, it would have to meet criteria before emplacement at the WIPP. First, it would have to meet requirements to be transported in the RH TRU waste transportation packaging, the NuPac 72B. When this packaging receives NRC certification (which is required before it can be used to transport waste), the allowable payload would be identified to comply with transportation safety requirements. Any such waste would have to meet the WIPP WAC before it could be emplaced in the WIPP. Regardless of changes in waste inventories, or in waste forms which may occur over the life of the WIPP, the criteria for transportation safety and WIPP acceptance must still be met before the waste would be transported to the WIPP.

7.3.1.3-2 **Comment**

A number of comments and questions were received regarding the container used for transporting RH TRU waste, the NuPac 72B cask. The majority of the comments requested more information on the design of the container, its certification process and schedule, and the operating procedures for the cask. Listed are some of the specific comments and questions:

- Include a drawing of the NuPac 72B cask.
- Will the NuPac 72B cask be tested?
- What will the test requirements be?
- What is the schedule for testing and planned submittal of documentation to the NRC?
- What is the expected date of certification?
- How many drums of waste per NuPac 72B cask?
- How many NuPac 72B casks per truck?
- Why is the NuPac 72B designed differently than the TRUPACT-II?
- Has production of the NuPac 72B casks been started?

7.3.1.3-2 **Response**

To transport RH TRU waste, the DOE would use the NuPac 72B shipping cask. The NuPac 72B cask is being designed to meet NRC requirements for Type B packagings, and the DOE must receive a Certificate of Compliance from the NRC before transporting any waste in the 72B cask. The 72B cask is a scaled-down version of the NuPac 125B cask, whose design has been certified by the NRC as a Type B packaging. The 125B cask is being used to transport debris from the core of the damaged Three Mile Island reactor.

The 72B cask is to be a reusable cylindrical cask consisting of a separate inner vessel within an outer cask protected by impact limiters at each end. A schematic of the NuPac 72B design is shown in Appendix L (Figure L.3.1). The capacity of each 72B cask is anticipated to be 8,000 pounds of payload. The RH waste canister is the primary payload container for the 72B cask. The waste within the canister is typically in three 30- or 55-gallon drums. The 72B cask is designed to transport a single canister of waste per shipment. A single 72B cask would fit on a custom designed semi-trailer which would be pulled by a conventional tractor for highway transport. The design of the NuPac 72B cask differs from that of the TRUPACT-II packaging because of the need to shield gamma radiation from the RH TRU waste, which is not a significant component of CH TRU waste.

For the design of the NuPac cask to be certified by the NRC, it will be necessary to demonstrate compliance with the NRC requirements in 10 CFR Part 71 for Type B packagings. Compliance with these requirements may be demonstrated by analysis or by a combination of analysis and testing. Since the 72B cask is a scaled-down version of the 125B cask whose design has been certified by the NRC, analysis will be the primary method of demonstrating compliance with the regulations for the 72B cask.

The DOE has not confirmed a schedule for applying for an NRC certification for the 72B cask. However, analyses and bench-scale testing have been performed and are currently in progress to provide data for the SARP to be submitted to the NRC. The SARP is the documentation necessary to apply for NRC certification; it describes how the packaging meets the regulations. Production of the NuPac 72B cask has not yet been initiated, and the DOE has not confirmed a start-up date for the production of these units.

Additional information and a drawing of the NuPac 72B is available in Appendix L of this final SEIS.

7.3.1.3-3 **Comment**

A commenter stated that neither on page 3-14 or in SEIS D.2.2.1 of the draft SEIS did it specifically state that the DOE will seek U.S. Nuclear Regulatory Commission (NRC) certification for the RH TRU packaging container currently under development. Moreover, the commenter stated that the draft SEIS did not discuss or reference any plan for obtaining such certification. The commenter further stated, "Although we believe the DOE intends to seek NRC certification of its RH transuranic container and has in fact committed in writing to doing so [Consultation and Cooperation Agreement, as amended, Article VI, Section E.4] (DOE, 1981c), the [draft] SEIS should explicitly state this and include a discussion of DOE's plans/procedures for attaining certification." Another commenter stated that another supplemental EIS should be prepared upon certification of the RH waste container.

7.3.1.3-3 **Response**

Subsection 3.1.1.3 of this SEIS has been revised as suggested. The DOE will obtain NRC certification for its RH TRU container as stated in the second modification of August 4, 1987, to the Consultation and Cooperation Agreement between the DOE and State of New Mexico. Information that was previously in Subsection D.2.2.1 has been revised and transferred to Appendix L. The DOE, as noted elsewhere in this final SEIS, will prepare a new SEIS at the conclusion of the Test Phase and before a decision to proceed to the Disposal Phase has been rendered. This new SEIS will consider the current status of the RH TRU container.

7.3.2 TRANSPORTATION MODES

7.3.2-1 **Comment**

A commenter wanted to know if, in case of emergencies, the TRUPACT-II transports would be in immediate communication with the WIPP dispatchers.

7.3.2-1 **Response**

An important feature of the truck transport mode is the Transportation Tracking and Communication System (TRANSCOM) that would be used to ensure efficient transport of TRU waste. The TRANSCOM would combine navigation, satellite communication, and computer network technologies to monitor the movement of TRU waste shipments to the WIPP. Each tractor-trailer rig would automatically send a signal every 15 minutes to update its geographic location indicating whether it is moving or stopped. The system would alert the nearest emergency points of contact (e.g., police, highway patrol, and emergency operation centers) should an emergency or mechanical failure occur.

7.3.2-2 **Comment**

Some commenters wanted to know how TRU waste would be transported to the WIPP.

7.3.2-2 **Response**

During the proposed Test Phase, CH TRU waste would be shipped by truck along designated routes (see Subsection 3.1.1.3). The DOE will continue to evaluate both truck and train transport for use during the proposed Disposal Phase.

7.3.2-3 **Comment**

One commenter wanted to know what requirements would be placed on railroads to maintain their equipment and rails in the best possible order, in the event that waste is transported by rail.

7.3.2-3 **Response**

Railroads must comply with DOT regulations and standards for their equipment and railways. Additional safety standards apply specifically to hazardous materials transportation including TRU waste shipments. Specific standards include:

49 CFR 174.700	-	Special Handling Requirements for Radioactive Materials Transport by Rail,
49 CFR 174.750	-	Incident Reporting Requirements,
49 CFR 213	-	Track Safety Standards,
49 CFR 215	-	Railroad Freight Car Safety Standards,
49 CFR 217	-	Railroad Operation Rules,
49 CFR 218	-	Railroad Operator Practices

7.3.2-4 **Comment**

A commenter stated: "Given that the [draft] SEIS's statistical analysis predicts more nonradiological accident fatalities and injuries with truck rather than rail transportation of transuranic waste to the WIPP, what is the DOE's justification for sacrificing safety to transport by truck instead of rail? Since the FEIS (DOE, 1980) for the WIPP proposed both rail and truck transport and rail is a safer means of transport, why ship transuranic waste by 100 percent truck?"

7.3.2-4 **Response**

The accident statistics used to estimate impacts of truck and rail transport were not intended specifically to support a safety comparison of the two transportation modes. Projections of injuries and fatalities, derived from national highway truck and railroad statistics, are based on a per unit of distance (kilometer) traveled. These statistics also apply to all classes of trucks (heavy duty, light, etc.) hauling all types of commodities and serve to introduce conservatism into the analysis due to the stringent driver training/and/qualifications/requirements, vehicle maintenance, and inspection programs.

Although the use of national statistics in estimating accidents, injuries, and fatalities, introduces conservatism into the analysis, it fails to take into account many mitigating factors, including the reliability of Type B packaging, special driver training and monitoring, special routes, and other safety factors built into the TRU waste transportation program. In fact, this additional management and control are not present in any other truck transportation system with the exception of the transportation of nuclear weapons.

Because truck transportation of TRUPACT-IIs to the WIPP would be conducted under a DOE contract and subject to extensive review and audit oversight, the DOE expects truck shipment statistics for WIPP shipments to show significantly lower accident, injury, and fatality rates than national averages (see Table D.4.14 for additional truck accident data). The DOE believes a higher degree of control over the carrier as well as other factors such as flexibility of dispatching, halting shipments during severe weather, and vehicle tracking would make TRU waste truck shipments equal to or less than the risks of rail transport. Historically, shipments of radioactive materials have an excellent safety record, and there is no reason to believe this record will cease to continue.

Since the specific percentage of mode mix between truck and rail is still unknown and depends on many safety, operational, and economic factors, this SEIS analyzes two bounding cases. The first is a 100 percent truck case, and the second is what is termed the "maximum" rail case, or exclusive rail shipment from all those facilities with rail access (8 of 10 facilities) and the remainder by truck. This approach permits the analysis to address any mix of modes that would be finally selected.

The original shipping projections of 75 percent train and 25 percent truck included in the FEIS were based on preliminary estimates that rail would be available to ship from the majority of the facilities. Since that time, studies have indicated that truck transport offers significantly more control over the dispatching, scheduling, and overall transportation management of TRU waste shipments. For these reasons, the DOE has elected to use 100 percent truck transport during the proposed Test Phase. In committing to truck transportation for the first 5 years of the shipping campaign, however, the DOE has not eliminated the possibility of rail transportation during the proposed Disposal Phase.

A specific process for determining the use of rail and/or truck transport during the Disposal Phase has not been developed. Factors such as radiological safety, non-radiological safety, cost, scheduling, etc., are expected to be used during this evaluation process. Also, information gained during the transport of wastes during the Test Phase.

7.3.2.1 **TRUCK TRANSPORT**

7.3.2.1-1 **Comment**

Representatives of the States of Oregon, Idaho, and Nevada, as well as other commenters asked: 1) if the trucks which will haul the waste would be marked, 2) if radiation monitoring equipment would be provided to the drivers, 3) if routine radiation monitoring of the vehicle would be done, 4) if speed governors would be a reliable method to regulate driver speed, 5) how often vehicle inspection would be performed, 6) if the States involved would be allowed to perform independent inspections, and 7) who pays for repairs.

7.3.2.1-1 **Response**

All TRU waste shipments would be placarded in accordance with DOT regulations. Radiation detection instruments would be carried in the tractors of all waste shipments and drivers would be trained in their proper use. Because each shipment would be surveyed before its departure, there would be no need for routine radiation monitoring of in-progress shipments by the drivers. Only if something occurs which indicates that there might be a problem would the drivers perform a radiation survey of an in-progress shipment. Each vehicle would be equipped with a speed governor set for a maximum speed of 65 mph. Of course, drivers would be expected to obey all speed limits; a moving violation would result in driver termination. The TRANSCOM satellite tracking system indirectly controls speed limits by providing periodic locations of the vehicle. Finally, as stated elsewhere, there are no driver incentives to exceed posted speed limits.

Vehicle maintenance and inspection would be extensive. On a typical round trip to Richland, Washington, a vehicle would be subject to 74 separate inspections, many by independent State agencies. The vehicle would be inspected before it leaves the Hobbs, NM maintenance facility en route to the WIPP site to be loaded. Once loaded, it would be inspected again. En route for 1,847 miles, it would be inspected every two hours or 100 miles. Upon arrival, it would be inspected again.

The Trucker's Atlas references 33 port of entry and weigh station locations between the WIPP site and Richland, Washington; thus, if all are open, the vehicle could be inspected another 33 times by independent State agencies. Any additional inspections of the driver, vehicle, and cargo at the point of origin or along the route (e.g., State police) are acceptable, but should not induce significant delays caused by waiting for inspector arrival.

Should there be any problems with the tractor or trailer, the trucking company would be responsible for providing a replacement tractor within eight hours. Because of the unique features on the trailer, a replacement vehicle would need to be trucked from the WIPP or nearest defense facility. Repairs to tractors and trailers would be paid by the DOE through the trucking company contract.

Appendix M has been added to the this final SEIS to provide additional detail on the tractor-trailer unit, maintenance procedures and types of vehicle inspections, driver training and qualification requirements, dispatcher duties, and various other information related to the management of the trucking carrier.

7.3.2.1-2 **Comment**

A New Mexico State senator, two State representatives, and the Nevada Agency for Nuclear Projects requested additional information on the Price-Anderson Act and its coverage. Specifically, commenters wanted to know if the Price-Anderson Act would pay for any clean-up costs or if the taxpayers would be forced to pay direct and indirect costs associated with an accident. Some commenters expressed concern about the party liable for loss of real or personal property, livestock, health, agricultural, or industrial loss due to a transportation accident. Lastly, commenters asked if truck fees would cover damage costs associated with an accident.

7.3.2.1-2 **Response**

Dawn Trucking, the current contract truck carrier, is required to carry a five million dollar motor carrier insurance policy. This insurance would be used to cover accidents that did not involve a release of radioactive materials. Any accident involving a release of radioactive materials would be covered under the Price-Anderson Act and its recent amendments. The Price-Anderson Act would cover costs associated with precautionary evacuations. Truck fees are used for highway improvements within the State in which they are collected.

Additional details can be found in Appendices C and M, and the responses to comments 3.1-5 and 7.12.9-6.

7.3.2.1-3 **Comment**

Several commenters requested that escorts accompany the WIPP trucks; others stated that escorts were not necessary.

7.3.2.1-3 **Response**

Although at the time of this writing a decision has not been made, the DOE does not believe that the use of escorts would be necessary to ensure public safety. Escorts are not legally required for the transportation of TRU waste materials. The DOE believes that the extensive training and driver qualifications, including: 1) yearly re-evaluation, 2) the vehicle equipment (e.g., speed governors) to restrict speed, 3) the TRANSCOM and mobile phone communications systems, 4) the number of inspections, and 5) the notification procedures would provide adequate public and driver safety. It should also be noted that at least one of the two drivers assigned to each shipment would maintain constant surveillance of each shipment at all times during its transport to the WIPP.

7.3.2.1-4 **Comment**

A Colorado Congressman, the City of Arvada, Colorado, plus other commenters expressed concern that the trucking contract was awarded to a company solely because it was the lowest bidder and in spite of the fact that it has no experience trucking hazardous materials on public highways.

7.3.2.1-4 **Response**

The Dawn Trucking Company was selected on the basis of competitive bidding using standard DOE procurement practices. Each bidding company submitted a five volume proposal; the first four volumes addressed technical criteria and the fifth volume addressed cost. All proposals were first assigned points based on technical criteria and then ranked. These criteria included: 1) proposed driver training, selection, and hiring criteria; 2) the type of tractor and its features proposed for use; 3) the proposed maintenance and inspection procedures, maintenance personnel qualifications, and access to a nationwide maintenance network; 4) corporate background; 5) ability to obtain or possess $5 million motor carrier insurance; and 6) the carrier's safety rating by the Bureau of Motor Carrier Safety. The proposals were then ranked by cost. The bid submitted by Dawn Trucking was neither the lowest nor the highest bid. The contract was awarded based on the combination of points for technical merit and cost consideration. Although Dawn Trucking does not have experience in transporting TRU wastes, they have demonstrated a willingness to provide a variety of experience enhancing programs to their staff and to adopt driver requirements that exceed DOT requirements.

7.3.2.1-5 **Comment**

A number of public commenters said that there are too many unresolved problems related to the transportation of TRU waste. They said that these issues have not been addressed adequately and competently, and for this reason, the commenters said that the WIPP should not open.

7.3.2.1-5 **Response**

Since publication of the draft SEIS, the DOE has completed additional analysis and is revising the text in the final SEIS to help clarify the transportation process. For example, as a result of the interest in the TRUPACT-II container, which has been certified by the NRC, Appendix L has been added to provide additional information and description of the transportation process. A new Appendix, M, provides elements of the trucking management plan. Specifically, it includes a description of driver qualification requirements, responsibilities, the training and hiring process, as well as a description of equipment and maintenance procedures.

Since publication of the draft SEIS, a preoperational checkout plan has been developed to provide a series of "dry run" test scenarios for all drivers and State and local personnel involved in the proposed WIPP shipments. A minimum of two dry runs will be conducted from each generator or storage facility to the WIPP. A State may request additional dry runs until it is satisfied with responses to the various transportation scenarios. Additional training will also be provided to the drivers, using similar route and weather conditions expected during actual shipments; drivers will become familiar in the use of all the special features prior to any dry runs.

Each corridor State has been contacted by the trucking contractor to ensure State acceptance of all truck routes through their jurisdictions. States may designate alternate routes in accordance with DOT guidelines or by using an equivalent routing analysis. The DOE believes it has been responsive to the large number of public concerns related to transportation; the final SEIS text and appendices have been revised to address these concerns.

7.3.2.1-6 **Comment**

The States of Oregon, Colorado, Nevada, Georgia as well as many other commenters had many concerns about the trucking carrier. They wanted to know what qualifications and training requirements will be established for truck drivers transporting transuranic waste to the WIPP, and how transportation activities will be managed. Commenters asked if unrealistic transit schedules for moving TRU waste to the WIPP would force carriers to drive unsafely. Finally, commenters wanted to know how States would be notified of TRU waste shipments or transportation emergencies.

7.3.2.1-6 **Response**

TRU waste transport drivers must meet stringent licensing, training, and health requirements established by the U.S. DOT in 49 CFR 177.825, 391. The Dawn Trucking Company has established additional driver qualifications, which include: 1) a minimum age of 25, 2) a minimum driving experience of 100,000 miles logged in a semi-tractor/trailer combination, 3) no moving violations within the last three years, 4) at least two years of uninterrupted commercial driving experience in the past five years, 5) and routine drug testing and retesting during the contract. The first two drivers hired by Dawn Trucking, for example, have 850,000 and 650,000 miles of experience, respectively. Specific training related to transporting radioactive materials includes classroom training on the properties and hazards of TRU waste materials, basic radiation and radiation protection principles, the use of radiation detection instruments, and accident or other emergency training required by law.

Dawn Trucking has added an additional driver training requirement and a preoperational checkout plan to its readiness procedures since publication of the draft SEIS. Additional training will be through the DOE Transportation Safeguards Academy. The course consists of two weeks of driver training using a WIPP tractor and trailer loaded with weights that duplicate the center of gravity and anticipated weight of loaded TRUPACTS. Driver training will take place in mountain, rural, city, and interstate environments. Subjects of interest, including emergency braking, roll over prevention, hazardous weather conditions, sabotage, protestors, radiation detection instruments, and the hazardous material requirements of 49 CFR 177.825 will be taught and reviewed before drivers become certified. Drivers will need to undergo annual recertification. The preoperational checkout plan provides a series of dry runs on the designated WIPP routes between each facility and the WIPP prior to actual shipments. The drivers and cooperating State and WIPP personnel will participate in various scenarios to test procedures and to provide experience. States may request additional dry runs as needed prior to waste shipment (See Appendix D). Appendix M discusses driver qualifications and training requirements in detail.

Two qualified drivers will accompany each shipment of TRU waste and will alternate driving shifts of approximately five hours duration. There will be no scheduled overnight stops. Salary incentives exist to encourage drivers not to exceed safe driving speeds. Additionally, speed will be mechanically controlled by a governor on each tractor and indirectly controlled by a tripmaster and real-time tracking. Any driver receiving a moving violation will be terminated. At this time, it is estimated that 30 truck drivers will be hired; the actual number of drivers will depend on the final number of shipments expected. The Central Coordination Center at the WIPP will provide scheduling and coordination of TRU waste shipments ensuring that drivers and the affected States are aware of the time shipments are expected to arrive at their destination. In addition, the Constant Surveillance Service will require that drivers maintain constant visual contact with the shipment. The Central Coordination Center, using the TRANSCOM shipment tracking system, will constantly be informed of transport progress along previously approved shipping routes. Any unauthorized deviation from the preferred route will result in a first time warning and two weeks leave without pay; a second offense will result in driver termination.

Weather monitoring capability at the WIPP will allow the dispatcher to inform drivers of impending storm systems and other weather problems. The dispatcher will recommend whether or not shipments should be stopped to avoid severe weather. Prior to the initial TRU waste shipments to the WIPP, "safe areas" in concept or by location will be established along all of the shipment routes to be used for delays related to severe weather. Accident reporting will be initiated by the appropriate personnel; in all cases, the DOE will receive a report. Specific procedures for notifying the affected State of transportation emergencies are discussed in Appendix C.

Through the DOE vehicle tracking system, TRANSCOM, the States will be given a 7 day advance notice of each shipment. If desired, the shipping facility traffic manager may notify the State official of the anticipated time a shipment will be available for inspection by State authorities, prior to departure. All States may disseminate this information to other State officials.

7.3.2.1-7 **Comment**

A commenter stated, "Figure 3.4 [of the draft SEIS] should be changed to show the flow of the back-up mobile telephone system and contact between the ground station and Oak Ridge. See [the attached] revised figure."

7.3.2.1-7 **Response**

Figure 3.4 has been revised as suggested.

7.3.2.1-8 **Comment**

A commenter said that, "The [draft] SEIS states [in Subsection D.2.2.2 of Appendix D] that the defense facilities are responsible for 'transmitting bill[s] of lading to TRANSCOM.' Will these facilities also be responsible for 'preparing' such bills of lading? Please provide more detail."

7.3.2.1-8 **Response**

Each defense facility will be responsible for the preparation of a bill of lading for each shipment. The information on the TRUPACT-II that was in Appendix D of the draft SEIS has been deleted and is now in Appendix L.

7.3.2.1-9 **Comment**

A commenter, referring to p. D-39 of the draft SEIS, said that "This section references a 'WIPP Transportation Manual.' What specifically is this document and where can it be found? Has a copy of it been made available to the States? Is it a 'dynamic' document, subject to periodic revision based on operational experience? The final SEIS should include a discussion of the manual, its expected use, and how it may relate to corridor States' transportation safety programs."

7.3.2.1-9 **Response**

The Transportation Management Plan which was referred to in Appendix D of the draft SEIS is summarized in Appendix M of this final SEIS. The plan provides requirements for maintenance, operator safety operator qualification and training, procedures, etc. This is a dynamic plan that will be revised annually, as necessary, in response to the WIPP experience.

7.3.2.1-10 **Comment**

A number of commenters expressed doubt that nonunion workers and drivers for the trucking company would be free to report safety violations to the DOE without fear of retribution, or the loss of their jobs.

7.3.2.1-10 **Response**

The rigorous overview and inspection program will provide independent verification of practices and equipment. Also, since the WIPP is the first facility of its kind, there will be considerable State and public scrutiny of the trucking company's management and safety activities.

7.3.2.1-11 **Comment**

The State of Idaho as well as other reviewers expressed concern about a lack of oversight or control of the Dawn Trucking Company. These commenters wanted to know how the carrier's compliance with the various DOT and NRC regulations will be monitored.

7.3.2.1-11 **Response**

The DOE will provide oversight of the performance of the Dawn Trucking Company. The current trucking contract is limited to the first three years of the proposed Test Phase; the contract for the following two years will be awarded based on a performance evaluation. There is no incentive to not follow applicable regulations since the trucking contractor would lose the contract. As the contracting agency, the DOE has the oversight responsibility and authority to ensure acceptable performance by Dawn

Trucking. The DOE may use audits as one mechanism to ensure acceptable performance. In addition, the States now provide enforcement of the hazardous materials transportation regulation (Title 49 CFR) under an agreement with the U.S. DOT.

7.3.2.2 TRANSCOM

7.3.2.2-1 Comment

The Governor of Idaho, the Western Interstate Energy Board plus other commenters said that the DOE had unfairly and incompletely evaluated rail transportation in the draft SEIS. They requested additional details in this SEIS, stating that rail transport would provide a safer mode of transportation and that direct rail lines to the WIPP were available (although one commenter felt that existing track might be in need of improvement), and that the DOE should re-evaluate the costs associated with rail versus truck. Reviewers requested more information for stating that rail transport is more expensive than truck transport and asked if the truck transportation costs included costs associated with upgrading roads and bypasses. Several commenters felt that to enhance rail transportation management, the DOE should negotiate a rail contract that would include DOE control over shipping. Finally, several commenters pointed out that the DOE currently transports Three Mile Island and Rocky Flats Plant waste by rail, and that it proposes to transport waste to the high level repository in Yucca Mountain by rail, but does not support shipment by rail to the WIPP.

7.3.2.2-1 Response

The DOE has committed to using truck transportation for the first five years of the TRU waste shipments. A commercial truck carrier has been selected and awarded a contract for the first three years of the Test Phase. The contract provisions include two one-year extensions that would be subject to a performance evaluation. The DOE believes that having a commercial trucking carrier available at the WIPP with a dispatcher on call 24 hours a day would allow greater and more immediate control over shipping schedules, transportation planning, emergency response, and quality control.

The DOE has not eliminated consideration of rail transportation during the Disposal Phase and welcomes suggestions on shipment control and security, interline transfers, and shipping cost commitments from interested rail companies. The use of existing control features, such as the TRANSCOM, could be used on rail cars. Detailed cost comparisons would be more appropriate when the transportation decisions for the operational phase are made.

7.3.2.2-2 Comment

Although the description of the TRANSCOM satellite tracking system garnered considerable interest and, in some cases, support for the benefits it will provide in monitoring truck transport, many commenters, including Oregon's Hanford Advisory Committee, and the States of Colorado, Nevada, and California indicated that States and Tribes will require financial assistance for telephone lines and computer equipment to effectively use the system. The States and Tribes also want to know what TRANSCOM features will be available to support State emergency response first responder requirements. Many of the questions were specific as to how the TRANSCOM system was tested for reliability and effectiveness; what type of back up systems will support both TRANSCOM and the Transcom Control Center; how timely communication will be maintained with the transport trucks, and how TRANSCOM will be used with rail shipments.

One commenter was critical of the amount of money and equipment that would be necessary to make TRANSCOM available to the States and Tribes, saying that the money would be better spent in purchasing emergency response equipment for communities along the routes. Another commenter expressed concern that unauthorized persons might gain access to the tracking system and use information about the shipments for sabotage or terrorist activities.

7.3.2.2-2 **Response**

At the present time, the DOE does not plan to provide funding to the States and Tribes to support their access to the TRANSCOM system. The type of computer equipment needed to access the system is neither expensive nor difficult to obtain. Nor does a dedicated telephone line need to be maintained for access to the system, since a conventional commercial telephone line can be used to access the system. As stated in the SEIS, the DOE will provide States and Tribes the computer software and technical guidance needed to use the system. Detailed information about the TRANSCOM system is provided below.

SYSTEM OPTIONS AVAILABLE TO STATES AND TRIBES

The Transportation Tracking and Communication System (TRANSCOM) options available to the States include:

- Tracking -- will allow users to view the position and status of every WIPP shipment en route on three map scales: national, State, and county.

- Messaging -- will allow two-way communication between authorized users and the vehicle operators. Messages will also be sent one-way to all system users (including States and Tribes) by the TRANSCOM Control Center and WIPP Central Coordination Center Operators. Messages cannot be sent by States and Tribes to other system users.

- Bill of Lading -- will provide a description of each shipment including responsible parties, shipping contents, planned route, status, and log of position information.

- Emergencies -- will provide information for dealing with a variety of emergency situations. The emergency checklist corresponds with the contents of the shipment and will provide information from the DOT Emergency Response Guidebook (DOT, 1987a). Also to be included will be emergency contact information for national and State emergency response organizations.

- Advanced Shipment Information -- will provide information about future shipments up to 7 days prior to the planned departure date. This information will include a scheduled departure date, originating facility and destination, and a brief description of the shipment.

- System Utilities -- will provide various options to aid in the data entry process including a summary report of active shipments.

States and Tribes will have access to all the TRANSCOM options except the capacity to send messages over the system. With the utilities option, the States and Tribes will have access to the summary report processes. The TRANSCOM system may be the mechanism which notifies the DOE that an off-normal situation has occurred. Upon notification that an accident has occurred, DOE response actions can be initiated.

TESTING

Testing has been done on the adequacy of the navigation and communication elements of the TRANSCOM system. In addition, the TRANSCOM equipment has been installed on the WIPP transport vehicle touring the western and southern United States in a public awareness campaign. The equipment is used to demonstrate tracking and communications capabilities under routine and simulated abnormal shipping scenarios. The TRANSCOM system has also been used to monitor DOE radioactive material shipments to verify system performance.

NOTIFICATION

TRANSCOM will provide the States with up to 7 days advance notification of a shipment. In the unlikely event that the system is not operational for an extended time, a State official will be contacted by telephone and advised of the planned shipment. Additionally, each truck will be equipped with a mobile phone as a backup communication system. Should there be operational problems with the TRANSCOM, drivers will call into the Central Coordination Center every two hours and at State border crossings.

Use of the TRANSCOM system by a State or Tribe does not, however, relieve the DOE of prenotification requirements for Highway Route Controlled Quantity (HRCQ) waste shipments.

TRAINING

When the WIPP is fully operational, all corridor States and Tribes will have received training on the use of the TRANSCOM system. To date, training has already been provided to the States of New Mexico, Colorado, Utah, Wyoming, Idaho, and the Shoshone-Bannock Tribes. The DOE plans to provide training to the remaining States approximately 30 days prior to the first preoperational checkout for transporting waste from a particular facility. Dry runs will be conducted to ensure that all the features of the system have been adequately tested.

TRANSCOM AND RAIL

Since the DOE has committed to using truck transport during the first five years of TRU waste transport, the DOE has not investigated the use of TRANSCOM system with regard to rail shipments. However, at this time, there does not appear to be any reason that would prevent the system from working with rail shipments.

Additional information is available in Appendixes C, L, and M.

7.3.2.3 **RAIL TRANSPORT**

7.3.2.3-1 **Comment**

The use of a dedicated train on either existing track or newly constructed track was suggested by several commenters. Some commenters thought that a fixed low speed of travel would promote safety, while transporting a considerably larger volume of waste per shipment seemed advantageous to others. Some commenters thought the increase in rail commerce would be a side benefit.

7.3.2.3-1 **Response**

Studies have been completed and lawsuits raised over the issue of dedicated trains. The Interstate Commerce Commission (ICC) has maintained the position that railroads may not lawfully impose special (i.e., dedicated) trains on an unwilling shipper. Early (in the 1940s) in the debate over transporting hazardous materials, the National Academy of Sciences decided that packaging was the critical element to consider, and that if properly packaged, any material could be safely transported by any mode of travel. Today, the DOT continues to support the concept that if properly packaged, hazardous materials may be shipped by any method and that dedicated trains are not required. As discussed elsewhere, the DOE will evaluate the efficacy of train transport for use during the Disposal Phase.

7.3.2.3-2 **Comment**

A commenter said, "If the railroads are used to transport shipments of radioactive waste, the waste will be traveling through the center of a large number of communities of this State. The main east-west route bisects Belen, New Mexico, a town 30 miles south of here where I grew up. The track going east of this community is a single track for many miles. The state of repair of our entire rail system must be checked prior to any of these shipments being sent via these routes."

7.3.2.3-2 **Response**

The DOE has chosen to use truck transport for the first five years of TRU waste shipments. The DOE will, however, continue to evaluate the use of rail transport for the Disposal Phase. The Federal Railroad Administration, as the delegated enforcement arm of the DOT, is responsible for inspecting tracks and evaluating the safety of the proposed rail routes.

7.3.2.3-3 **Comment**

One commenter said that In ". . . Figure 3.6 . . . and Figure D.2.7 [of the draft SEIS]. . . the D&RGW [the Denver and Rio Grande Western Railroad] is the rail carrier between Walsenberg, Colorado and Trinidad, Colorado, not [the] AT&SF as shown."

7.3.2.3-3 **Response**

The Denver and Rio Grande Western Railroad was contacted for clarification of the location of its rail lines in Colorado. The commenter is correct in stating that D&RGW track extends to Trinidad, Colorado; however, the track has not been used in several years. At Walsenberg, Colorado, trains go west. The interchange available to rail cars heading south is at Pueblo, Colorado as shown on Figures 3.6 and D.2.6 of this SEIS.

7.3.3 TRANSPORTATION ROUTES

7.3.3-1 **Comment**

A number of commenters asked, "Why ship transuranic waste to the WIPP at all? Wouldn't it be safer to leave these radioactive materials where they are now stored? Why do shipments of transuranic waste have to travel on roads, tracks, or highways near my city and my home? Isn't it a basic disregard of human life to ship radioactive waste on the nation's roads and railways?" In general, many public commenters did not believe enough safeguards were in place to ensure public safety and that not enough is known about the transportation risks of trucking these materials through populated areas.

7.3.3-1 **Response**

This SEIS analyzes the impacts of proceeding with the phased development of the WIPP as an R & D facility to demonstrate the safe disposal of defense TRU waste generated since 1970 as authorized by Congress. The proposed action necessarily involves the transport of TRU waste to the WIPP since the waste that might be ultimately disposed of at the WIPP is currently in storage or will be generated at facilities other than the WIPP. The SEIS also analyzes the no action alternative which would not involve transportation of waste to the WIPP. Additional information is available in responses to comments 5.2-1 and 5.2-2 and in subsections 5.2 and 5.5.

Any transportation of TRU wastes to the WIPP would be done under strict adherence to the regulations of the DOT and the NRC. Additionally, the DOE is implementing a stringent program of safeguards including driver training, equipment maintenance, and shipment monitoring and tracking. These precautions will make TRU waste shipments as safe as, and in many cases safer than, other commerce on the nation's transportation systems.

A new appendix, Appendix M, has been added to this final SEIS to better explain the transportation management policies of the trucking contractor. Many safeguards have been incorporated into the transportation system, including:

- The NRC-certified TRUPACT-II container

- The extensive number of vehicle inspections made by maintenance personnel at the WIPP; by drivers at the WIPP and every two hours while the shipment is en route; by State inspectors at ports of entry, as well as at any other point inspectors suggest

- The fact that the DOE exceeds many DOT safety requirements related to transportation

- The fact that the interstate highway system or State-designated routes are used.

7.3.3-2 **Comment**

Commenters asked about the risks and dangers of a possible accident involving radioactive waste, especially in densely populated areas.

7.3.3-2 **Response**

The transportation packaging system, TRUPACT-II, has been certified to comply with NRC requirements for Type B packaging in accordance with the regulations of 10 CFR Part 71. This certification ensures that the TRUPACT-II design provides the necessary protection against a breach of the waste package and exposure of individuals to radioactive waste. In the almost 30 years of shipping materials in Type B packages, there has never been a package failure in accident conditions which resulted in a release of radioactive materials. A radiography camera failed after being struck by a car, and an improperly secured sealed source was dislodged. However, the source remained intact and no radioactive material was dispersed. A detailed risk assessment of potential transportation accidents is presented in Appendix D.

7.3.3-3 **Comment**

A commenter asked if margins of error for equipment failure and human error make it inevitable that an accident involving a release of radioactive materials will occur.

7.3.3-3 **Response**

Even though the DOE acknowledges that human error can occur in any system, the TRU waste containment and transport equipment design, maintenance procedures, driver training and qualifications, traffic management and surveillance, together with restrictions on the waste characteristics (e.g., no free liquids) provide redundant protection against the release of radioactive material to the environment.

Nonetheless, the DOE is providing State law enforcement and fire protection staff with emergency response training so they can effectively and efficiently respond to any accident involving TRU waste. The DOE also provides a regional radioactive materials response team available 24-hours a day to support States and communities in case of an accident involving radioactive materials.

Additional details on emergency response and other safety features can be found in Appendices C, D, L, and M and the responses to comments 7.3.2.1-1 and 7.3.2.1-5.

7.3.3-4 **Comment**

One commenter asked, "How can I be assured that the best and safest transportation routes have been or will be selected for transporting transuranic waste across the nation?"

7.3.3-4 **Response**

Because interstate highways provide a safer, more efficient movement of traffic than other highways systems in the United States (based on factors like pavement surface, number of lanes, maximum grades, etc.), the DOT regulations (49 CFR 171, 174, 177) require carriers to use the interstate highway system, to the extent possible and reasonable, as the preferred route for shipping hazardous materials. Where no interstate highway exists, the shortest reasonable route must be used. States or other recognized routing authorities may designate alternate routes in accordance with procedures stated in 49 CFR.

If emergency detours are required (e.g. road construction, or similar situations), the driver must notify the dispatcher at the WIPP and may not deviate from the route until the detour has been approved by the dispatcher. The DOE will notify any State or local officials of any change in routes.

In this SEIS, the DOE consulted with the corridor States to identify segments of proposed shipping routes that have special problems or a higher incidence of accidents. This information will be incorporated into driver training and other program elements. If the DOE elects to ship by rail, the TRU waste program will work with the

States and the railroads to implement similar controls as has been done for the truck shipping mode. Additional details regarding the routes and the regulations that govern route selection can be found in Subsections 3.1.1.3 and 10.3 and Appendix D.

7.3.3-5 **Comment**

The Department of Energy, Minerals, and Natural Resources for the State of New Mexico and other commenters asked if the DOE has followed through with its commitments to assist the State in highway improvements and bypass construction.

7.3.3-5 **Response**

The DOE has made and continues to make a good faith effort to assist the State of New Mexico to obtain special appropriation monies from Congress for New Mexico highway improvements.

Through the efforts of the New Mexico congressional delegation, Federal highway appropriations totaling an estimated $57.9 million were sought for highway improvements for the routes expected to be used for transportation of TRU waste to the WIPP. However, none of these funds was earmarked for bypass construction.

The State of New Mexico received approximately $54.4 million for highway improvement construction between fiscal years 1983 and 1987. Then, in 1987, the State revised its estimates of construction costs, adding another $39 million to the total. In response to New Mexico's needs, the DOE reprogrammed $43 million in 1989 toward these additional highway costs. However, the agency received congressional direction that the funds could not be expended until land withdrawal for operation of the WIPP was accomplished.

In 1987, the Governor of New Mexico asked the DOE for a commitment to assist the State in seeking funds for construction of bypasses around cities along the WIPP routes. As a result, an agreement known as the "Roads Agreement" was drawn up wherein the DOE agreed to make "good faith" efforts to help the State obtain a special appropriation of $190 million for WIPP relief routes in New Mexico.

In October 1987, DOE Acting Assistance Secretary Troy Wade met with staff from the Federal Highway Administrator's office seeking their assistance in identifying Federal highway funds for the bypasses. The Federal Highway Administration responded that there was no Federal highway money available at the time.

Subsequent to this, New Mexico received $25 million from the DOT for a bypass demonstration project which the State is using to begin construction of the Santa Fe relief route. Funding for completion of bypasses is linked to the legislative land withdrawal bill currently before Congress.

7.3.3-6 **Comment**

Representatives from the city of Arvada, Colorado, the State of Colorado, the Nevada Agency for Nuclear Projects, and many public commenters expressed concern over the routes proposed in the draft SEIS. Reviewers felt that it was inappropriate for the trucking contractor to decide the routes and wanted the routes to be included in the Dawn Trucking Company contract, along with a statement obligating the truck drivers to use the stated routes. In addition, several commenters wanted the process for designating alternate routes to be clarified. Many asked whether or not the DOE would use an alternate route proposed by States. The city of Arvada asserted that States along the routes should be involved in designating routes.

7.3.3-6 **Response**

The truck transportation routes described in the draft SEIS and final SEIS are the "preferred" routes according to criteria established by the DOT. "Preferred" routes are defined as any route designated by a "state routing agency" and any Interstate System highway for which an alternate highway has not been designated by a State agency. It is not the DOE's prerogative to designate transportation routes; rather, the DOE must follow State-designated routes, or, in their absence, interstate highways and bypasses where they exist, and the most direct access roads to interstates.

The DOE has revised the Dawn Trucking Company contract to reflect these preferred routes identified in the Dawn Trucking Company Management Plan (see Appendix M of this final SEIS). They must be followed by carrier drivers. Drivers will be penalized for deviating from the routes. The first offense for failure to follow a route will result in a warning to the driver and two weeks leave without pay; a second offense will result in termination of employment. At any point along the route where a driver might need to deviate, (e.g., road construction), he or she must contact the WIPP Central Coordination Center for approval or further instruction before he or she may proceed.

The Dawn Trucking Company has forwarded copies of the proposed truck routes to all corridor States for their review. In 1988 and 1989, the DOE held several meetings with representatives of the corridor States and discussed the WIPP routes with these representatives. If the States desire to designate alternatives to the preferred routes, the DOE is willing to provide assistance to the State in assessing these routes, and the trucking contract would be modified to reflect such State designated routes.

Originally, specific to New Mexico, the DOE had agreed that routes identified in the 1982 Supplemental Stipulated Agreement (DOE and New Mexico, 1982) and subsequently modified in the 1987 Roads Agreement with New Mexico (DOE and New Mexico, 1987) would be the routes accepted for transport of TRU waste. Subsequently, the New Mexico Attorney General determined that the State would have to designate certain non-interstate routes as alternate routes. The DOE will cooperate with New Mexico as much as possible to assist the State in meeting these requirements.

7.3.3-7 **Comment**

The Western Interstate Energy Board and other commenters requested that the DOE clarify the role of State and local ordinances as they relate to the WIPP shipments. Related to this general comment were requests that the DOE consider a Roswell, New Mexico, ordinance banning shipments between the hours of midnight and 6:00 a.m.

7.3.3-7 **Response**

The DOE recognizes that a successful transportation program for TRU waste depends in large part on good cooperation with State and local jurisdictions. The DOE will continue to cooperate with States and communities to ensure that the transport of waste is done safely. Under DOT regulations, however, State and local governments may not interfere with the interstate shipment of hazardous materials. Regulations and inconsistency rulings issued by the DOT provide specific direction on the role of State or local ordinances or other special regulations as they apply to the shipments of hazardous materials. In response to the comments on the Roswell ordinances, DOT regulations state that any requirement is inconsistent if it causes a delay in transportation; requires additional or special personnel, equipment, or escorts; or requires prenotification.

7.3.3-8 **Comment**

Many commenters expressed concern and opposition to WIPP shipments traveling through their towns, in front of their homes, or by public schools. A large number of these comments came from residents of Santa Fe, New Mexico.

7.3.3-8 **Response**

The DOE, in complying with DOT routing requirements, will follow the most direct interstate highways, using beltways and bypasses around urban areas to the extent possible. Where States deem it appropriate, they have the option to designate alternate routes. In this case, the DOE would then use these alternative routes for transporting TRU waste.

At the time of this writing, it is expected that the Santa Fe relief route, a bypass around central Santa Fe, will be constructed prior to any WIPP shipments from Los Alamos. As discussed in Appendixes C, D, L, and M, and throughout Section 7.3 of this response to comments, the DOE believes that shipments of TRU waste will pose no undue hazard to communities along the routes.

7.3.3-9 **Comment**

A commenter asked how many shipments of transuranic waste will pass through Idaho cities (e.g., Pocatello) on their way to the WIPP.

7.3.3-9 **Response**

The DOE has revised the estimated numbers of waste shipments from generating and storage facilities to the WIPP. It is estimated that over the proposed 25-year operation of the WIPP, as many as 4,046 truck shipments or 2,083 rail shipments could move from the Idaho National Engineering Laboratory through Idaho cities, including Pocatello, en route to the WIPP (see Table D.3.2).

7.3.3-10 **Comment**

Some commenters were concerned that einsteinium would pose a threat to the States and communities through which the DOE intends to ship TRU waste.

7.3.3-10 **Response**

Einsteinium (atomic number 99) poses no significant transportation risk because it is not a typical TRU waste constituent. Any einsteinium isotopes originally present have likely decayed away, and, if present, they are as well contained as other TRU nuclides.

Einsteinium (Es) is listed in Lederer and Shirley (1978) as having 14 isotopes. Each isotope is produced by the mechanism of a lighter nuclide capturing one or more particles, such as neutrons or fission fragments. These reactions that produce Es isotopes occur in operating reactors, but not in waste matrices. Typically, any Es formed in a material production reactor becomes high level waste resulting from fuel processing. Thus, Es is not expected in TRU waste. In the event some Es is present in TRU waste, the short half life of most Es isotopes (<38 days) ensures that essentially all Es originally present will decay away in the time between the original creation in a reactor and the time any Es-containing waste is transported. (Es-253 can also result from the beta decay of Cf-253, but also has a short half life [17.6 day], so no significant Es-253 is in transported waste.) Two Es isotopes, Es-252 and Es-254 have slightly longer half-lives, 470 days and 276 days respectively. For stored TRU waste, these isotopes have had sufficient time to decay to insignificant levels. If any Es 252 or Es 254 is present in newly generated waste that is transported, the isotopes are alpha-emitting (so no increase in waste package surface dose rate results), and are as well contained by the transporter as TRU nuclides; thus, no threat results from the presence of Es in TRU waste.

7.3.3.1 TRUCK ROUTES

7.3.3.1-1 **Comment**

One commenter discussed the lack of any "road segments of concern" for the route through Texas. The commenter suggested that the transportation analysis was, therefore, not complete.

7.3.3.1-1 **Response**

Each corridor State was contacted for information related to possible hazardous road conditions along the WIPP route. The State of Texas responded that there were no road segments present that contained hazardous segments. Appendix D of this final SEIS provides all information received from the States regarding highway segments of concern.

7.3.3.1-2 **Comment**

Many public commenters expressed concern that shipments would be traveling on U.S. 285. They felt that the interchange with I-25 was dangerous and that the majority of U.S. 285 was in poor condition.

7.3.3.1-2 **Response**

The DOE has stated in past agreements that it will assist the State of New Mexico in obtaining funding for various road segments in need of improvements. U.S. 285 in the El Dorado area is one of the areas identified in these agreements as needing improvements. Because of the large amount of public concern over travel on U.S. 285, a driving log, which is being prepared for the WIPP truck drivers, will have this information added to the existing list of highway segments of concern.

Also see response to comment 7.3.3-5 for a discussion on funding of New Mexico highway improvements.

7.3.3.1-3 **Comment**

A petition signed by 292 businesses and merchants on U.S. Highway 82 (Main Street) and U.S. Highway 285 (First Street) in Artesia, New Mexico, requested that the Southeastern New Mexico Economic Development District, the Artesia City Council, the County Commissioners of Eddy County, the New Mexico State Highway and Transportation Department, the team appointed to investigate routes, and other affected agencies designate U.S. 285 as the primary thoroughfare through Artesia and adjacent areas.

7.3.3.1-3 **Response**

The DOE intends to use U.S. 285 and U.S. 82 as the primary access to the WIPP. However, the State of New Mexico is presently proceeding with the formal route designation process to establish these roads as a state designated route.

7.3.3.1-4 **Comment**

The Nevada Agency for Nuclear Projects as well as other public commenters questioned whether WIPP shipments would be halted during severe weather.

The State of Colorado also asked for a shipment plan to be developed to minimize the number of shipments exposed to bad weather or road conditions and to define uniform criteria for halting shipments.

7.3.3.1-4 **Response**

The trucking contractor for the WIPP will have access to a national weather forecasting channel. Drivers will be advised of approaching storm systems by the dispatcher and shipments will either be postponed or be halted in safe havens during severe weather.

The DOE believes that a long-range shipment plan is not necessary as the dispatcher for the trucking contractor can direct drivers to a "safe haven" if poor weather indicates that unsafe road conditions exist.

7.3.3.1-5 **Comment**

The Western Interstate Energy Board, the State of Oregon, the Nevada Agency for Nuclear Projects, the Acoma Pueblo, and other commenters expressed concern over whether or not the DOE had designated locations along the WIPP routes for emergency parking and what liability may be associated with such locations. Some commenters also inquired about the DOE's investigation into the possibility of military bases providing parking areas. These commenters said that if parking areas have not been located, officials and the public want to know what criteria will be used by the drivers to identify safe emergency parking areas.

7.3.3.1-5 **Response**

The DOE has reached agreement with the Department of Defense for the use of its facilities along the WIPP route for emergency parking. However, since there are only 50 such facilities along the WIPP routes, there may be a need to identify additional parking areas. The DOE has initiated discussions with representatives of first corridor States to identify additional potential parking areas.

7.3.3.1-6 **Comment**

The office of the Governor of Colorado, the City of Arvada, Colorado, the Jefferson County, Colorado, Commissioners, a councilwoman, and several other commenters asked the DOE to consider routing shipments around the city of Denver on a beltway currently under construction (the E-470 Project). Also, some commenters were concerned that planned highway construction in the Denver area and rush hour traffic were not included in Table D.2.1 of the draft SEIS.

7.3.3.1-6 **Response**

The DOE welcomes designations by the corridor States of alternate routes. If the suggested E-470 Project bypassing Denver is designated a bypass, DOE shipments would use this route. Table D.2.1 has been revised to show rush hour traffic congestion in the Denver and Pueblo areas. Since it is likely that some portion of the WIPP routes will be under construction at some time, construction activity is not shown on Table D.2.1; drivers will be apprised of road construction through normal communication procedures.

7.3.3.1-7 **Comment**

California Energy Commission, the Acoma Pueblo, the Nevada Department of Transportation, the Nevada Agency for Nuclear Projects, and other commenters expressed concern over WIPP shipments being routed through the Los Angeles and Las Vegas areas. The dense population along the routes, the heavy traffic volumes, and the potential difficulty in reaching a vehicle should an accident occur were some of the issues of concern. The California Energy Commission commented that a routing analysis has been completed by the California Highway Patrol for shipments from the Lawrence Livermore National Laboratory to the Nevada Test Site and to the WIPP. It includes alternate routes which circumvent the Los Angeles area. The California Energy Commission recommended that no TRU waste shipments through California take place until the State's route designation process has been completed. The Acoma Pueblo commented that the SEIS should discuss Interstate-10 routing as an alternate route through California, Nevada, and the southern portions of Arizona and New Mexico. Also, the Nevada Department of Transportation was concerned that information provided to the DOE on route segments of concern was not included in the draft SEIS.

7.3.3.1-7 **Response**

DOT regulations provide that a State routing agency, following DOT guidelines, may designate routes as alternates to the interstate highway system. As they become effective, State designated alternate routes will be incorporated in the WIPP transportation system plan.

As described in Section D.3.2.1 and amplified in the response to comment 7.3.5.1-14, routes from each facility to the WIPP used for the transportation risk analysis were an average of several potential routes. In fact, for shipments for Lawrence Livermore National Laboratory, three potential routes were used to derive the average route used in the analysis. Two of these routes used I-10 as the major east-west interstate rather than I-40. The characteristics (distance, population zones) of I-10 were thus factored into the route used to calculate transportation risks for shipments from Lawrence Livermore National Laboratory to the WIPP.

In response to the Nevada Department of Transportation comment on missing information on route segments of concern, Table D.2.1 has been revised to include the missing information.

7.3.3.1-8 **Comment**

The State of Colorado requested additional evaluation of highway funding, stating that there is a need to distribute highway funds to corridor States using a formula that would include factors such as the number of shipments, shipment miles, and exposures to the population. Several commenters expressed concern regarding the condition of the roads and bridges over which trucks would travel.

7.3.3.1-8 **Response**

In the 1982 Supplemental Stipulated Agreement between the DOE and the State of New Mexico, the DOE agreed to assist the State of New Mexico to obtain highway construction appropriations from Congress because New Mexico, as the host State, would receive all shipments. Since shipments from the defense facilities would travel different routes over 23 States, it is not anticipated that they would significantly degrade road surfaces within any specific corridor State. The DOE is currently evaluating options for funding or other assistance to corridor States, in particular for the areas of emergency response equipment and training.

With regard to the condition of roads and bridges, the DOE has no authority over roadway conditions. These responsibilities reside with the DOT and the concerned States. However, the DOE does and will comply with all directives (such as detours) issued by State authorities in response to poor roadway conditions.

7.3.3.1-9 **Comment**

A commenter said that on page 3-19 of the draft SEIS, a "sentence regarding State designated routes implies that analyses must demonstrate 'less risk'. The State designated route is not required to demonstrate 'less risk', but only that the routing analysis consider overall risk."

7.3.3.1-9 **Response**

The commenter is correct in stating that the routing analysis must consider overall risk instead of less risk. The text of Subsection 3.1.1.3 has been changed and the phrase "less risk" deleted.

7.3.3.1-10 **Comment**

A commenter said that the draft SEIS "characterizes use of U.S. Highways as 'exceptions' to the use of Interstates. Perhaps use of the word 'exception' is not appropriate. There is no interstate access from portal to portal; we do use the Interstate to the 'maximum extent possible'; therefore, we follow the rules without exception."

7.3.3.1-10 **Response**

The text of Subsection 3.1.1.3 has been revised to clarify the use of the interstate highway system.

7.3.3.1-11 **Comment**

One commenter stated, "I would like to go on record with regard to the Rio Bravo corridor which dissects the heart of the unincorporated area of the southwest quadrant of Bernalillo County, known as the Southwest Valley. I stand firmly in opposition to any plans for the Urban Transportation Policy Board, the State of New Mexico and the Federal government in regards to using any or part of the Rio Bravo corridor in the heart of the South Valley for any type of transportation route."

7.3.3.1-11 **Response**

At the time of this writing, the Rio Bravo corridor is not under consideration by the DOE for WIPP traffic routing.

7.3.3.1-12 **Comment**

A commenter said, "The highway department has recently allocated $5 million to upgrade Highway 3. We consider[ed] this proposal to create Highway 3 as an alternative WIPP route. The small, paved road that meanders along the Pecos River ultimately connects with I-40 near 285. We support preservation of this region of the Pecos with no further WIPP routing."

7.3.3.1-12 **Response**

At the time of this writing, Highway 3 is not under consideration by the DOE for WIPP traffic routing.

7.3.3.1-13 **Comment**

A commenter asked, "This past spring in our [S]tate legislative session a state senator who doesn't represent us, a state senator by the name of James Caudell, pursued a plan to construct a new road in the Placitas area . . . This road would serve as a good route for WIPP trucks . . . first of all, has Senator -- State Senator Caudell proposed to your agency any new WIPP routes by [sic] bypass Albuquerque? Second question is, when your agency is considering a new route for transporting these radioactive waste, how and when do you inform local communities and land owners in the local communities?"

7.3.3.1-13 **Response**

New Mexico State Senator James Caudell has not officially proposed any alternate WIPP routes which would bypass Albuquerque via Placitas, New Mexico. Recently, the Attorney General of New Mexico announced that the State would follow DOT designation procedures for WIPP-related routes in New Mexico. These procedures include opportunities for public review and comment on proposed alternate routes. If the State were to propose such a route, residents of the community would be given opportunity to publicly comment on the proposal. The DOE is not aware of plans to designate a route through Placitas to the WIPP.

7.3.3.1-14 **Comment**

A commenter stated, "The [draft] SEIS report lists possible hazardous road conditions in New Mexico on I-40. It does not mention the highways from Clines Corners to Carlsbad[, New Mexico]. [The] DOE needs to address the frequent traffic tie-ups occurring along this road due to snow and blizzards."

"Closer to home, [the draft] SEIS is lacking in noting hazardous road conditions on Highway 285 -- the main 'final' corridor for TRU shipments. This highway is frequently, at least once every winter, closed to traffic due to heavy snow and blizzard conditions. At times as many as 200 or 300 trucks and automobiles are stalled at Vaughan or Clines Corners."

7.3.3.1-14 **Response**

Table D.2.1 (Road Segments of Concern) identifies road segments of U.S. 285 as hazardous. The description of U.S.-285 is included in the route description for the Hanford Reservation. Figure D.2.4 of the draft SEIS (renumbered as D.2.3 in the final SEIS) shows the routes in New Mexico and the generalized segments of concern.

7.3.3.1-15 **Comment**

One commenter stated: ". . . the SEIS places incorrect emphasis on weather factors in its table on road segments of concern, Table D.2.1, for two major WIPP groups in New Mexico. Route I-25 from Raton south to Santa Fe is considered a high crash rate road, according to the New Mexico Traffic Safety Bureau. So is the intersection of I-25 and I-40 in downtown Albuquerque. These are the roads the WIPP trucks will use. The [draft] SEIS omits this crash data, omits mention of traffic congestion in Albuquerque's main intersection, and focuses on weather concerns which are rarely a factor in New Mexico's accidents. New Mexico also had a higher than the national average of vehicle death rates from 1984 to 1987. This implies more severe accidents occur when they occur."

7.3.3.1-15 **Response**

The DOE contacted each corridor State for information on hazardous road segments along the WIPP route(s) in their State. In some instances, States responded that all roads were constructed to highway standards and therefore could not be considered of concern. The results of this survey were compiled in Table D.2.1 to show a qualitative assessment of highway road conditions. There was no intent to compare highway accident statistics with accident perceptions in this table. See response to comment 7.3.6.1-3 for information on differences between State-supplied accident statistics and assumptions used in the analyses in this final SEIS.

7.3.3.1-16 **Comment**

One commenter stated,

> DOT regulations contained in 49 CFR, Parts 171, 174, and 177, are characterized as requiring that the interstate highway system be used whenever possible to transport highway route controlled quantities of radioactive materials to WIPP and that appropriate State agencies can require other routes if less risk can be demonstrated.
>
> This analysis of 49 CFR, Parts 171, 174, and 177, is misleading and inaccurate. The requirements of 49 CFR, Part 177.825, are that highway route controlled quantities of radioactive materials can be transported over "preferred routes" which are selected by a State routing agency when interstate highway system or bypass is not available. As of this date, there have been no "preferred routes" designated by the State of New Mexico as required by the DOT regulations in 49 CFR 177.825 dated May 8, 1988.

7.3.3.1-16 **Response**

The text of Subsections 3.1.1.3, 10.2.6, and Appendix D (Subsection D.2.2.1) has been revised to more accurately describe the use of "preferred routes."

7.3.3.1-17 **Comment**

A specific comment made by the EEG stated:

> On page D-10 and 11 [draft SEIS] the text indicates that all applicable U.S. DOT regulations, with respect to "preferred routes," have been implemented. They have not.
>
> The definition of preferred route in the context of U.S. Department of Transportation regulations is incorrect and fails to acknowledge the May 8, 1988, revision of the U.S. Department of Transportation regulations, 49 CFR 177.825, requiring a State to formally notify DOT when it has completed

the procedures. Such notification has not occurred and the text should make this clear.

7.3.3.1-17 **Response**

The commenter is correct in the above statement; the text (Subsection D.2.2.1.1) has been revised by including the referenced information.

7.3.3.1-18 **Comment**

One commenter stated, "In Table D.4.22 [in the draft SEIS], please identify sections 1 through 6 along in the I-20/I-285 corridor in Georgia by location."

7.3.3.1-18 **Response**

This has been done in a new Table D.4.12.

7.3.3.1-19 **Comment**

The EPA commented that the population data given for St. Louis in Figure D.2.5 was correct but that the data should have included the suburb populations to better reflect the population exposed to TRU waste shipments.

7.3.3.1-19 **Response**

The population figures shown in Figure D.2.5 were for illustrative purposes only; they were not used explicitly in the transportation risk assessment. However, as described in Subsection D.3.2.1, potential routes from the facility of origin to the WIPP were identified (routes from Argonne National Laboratory-East and Mound Laboratory pass through St. Louis) and the populations along those routes classified into rural, suburban, and urban fractions with population densities of 6,719 and 3,861 people per square kilometer (See Table D.3.6). Thus, for shipment from Argonne National Laboratory-East and Mound Laboratory, travel through St. Louis and surrounding suburbs added to the fraction of travel in suburban and urban zones. For example, from Table D.3.6 for Mound Laboratory shipments (average distance 1472 miles), 75.4% of the route (1110 miles) passed through rural population zones, 24.1% of the route (355 miles) passed through suburban population zones, and 0.5% of the route (7 miles) passed through strictly urban population zones.

Assuming an exposed population residing uniformly along the route in a strip one kilometer wide, for shipments from Mound Laboratory, approximately 10,700 people are in rural zones, 410,000 people are in suburban zones, and 46,000 people are in urban zones.

7.3.4 U.S. NUCLEAR REGULATORY COMMISSION

7.3.4-1 Comment

One commenter asked, "What safety and security regulations must DOE meet in order to ship transuranic waste to the WIPP?"

7.3.4-1 Response

TRU waste will be shipped to the WIPP in NRC-certified Type B shipping containers. In addition, shipments must comply with all DOT regulations regarding truck/trailer safety equipment and maintenance, placarding, and manifesting. The contract carrier drivers are also required to meet certain DOE-specified safety standards and must comply with all State and local laws and regulations in the areas through which the trucks will pass (e.g., speed limits, traffic signals, law-enforcement officials, etc.).

Specific applicable DOE orders are:

- DOE Notice 5480.3, "Safety Requirements for the Packaging and Transportation of Hazardous Materials, Hazardous Substances and Hazardous Wastes" (DOE, 1988e)
- DOE Order 1540.2, "Hazardous Material Packaging for Transportation Administrative Procedures" (DOE, 1986a)
- DOE Order 5000.3, "Unusual Occurrence Reporting Systems" (DOE, 1984a).

To ensure the security of shipments, drivers will be required to maintain visual contact with the shipment at all times (even during meal stops) and will report its status to the WIPP Central Coordination Center by telephone and through the TRANSCOM real-time tracking system. Other safeguards against sabotage or terrorism will include specialized training provided to drivers on how to respond to emergency situations of this nature.

Additional information is available in Section 10 and Appendixes D, L, and M.

7.3.4-2 Comment

A commenter asked, "Since the TRUPACT-II has not yet received NRC certification, are risk analyses included in the [draft] SEIS valid?"

7.3.4-2 Response

Yes. The TRUPACT-II waste container received NRC certification on August 30, 1989, and this SEIS has been revised to so indicate.

7.3.4.1 **REGULATIONS**

7.3.4.1-1 **Comment**

A number of comments were received concerning the testing requirements that the TRUPACT-II and NuPac 72B must satisfy before NRC can certify them as Type B packages. Many of the commenters had uncertainties regarding the ability of the test requirements to duplicate real accidents and whether they included worst case scenarios. As an example, they said the TRUPACT-IIs were only subjected to 30 feet drops during the testing, although drop-offs along the designated routes may be much higher.

7.3.4.1-1 **Response**

As part of the certification process for Type B packagings, the NRC requires that a candidate packaging design demonstrate containment, radiation control, and criticality control when subjected to mechanical and thermal forces from a sequential series of tests called the hypothetical accident conditions, through testing, analysis, or a combination of both. The hypothetical accident conditions are based on engineering criteria and are not intended to duplicate accidents; instead, they are intended to produce packaging damage equivalent to that observed in severe transportation accidents. In fact, it has been shown that for accident conditions with impact and fire, more than 99.5% of all accidents are less severe than these regulatory criteria (Dennis, 1978).

Additional information is available in Appendix L and the responses to comments in Subsections 7.3.1.1.

7.3.5 **RADIOLOGICAL AND HAZARDOUS CHEMICAL IMPACTS**

7.3.5-1 **Comment**

Comments by the State of Nevada through its Nuclear Waste Project Office, a Congressman from Colorado, and many individuals expressed concerns about the effects of human error on transporting TRU waste to the WIPP.

The State of Nevada comments also reflected a much broader concern that the opportunity for human error is possible at every stage of the transportation process, from the manufacturing of the TRUPACT-II to actually transporting the TRU waste to the WIPP. The commenters said the DOE, has not fully considered human error in assessing transportation risks.

It was suggested that if a major breach were to occur with the TRUPACT-II because of human error in the manufacturing, loading, or sealing of the packaging, the accident risk analysis included in the draft SEIS would be invalid. "What measures", asked the State, "are being taken to eliminate human error in transporting TRU waste?"

7.3.5-1 **Response**

Although many commenters believe that human error has not been considered in the analysis of risks associated with transporting TRU waste, in actuality, the accident risk analysis does consider the influence of human error. Transportation accident statistics inherently include this factor simply because the major cause of transportation accidents is human error. This SEIS transportation risk analysis includes conservatisms in every major input to the analysis to accommodate the effects of human error and other unknowns.

At the same time, in other aspects of the transportation system, particularly the manufacture, operation and maintenance of the TRUPACT-II packaging, human error is being given serious consideration. In past analysis, the answer to human error has focused primarily on the integrity of the Type B packaging, the TRUPACT-II or the NuPac 72B, proposed to transport TRU waste. A qualified Type B packaging has been demonstrated historically to be so reliable and so resistant to any breach or penetration, that concerns about the effects of human error on transportation risk have not been considered credible.

Although the performance of Type B packaging continues to be extremely reliable, an extensive system of quality control procedures and regulations, together with independent verification is being integrated into the TRU waste transportation system. These procedures, together with independent auditing, are designed to ensure that human error is discovered before it becomes significant and that necessary changes are implemented to correct and eliminate it. Appendix L reviews in detail the procedures and plans developed for the waste packaging (design, testing, manufacturing, use) and waste handling at the facilities, as they relate to potential transportation impacts. Appendix M reviews similar plans and procedures as well as requirements, regarding the transportation carrier and drivers.

Transportation-related procedures (waste certification, TRUPACT handling) are developed by waste generator/storage facilities according to local policies regarding review and approval of new procedures. These procedures are also audited by the WIPP Waste Acceptance Criteria Certification Committee (WACCC) as part of the process of certifying each facility's waste as acceptable for shipment to the WIPP.

Procedures regarding the shipment of waste are developed by the contract carrier (see Appendix M) and are reviewed by the DOE as the contracting agency for the carrier contracts.

However, to briefly illustrate how human error is considered throughout the transportation process, Table 1 lists phases of the transportation system where human error could occur in the preparation and transportation of TRU waste to the WIPP, together with the mitigating systems that minimize the potential for human error.

TABLE 1
IDENTIFYING AREAS OF POTENTIAL HUMAN ERROR AND POSSIBLE MITIGATING ACTIONS

TRANSPORTATION ACTIVITIES WHERE HUMAN ERROR MAY BE A FACTOR	ACTIONS WHICH MITIGATE POTENTIAL HUMAN ERROR
PACKAGING	
Design	NRC Regulations: Package Standards, Tests, Certification, Approval (internal/external QA/QC)
Manufacture	DOE Specifications Manufacturer's QA/QC for raw materials, purchased subcomponents and in-process fabrication and assembly; DOE Audit
DOE Acceptance	DOE Inspection Criteria
Receipt at Site	Site Inspection Procedures; Site Certification Official; DOE Audit; EEG Review; State Inspections
Loading at Site	Site Procedures, QA/QC; Site Certification Official; DOE Audit
Placement on Trailer	Site Procedures, QA/QC; Site Certification Official; Driver Verification; DOE audit
Transportation to the WIPP	State Departure Inspection; Driver Selection, Training, Testing, Performance; Driver Periodic Inspection; State Point of Entry Inspection
WIPP Handling	WIPP Procedures, QA/QC, Inspection and Acceptance
Maintenance at the WIPP	WIPP Procedures, QA/QC, Inspection and Acceptance; DOE Audit
Return Transportation to Site	Driver Selection, Training, Testing, Performance, Driver Periodic Inspection; State Point of Entry Inspection
Receipt at Site	Site Procedures, QA/QC; DOE Audit

TABLE 1 Continued

TRANSPORTATION ACTIVITIES WHERE HUMAN ERROR MAY BE A FACTOR	ACTIONS WHICH MITIGATE POTENTIAL HUMAN ERROR
WASTE	
Certification to WAC and NRC Approved Contents	Site Procedures, QA/QC; Site Certification Official; DOE Audit; EEG Review
Waste Packaging	Type A (Mfg. to DOT Specifications); Accepted at Sites; Site procedures, QA/QC
Load Management	Approved Contents Criteria; Site Certification Official; DOE Audit
Manifest Review	Driver Review; Site Certification Official; State Inspection
TRANSPORT SYSTEM	
EQUIPMENT	
Manufacture	Industry/DOE Standards; Internal/External QA/QC; DOE Audit;
Acceptance	Operator Acceptance; DOE Review
Maintenance	Operator Procedures, QA/QC; DOE Audit
DRIVERS	
Hiring Qualifications	DOE-Established Criteria; Operator Compliance; DOE Review
Training	Qualified Resource (e.g. Colorado Training Institute); DOE Review
Performance	Testing; Licensing; Tracking System; Dispatcher Review; DOE Audit

TABLE 1 Concluded

TRANSPORTATION ACTIVITIES WHERE HUMAN ERROR MAY BE A FACTOR	ACTIONS WHICH MITIGATE POTENTIAL HUMAN ERROR
TRANSPORTATION INFRASTRUCTURE	
Highways/Rails	Bypasses; Federal/State Maintenance; Drivers' Experience, Feedback (logs)
Preparation for Unforeseen Events: Severe Weather, Detours, Breakdowns, Sabotage, Accident	Driver/Dispatcher Procedures; Tracking System; Package Design; State Emergency Response Capacity; DOE Emergency Response Capacity; On-going Emergency Response Training and Equipment Availability
DISPATCHERS	
Routes	DOT Approved; State Accepted
Schedules	Monitor Driver Performance (Tracking System)
Severe Weather/Detours	Revise Schedule
Driver Instructions	Warnings on Segments of Concern
Performance	WIPP Procedures, QA/QC; Testing; Emergency Simulation Training

7.3.5-2 **Comment**

The EEG asked why (on page 5-31 [of the draft SEIS]) the maximally exposed individual in the transportation accident is located at 30 meters and 50 meters.

7.3.5-2 **Response**

The maximally exposed individual in the transportation scenario is located 50 meters away from the point of release. The distance in paragraph five on page 5-31 of the draft is in error. The distance of 50 meters was correctly used in the PUFF model to determine the concentrations of hazardous chemicals in air at the hypothetically exposed individual. The typographical error in Subsection 5.2.2.2 is corrected in this final SEIS.

7.3.5-3 **Comment**

The Environmental Evaluation Group commented that it is not clear how the values in Table 5.15 were calculated. They asked if the units of g/m^3 are correct. They asked why the concentration in six TRUPACT-IIs is twice as great as the three TRUPACT-IIs. Using carbon tetrachloride as an example, the average headspace gas concentration in Table 5.33 and the average emission rate in Table 5.35, they calculated a concentration. Using the 1.9 g/m^3 in the headspace gas and diluting it in the TRUPACT-II cavity outside the drums ($2.45m^3$), they calculated an average concentration of 0.87 g/m^3. This value is 50 times that reported in Table 5.10 for three TRUPACT-IIs. They state that the emission rate for carbon tetrachloride would add another 0.12 g in 100 hours. Thus, they believe the amount of carbon tetrachloride in the TRUPACT-II void space should be assumed to be 2.0 g or 0.82 g/m^3. They stated that this value is 27 times the TWA-TLV (time-weighted average threshold limit value) and that corresponding values for the 1,1,1 trichloroethane and trichloroethylene are 3.2 and 1.2 times the TWA-TLV values, respectively.

7.3.5-3 **Response**

In the draft SEIS, the concentrations of volatile organic compounds (VOCs) in the TRUPACT-II were calculated by dividing the headspace gas concentrations in 14 drums for each chemical by the volume of the TRUPACT-II. The units of g/m^3 were correct as calculated; however, the numbers were erroneously used as the total grams of material potentially released and therefore the value for the truck shipments was multiplied by two to obtain the values reported in Table 5.15 of the draft SEIS. The error in the draft SEIS omitted the consideration of the void volume of each drum (i.e., 147.26 L) in calculating the total grams released. Because it is assumed that all drums and all inner bags are breached during the accident, the emission rates of the VOCs through the carbon composite filters are not used in the calculation.

Taking the void volume of the drums into consideration, the release of VOCs is recalculated in this final SEIS. The recalculated concentrations of VOCs inside the TRUPACT-II prior to a breach are not below the respective TWA-TLV values for these chemicals. The concentrations of VOCs are predicted at a location 50 meters from the accident using the PUFF model, and the subsequent risk calculations are included in Subsection 5.2.2.2. The TLV-based hazard indices ranged from 6.9×10^{-6} for 1,1,2-trichloro-1,2,2-trifluoroethane to 5.3×10^{-3} for carbon tetrachloride. These values are well below one, indicating that exposures to volatile organic compounds during a severe transportation accident are well below health-based reference levels.

7.3.5-4 **Comment**

The EEG stated that although the statement that the bounding accident assumes that all drums are breached is incorrect, they agree with the assumption that all headspace gas is released in an accident.

7.3.5-4 **Response**

The statement in the draft SEIS is correct.

For the bounding case transportation accident, it is assumed that all 14 drums in all TRUPACT-IIs are breached. The risk assessment for the bounding case transportation accident is reanalyzed in this final SEIS to include the concentration of volatile organic compounds (VOCs) in the entire void volume of the drums as part of the release from the TRUPACT-IIs. This assumption includes the breach of not only all of the drums but all of the inner bags.

7.3.5-5 **Comment**

The EEG summarized its comments on Subsection 5.2.2.2 [draft SEIS] by stating it has significant reservations about the quality of the data, some of the assumptions, and calculation inconsistencies in this section. Because of these concerns, the EEG could not yet conclude that reported concentrations, which are low compared to TLV (threshold limit values)-based limits, indicate that hazardous chemical releases from transportation accidents are negligible.

7.3.5-5 **Response**

The DOE has used the most current information available on the hazardous chemicals in TRU mixed waste. To compensate for uncertainties in the data, conservative assumptions have been used throughout the risk assessment.

The potential exposure to hazardous chemicals released during a severe transportation accident are well below health-based limits, and therefore no adverse human health effects are expected to result from these short-term exposures to hazardous chemicals.

As previously discussed in more detail in response to comments 7.3.5-3 and 7.3.5-2, the release fractions and estimation of risk are recalculated in this final SEIS. After consideration of the grams of VOCs in the void volume of the drums, which were omitted in the draft SEIS calculations, the concentrations of VOCs inside the TRUPACT-II cavity prior to a release were shown not to be below time-weighted average threshold limit values. The concentration of VOCs in the air at a receptor located 50 meters from the accident was determined, and a subsequent risk analysis is presented in this final SEIS. The hazard indices calculated for all the VOCs released are well below health-based reference levels. The analysis indicates that no adverse human health effects are expected to result from the potential exposure to VOCs released during a transportation accident in which all TRUPACT-II containers in a shipment are breached.

7.3.5-6 **Comment**

The EEG commented that a fraction of the total VOCs (Volatile Organic Compounds) in the waste matrix should be assumed to be released on a transportation accident. They stated that there are experimental data to support releases of the order assumed in the draft SEIS for the radionuclides (i.e., 0.02 percent), which are typically in a non-mobile, nonvolatile form. They felt that a factor of 0.02 percent would be appropriate for the VOC fraction in the waste matrix, which would increase the source term by 29 to 630 percent. They stated that for carbon tetrachloride, which has the most hazardous headspace gas concentration (40 times the TWA-TLV [Time Weighted Average - Threshold Limit Value]), the increase would be 86 percent. They noted that there would still be the non-conservative assumptions of assuming average values for headspace gas concentration and concentrations in the waste.

7.3.5-6 **Response**

It is conservatively assumed that during the transportation accident postulated in both the draft and this final SEIS, all drums and inner bags are breached and the quantity of VOCs in the total void volume (i.e., 147.26 liters) of the drums is released. This scenario assumes that over half the volume of the drums contains gaseous forms of VOCs. The total concentrations of VOCs reported by the Rocky Flats Plant are based on total inputs of chemicals into a process. Based on process descriptions, there is no evidence to indicate that the solid materials contain these high concentrations of VOCs (WEC, 1989a). These concentrations are used in the risk assessment to identify potential chemicals of concern.

Because of the conservative gaseous release fraction used in the bounding case accident, calculations using a 0.02 percent particulate release fraction consisting of VOCs absorbed on activated carbon do not contribute a large increase in the quantity of VOCs released during an accident. Because activated carbon would represent a worse case particulate release of absorbed VOCs, the release fraction used in this and the draft SEIS is considered to bound any potential risks from exposure to these chemicals during a transportation accident. Using the maximum headspace gas concentrations for each VOC as a source term in the risk assessment also results in exposures that are orders of magnitude below established health-based limits. The analysis in this and the draft SEIS is considered to be conservative and bound any potential releases of hazardous chemicals during a severe transportation accident.

Additional information can be found in Subsection 5.2.2.2.

7.3.5-7 **Comment**

The EEG asked what the origin of the 1,300 degree Kelvin temperature is in the bounding case transportation accident. They stated that the assumed temperature for the hypothetical test accident is somewhat lower (800 degrees Celsius or 1,073 degrees Kelvin).

7.3.5-7 **Response**

The fire temperature of 1,300 degrees Kelvin was taken from NUREG 0170 (NRC, 1977). The NRC used this temperature in its accident models to facilitate comparison with previous data from tests conducted at Sandia National Laboratories, and to correspond approximately to the temperature of a jet fuel fire.

7.3.5-8 **Comment**

The EEG commented that for the quantity of lead released during the transportation accident, the fraction received by the maximum receptor is very high. They stated that the intake for an individual amounts to 8.5×10^{-5} of that released. They noted that the radiological bounding accident has only a 3.1×10^{-8} fractional intake, and they calculated 5.5×10^{-8}. They asked if the concentration should be micrograms/m^3.

They stated that this very low dilution offsets a good bit of their objection to the very low release fraction. They believe the quantity released from a CH TRU trailer should be about 5×10^5 mg (500 g), and the air concentration at the maximum individual should be about 28 times the 90-day Clean Air Act Standard, but for a time weighted average would be well below any of the limits shown on page G-15.

7.3.5-8 **Response**

The PUFF model (Petersen, 1982) is used to predict the maximum air concentration at a receptor 50 meters from the release. This model is appropriate for evaluating instantaneous releases of chemicals. The concentration at the receptor is correctly reported in mg/m^3. The exposure period in the chemical risk assessment is conservatively assumed to be 30 minutes. Because the radiological risk assessment is using the RADTRAN and AIRDOS models, a direct comparison of the intakes is not appropriate. The DOE believes that the calculated release fraction for lead and subsequent intakes are conservative and bound any risk associated with the release of chemicals during a transportation accident.

Based on the physical form of the lead in the waste, a release of 500 grams of respirable lead that exceeds the 90-day Clean Air Standard by 28 times is not expected as a result of a bounding case transportation accident. Additional details can be found in Subsection 5.2.2.2.

7.3.5-9 **Comment**

The EEG stated that the quantity of lead released during the bounding case accident scenario is unrealistically low. Assuming that an average amount of lead in the waste is 60.3 kg/drum, they stated that the total release fraction in the draft SEIS is only 0.46 mg of lead per drum or 7.6×10^{-9}. They compared this to the release fraction for plutonium in this waste of 2×10^{-4} and stated that they do not believe plutonium is 26,000 times as mobile as lead. They commented that the very low value resulted from the DOE assumption that no lead could possibly be released from any waste form other than sludges, which have only 10 mg/kg of lead. The EEG rejected this assumption and stated that they believe the appropriate source term should be 507 grams per trailer.

7.3.5-9 **Response**

The DOE has no evidence to indicate that 507 grams (i.e., one pound) of respirable particulates of lead can be released from the waste, even in the most severe accident.

In a risk assessment, it is necessary to consider the physical form of the contaminant when evaluating a potential release. The three forms of uranium used to determine the 2×10^{-4} release fraction for plutonium included uranium dioxide powder, uranium nitrate liquid, and solid residues from air-dried uranium nitrate solutions (Mishima and Schwendiman, 1973). These correspond to the forms of plutonium most frequently involved with flammable waste. The primary sources of lead in the waste include solid bricks and shielding. These forms of lead, which could potentially result in an average quantity of 60 kg per drum, will not act similarly to uranium oxide powders during an accident.

The two sources of lead considered in the release fraction during a transportation accident in both the draft and this SEIS are particulate and vaporized lead. Based on the physical form of lead in the waste, the impact of the accident is assumed to release 2×10^{-4} (i.e., 0.02 percent) of particulate lead from sludges which contain 10 mg/kg of lead (Rockwell, 1988). A drum is assumed to weigh 227 kg; therefore the particulate release fraction from one drum is calculated as follows:

$$10 \text{ mg Pb/kg} \times \frac{227 \text{ kg}}{\text{drum}} \times 2 \times 10^{-4} = 0.46 \text{ mg Pb}$$

The total release is then equal to 0.46 mg Pb multiplied by 14 drums and 3 or 6 TRUPACT-II per shipment. This release fraction is consistent with the radiological assessment because lead in sludges could potentially act as a powder. To estimate another potential source of lead that may be released because of the fire, it is conservatively assumed that lead is vaporized at a temperature of 1,000 ^{O}F for one and a half hours. The assumption is that the waste inside the TRUPACT-II is heated to 1,000 ^{O}F within one-half hour, and solid lead is melted and vaporized during the remainder of the accident. This is a very conservative assumption because results of fire tests on the TRUPACT-II indicate that the maximum temperature of the waste after one-half hour is 250 ^{O}F, which is below the melting point of lead. This calculation results in an additional 1.06 mg of respirable lead released per TRUPACT-II. Additional information on the assumptions used in the chemical risk assessment and the risk associated with releases of lead can be found in Subsection 5.2.2.2.

7.3.5-10 **Comment**

The EEG commented that paragraph 3 on page 5-31 [of the draft SEIS] has fires lasting for 2.0 and 1.5 hours.

7.3.5-10 **Response**

The bounding case accident for transportation in this final SEIS includes a fire with a duration of 2 hours. It is conservatively assumed for purposes of assessing releases of lead from the TRUPACT-II that the temperature inside the TRUPACT-II is maintained at 1,000 ^{o}F for 1.5 hours. In other words, the temperature inside the TRUPACT-II reaches 1,000 ^{o}F in one-half hour and maintains that temperature for 1.5 hours. The fire tests on the TRUPACT-II have shown that the package is very well insulated and the inside payload only reached approximately 250 ^{o}F after one-half hour. The assumption is used to calculate an aerosolized fraction of lead released during the accident.

7.3.5-11 **Comment**

A commenter stated that Subsection 5.2.2 estimates the collective committed effective dose equivalent (CEDE) of the worst case accident as 1,240 person-rem. Appendix D estimates 1,240 millirem.

7.3.5-11 **Response**

The 1,240 millirem given in Appendix D, is a typographical error. The number should be 1,240 person-rem, and has been corrected in this SEIS.

7.3.5.1 RISK ASSESSMENT METHODOLOGY

7.3.5.1-1 **Comment**

Reviewers questioned how organic chemicals would interact with radionuclides in a fire during a transportation accident.

7.3.5.1-1 **Response**

No reasons are known to expect any types of interactions of organic chemicals with radionuclides that might increase or decrease releases of chemicals or radionuclides because of a fire.

Many organic chemicals would be destroyed in a fire and broken down to carbon dioxide, water, or other simpler forms. Some organic compounds would be volatilized during the heat process, and if not destroyed, would be available for inhalation by individuals in the near proximity to an accident. TRUPACT-II certification tests have demonstrated that the TRUPACT-II is very well insulated in that after subjecting the container to a 1475 ^{O}F fire for 30 minutes, the inside payload temperature was only 250 ^{O}F. The bounding case accident assumes a limited oxygen supply inside the TRUPACT-II based on certification testing; therefore, a release of volatile organic compounds contained within the void volume of all 14 drums of the TRUPACT-II is considered conservative. Subsection 5.2.2 has been reanalyzed to include the void volume of the drums in the release fraction.

7.3.5.1-2 **Comment**

A commenter asked if it is appropriate to compare the concentrations of volatile organic compounds to which a member of the public would be exposed in a transportation accident to the occupational exposure limits, Threshold Limit Values (TLVs), which are generally at least 100 times greater than standards for public exposure.

7.3.5.1-2 **Response**

Yes. The DOE believes that although TLVs are established as occupational exposure limits, the comparison of TLV standards to the intake of chemicals per exposure to the public during the hypothetical transportation accident provides a conservative indication of the risk.

TLVs can be used to assess the potential for health effects to the public for short-term exposure periods, such as 30 minutes. Standards for chronic exposure of the public have been developed by the EPA and other governmental agencies. These standards, however, were developed for long-term, chronic exposure and are not appropriate for use in short-term exposure scenarios as would occur during a transportation accident. The TLVs are established to indicate the potential for adverse health effects from an 8-hour occupational exposure over a working lifetime. The use of these levels for evaluating a 30 minute exposure to the public is a conservative methodology (i.e., tends to overestimate impacts).

7.3.5.1-3 **Comment**

Commenters noted that the draft SEIS makes excessive use of averages, moving averages and moving weighted averages that may hide the true impact that unaveraged data may have on the findings.

7.3.5.1-3 **Response**

Although it is true the models used to estimate the radiological and nonradiological risks associated with shipping TRU waste to the WIPP often relied on average values, this does not mask the consequences or understate the risks. Where it was available, this SEIS was modified to include actual State-supplied transportation accident, injury, and fatality data. These data are presented in Table D.4.12 of Appendix D. An examination of these data indicate that accident, injury, and fatality rates used in the risk analysis are conservative. Additionally, Table D.4.15 presents data from industry and the DOE on radioactive materials transport. As shown in this table, the accident, injury, and fatality rates are much lower than the data used in the transportation risk analysis and reflect the excellent safety record compiled by the nuclear industry, again indicating that the use of averaging, where it is the best available information, does not invalidate the risk analysis.

7.3.5.1-4 **Comment**

The States of Idaho and Nevada questioned why key parameters in the transportation risk analysis did not use a range of values rather than a point value. The use of a point value, they say, does not provide a discussion of the range of impacts such as a modal mix, weather conditions, major breaches of the waste package, or the RH cask shipment. The final SEIS should provide a range of assumptions and results.

7.3.5.1-4 **Response**

The purpose of the draft SEIS transportation risk analysis was not specifically to identify and assess the variables of individual options for transporting TRU waste. Rather the risk assessment supports a comparison of alternatives and seeks to conservatively estimate the risks so that potential variations of transportation mode mixes, route distances, safety factors, and other transportation variables would be "bound" within the analysis.

To ensure such a conservative analysis, this final SEIS seeks to bound potential transportation impacts and thus ignores program aspects that would actually reduce the total risk associated with truck transport. For example, vehicle route tracking, tight carrier management, strict driver qualification and training requirements, and other safety factors, such as speed restricting governors on trucks would reduce risk.

Where many uncertainties exist and information is either incomplete or unavailable, the regulations (40 CFR 1502.22) under NEPA require an evaluation of impacts "based upon theoretical approaches or research methods generally accepted in the scientific community." The transportation risk analysis in this SEIS, following the methods established by the NRC, meets this criterion.

7.3.5.1-5 **Comment**

The States of Colorado and California and other commenters pointed out that over the years the DOE has issued reports that give different annual and total number of shipments of TRU waste going to the WIPP for disposal. Commenters also felt that the shipment numbers presented in the draft SEIS do not factor in changes from activities such as waste minimization and supercompaction. The commenters pointed out that the changes in the shipment numbers make emergency planning and inspection activity difficult for responsible State agencies. Also, the State of California asked what impact the Engineering Demonstration System at Lawrence Livermore National Laboratory would have on the number of TRU waste shipments from this facility.

7.3.5.1-5 **Response**

The estimated number of shipments of TRU waste to the WIPP has been revised since the FEIS. The shipment numbers in the 1980 WIPP FEIS were for only the volume of waste stored at the Idaho National Engineering Laboratory and the volume of waste projected to be generated and shipped from the Rocky Flats Plant (see Subsection 3.1.1). The Transuranic Waste Transportation Assessment and Guidance Report (DOE, 1986b) prepared by the Joint Integration Office in 1985 presented shipment numbers based on all ten TRU waste storage and generating facilities and on volumes of waste through 1983 reported in the Integrated Data Base for Spent Fuel and Radioactive Waste Inventories, Projections, and Characteristics (DOE, 1987b). Additionally, beginning with 1983, TRU waste inventories were estimated on the basis of DOE Order 5820.2A (DOE, 1988f) which defined TRU waste as that waste containing 100 nanocuries per gram or more of TRU nuclides. Prior to this time TRU waste was defined as waste containing 10 nanocuries per gram or more of TRU nuclides. Beginning with the waste volumes reported in subsequent annual publications of the Spent Fuel and Radioactive Waste Inventories, Projections, and Characteristics, the facilities revised their stored waste volumes and projected generation volumes. The total number of shipments was then revised to reflect these changes.

The WIPP has a design limit of 6.2 million cubic feet of CH TRU waste and 250,000 cubic feet of RH TRU waste. To provide an upper bound or most conservative transportation risk for this SEIS, the waste volumes and projected waste generation rates were scaled up to the 6.2 million ft^3 and 250,000 ft^3 total to give the maximum volume and, therefore, the maximum estimated number of shipments (see Subsection 3.1). Additionally, it was assumed that all waste would be in drums, thus giving the maximum number of shipments (See Table D.3.2). It is presently anticipated that 50 percent of the waste would be shipped in drums and 50 percent would be shipped in standard waste boxes (SWBs). This shipping mix would produce fewer actual shipments than shown in this SEIS.

In addition, the TRUPACT-I (a rectangular shipping container) was originally expected to be used. The TRUPACT-I could transport a total of 36 drums per truck shipment. The TRUPACT-II, as licensed by the NRC, will transport 42 drums per truck shipment, thus reducing the number of shipments even more.

All shipment numbers previously published were correct based on data and assumptions used at that point in time. As previously stated, it is expected that the shipment numbers presented in this SEIS accurately estimate the maximum number of TRU waste shipments to the WIPP.

Other treatments such as supercompaction would also reduce the total number of shipments to the WIPP. In this case, while a more dense waste form would be shipped, this SEIS analysis is still bounding for normal and accident conditions. For example, the bounding case accidents in this SEIS are based on maximum amounts of radioactivity which can be carried by the TRUPACT; supercompacted waste would remain within these limits. For accidents in general, the increase in exposure per shipment (due to more waste per shipment) would be offset by a reduction in the total number of shipments so that the overall population exposure for the entire campaign would be equal. The same analysis applies to incident-free exposures (exposure to people living along the route, people at stops, inspectors and other occupational categories of people who see multiple waste shipments); any increase in per shipment exposure would be offset by a corresponding decrease in the number of shipments. Intuitively, with either supercompacted or unsupercompacted waste, the total mass of radionuclides being transported remains the same, so that the campaign population exposure resulting from transportation of these radionuclides remains the same. For example, let us assume that 70 drums of unsupercompacted waste are to be shipped from Rocky Flats Plant and that this corresponds to 5 TRUPACT loads with a TRUPACT Transport Index of 1.5 as given in Table D.3.5. The contribution of any drum in a TRUPACT to the Transport Index is 1.5/14 = 0.107 millirem per hour per drum. Therefore, the campaign exposure rate for moving these 70 drums is 0.107 x 70 = 7 millirem per hour. If the waste in these drums were supercompacted with a 5:1 compaction ratio, each drum would contribute 0.107 x 5 = 0.5 millirem per hour per drum. The 70 drums would then fit into 1 TRUPACT (70/5 = 14). The campaign exposure rate for this 1 TRUPACT would be 0.5 millirem per hour per drum x 14 drums, or 7 millirem per hour, the same as for unsupercompacted drums.

A scenario involving an individual exposed to a single shipment would be the only situation in which supercompacted waste could result in a higher radiation dose to a member of the public than unsupercompacted waste. An example would be when a person is stopped in traffic beside a shipment. The Transport Index for a shipment of supercompacted waste and the resulting dose to an exposed individual could change as a result of supercompaction of the waste.

A value for the upper bound of the radiation dose to a person stopped in traffic for 30 minutes beside a TRUPACT carrying Rocky Flats Plant waste that had not been supercompacted was calculated to be 0.75 mrem (see Table D.3.14). If the shipment contained supercompacted waste (with a 5:1 compaction ratio) and if the Transport Index increased in proportion to the compaction ratio, then the calculated upper bound for the radiation dose to an individual stopped next to this shipment would be 5 x 0.75 or about 3.8 mrem. However, because of the conservative assumptions in generating the 0.75 mrem estimate given in Table D.3.14, and additional conservatism relating specifically to supercompaction, the actual radiation dose would be much less than 3.8 mrem.

The conservative assumptions included: using a distance of 1 meter instead of the more likely 2 to 4 meters between the TRUPACT-II and the hypothetical maximally exposed individual; using a photon energy of 1 MeV instead of the actual 0.06 to 0.1 MeV to estimate the shielding effect of the TRUPACT-II; using the maximum surface dose rate on a drum to determine the Transport Index (if this were due to a localized area of contamination, supercompacting the drum would not increase the Transport Index); and ignoring the increase in self-shielding within the waste due to the increase of the density in the waste by supercompaction.

As schedules for shipments of waste are finalized, States will be notified. The DOE has offered to conduct emergency response training prior to waste shipments from one to four months before shipment of waste. Updates on the number of shipments and radionuclide inventory, etc., would be provided prior to shipment.

If the Engineering Demonstration System is operated as proposed at Lawrence Livermore National Laboratory, the numbers of shipments would increase. However, the shipments are currently overestimated because of the use of 6.2 million ft^3 of CH waste in the analysis and, therefore, environmental impacts are bounded by the analyses in this SEIS.

7.3.5.1-6 **Comment**

The State of Nevada and other commenters expressed concern about additional transportation risks if, after the proposed 5-year Test Phase, the WIPP should fail to meet the EPA's long-term isolation requirements (40 CFR 191, Subpart B) and, subsequently, the TRU waste would have to be retrieved and shipped elsewhere for storage or disposal. They believe the risks associated with retrieval, including shipping, should be addressed in the final SEIS. Additionally, they believe the facilities that would receive the retrieved waste should be identified.

7.3.5.1-6 **Response**

The risks of retrieval, including shipment off-site are addressed in the final SEIS in Sections 3 and 5. If the WIPP should ultimately fail to demonstrate compliance with the applicable regulations for the disposal of TRU waste, and the waste emplaced during the proposed 5-year Test Phase should have to be retrieved, the risks associated with transporting waste from the WIPP to a storage facility would be roughly equivalent to the risks of transporting waste to the WIPP. A factor which should reduce the risks below those for shipments to the WIPP during the proposed Test Phase is that the operational experience, including improvements and modifications to the shipping program, would be available to any subsequent shipping campaign. Prior to retrieval, an appropriate NEPA document would be prepared to analyze the impacts of retrieval and shipment to alternative storage facilities to be identified at that time. For purposes of analysis in this SEIS and to bound the impacts, the retrieved waste is assumed to be transported back to the facilities from which it was received.

Additional details on retrieval plans can be found in Subsection 2.5. Also see response to comment 5.4-4.

7.3.5.1-7 **Comment**

The State of Nevada and the Western Interstate Energy Board questioned the assumptions made in the draft SEIS transportation risk assessment regarding rail accident severities and train speeds in various population areas (e.g., are train speeds lower in urban areas?).

7.3.5.1-7 **Response**

The assumptions used in the risk assessment are based on statistics presented in the NRC's report (NRC, 1977).

The transportation accident rates for rail are a function of travel time, traffic density, track condition and fraction of travel in a population zone. As shown in Table D.4.2, the most travel in an urban zone is 1.9 percent of 1,677 miles for a Mound Laboratory shipment or approximately 32 miles. Train speeds are slower in urban zones because of switching operations, train make-up, greater traffic, and interline switching, which is reflected in a lower severity case accident. At the other extreme, a shipment from Hanford Reservation travels approximately 2,016 miles in the rural population zone where speeds are greater and travel time is longer, but traffic density is much less.

Data accumulated over many years indicate that in a probabilistic risk assessment, one could expect to see approximately the same number of accidents with the same severity as shown in this SEIS.

7.3.5.1-8 Comment

A number of commenters questioned whether use of accident probabilities in the draft SEIS transportation risk assessment simplified the analysis too much and clouded the fact that, in their view, an accident is inevitable, sooner or later, and that the focus of the analysis should be on response to the accident.

7.3.5.1-8 **Response**

The transportation risk analysis in both the draft and this SEIS used both a probabilistic and a deterministic approach to assess risks. The probabilistic approach relied, in part, on statistics regarding accident probabilities and consequences. These statistics were used to estimate the overall risk of the shipping campaign for the various alternatives. The deterministic (bounding case) approach was used to estimate the effects of severe accidents that were assumed to occur with a probability of 100 percent.

Because each shipment is essentially an independent event, the probability of an accident occurring during any one shipment remains the same and is independent of the number of previous shipments made. While it is to be expected that during the next 20 to 25 years, traffic patterns may change, increasing in some areas and decreasing in others, it does not follow that the potential for accidents increases as a direct result. Other factors such as road deterioration are even more difficult to predict since, at least where the Interstate highway system is concerned, maintenance and improvement are expected to continue.

In fact, many positive factors should actually decrease the opportunity for accidents during the shipping campaign. For example, during the same time frame, better transportation equipment would evolve (improved tractors). More experience would be gained working with equipment, tracking systems, routes, and other transportation elements. The carriers and traffic managers would work out problems and develop time-tested procedures to maximize safe and efficient transportation systems. Alternative routes would be coordinated with appropriate State authorities. All these dynamic elements would combine to improve the safety of the shipping campaign as it progresses.

The DOE acknowledges that when shipments of any kind are made on our highways, the potential for an accident exists; therefore, upper bounding case accidents are provided in this SEIS and an extensive system, described in this SEIS, has been developed to minimize the chances for accidents and the consequences of accidents if they do occur (see Appendix M). In addition, even though the DOE is confident in its plan for transporting TRU waste, it has developed a detailed emergency response program. The details of this program are presented in Appendix C.

7.3.5.1-9 **Comment**

The States of Colorado and Nevada wanted clarification on how the term "accident" was used in the draft SEIS transportation risk assessment.

7.3.5.1-9 **Response**

For the radiological transportation risk analysis, specific accidents are not defined, per se. The analysis assumes that, in shipping TRU waste, accidents of varying severity would occur with different likelihoods. Accidents are projected based on total distance traveled using a rate of 1.1×10^{-6} accident per kilometer. The severities of the resulting accidents are projected using the fractions specified in Table D.3.15. The least likely events are those that release the most material to the environment and have more significant consequences. The probabilities of these events and the resultant consequences define the non-normal radiological risk of the shipping campaign. In addition, this SEIS analyzes bounding case accidents which are very severe and addresses the consequences of these scenarios explicitly.

For nonradiological risk analysis, the issue of importance was the estimated number of injuries or fatalities resulting from the shipping campaign. These estimates were based on national statistics for truck and rail shipments and were stated on a per mileage traveled basis.

7.3.5.1-10 **Comment**

The State of Nevada and others questioned the estimation of transportation stop times assumed in the incident-free radiological risk analysis citing experience in Nevada and eastern Oregon where either weather conditions or accidents resulted in closure of roads.

7.3.5.1-10 **Response**

For the incident-free transportation radiological risk analysis, stop times for both truck and rail transport were input to the RADTRAN model. These times are used by the model to estimate the radiological exposure of people near the stopped vehicle; times are input as a number of hours stopped per kilometer of distance traveled. For truck transport, the stop time parameter assumed was .011 hours stopped per kilometer of travel and was based on actual stop times experienced by typical radioactive material shipments (Wilmot et al., 1983). For rail transport, the corresponding parameter was .0036 hours stopped per kilometer of travel. These values are extremely conservative in that, especially for truck travel, they assume quite long stop times for an average TRU waste shipment from any facility to the WIPP. For example, truck shipments from Los Alamos National Laboratory are estimated to take 15.9 hours; the analysis assumed a stop time of 6.1 hours for these trips. Similarly, trips from the Hanford Reservation may take 88.5 hours with stop times of 53.8 hours assumed for the risk analysis. As a percentage of travel time, these stop times are quite long and add conservatism to the analysis.

For rail shipments, the stop time value of .0036 was used with rail distances to determine per shipment stop times in a similar manner; these times varied from 6 to 13 hours reflecting a lesser likelihood for rail shipment delays caused by unforeseen events.

For actual waste shipments by either truck or rail, it is expected that stop times would be much less than those estimated for the purposes of the incident-free risk analysis and that corresponding exposures to people near stopped vehicles for any shipment would also be much less.

7.3.5.1-11 **Comment**

The State of Idaho and other commenters questioned the overall approach to the draft SEIS transportation risk assessment, expressing particular concern about the use of averages in the analysis, failure to consider unplanned events and their impacts, failure to analyze all reasonable accidents, including those with spills, and a lack of comprehensiveness in the analysis. The EEG stated that routine transportation doses were "appropriate and conservative."

7.3.5.1-11 **Response**

As presented in Appendix D, the transportation risk assessment was based on previously approved and validated approaches, especially those used by the NRC in their basic analysis of the risks of transporting radioactive materials (NRC, 1977). Thus, both the draft SEIS and this final SEIS include an assessment of the transportation risks resulting from incident-free operations (i.e., no accident occurs) as well as from accident conditions which were calculated probabilistically to occur over the life of the WIPP shipping campaign (i.e., accidents of varying severity were assumed to occur as a function of the distances traveled). The risks from radiological exposures were calculated for both of these conditions; in addition, nonradiological risks from both normal (risks from vehicle pollution) and accident (injuries and fatalities) conditions were evaluated.

For all of these analyses, conservative data were used to estimate accident probabilities, material release fractions, exposed populations, material dispersal and uptake pathways, and consequent doses and health effects. Much of these data were upper range estimates of the parameters involved. However, because the purpose of the transportation risk assessment is to compare the risks of the SEIS alternatives, use of the same average values in the assessment of all of the alternatives is consistent and allows a reasonable comparison to be made.

In addition to the probabilistic approach discussed above, the draft SEIS evaluated specific accident events to determine the consequences of very severe accidents which were assumed to occur in heavily populated areas with maximum loads of radioactive waste. This final SEIS evaluates several bounding case accident scenarios whereas the draft SEIS considered only one scenario.

Also see response to comment 7.3.5.1-3.

7.3.5.1-12 **Comment**

A number of commenters expressed a generalized fear of potential health and environmental effects from transporting TRU waste across the nation to the WIPP. An example of this concern was the stated belief that the components of even a single shipment of TRU waste have the capacity to contaminate people, property, and virtually all surrounding life forever. Some commenters saw the potential for an irreversible Chernobyl-type accident on the nation's highways every day of the projected 25-year shipping campaign. For many commenters, the fact alone that TRU waste will be transported constituted a threat. They could see no reasonable or safe way to ship these waste materials.

7.3.5.1-12 **Response**

No event that could occur associated with the WIPP could approximate the impact posed by the Chernobyl accident, because of the differences in the types and amounts of radioactive materials involved.

Although the managers and personnel working in the TRU waste program understand the concerns and the fears of many citizens about TRU waste, these shipments must be put into perspective with other concerns and factual information:

- Type B shipping containers, packagings which are doubly contained to provide shielding and prevent releases of radioactive materials and certified by the NRC after passing a series of rigorous tests, would be used to ship this waste either by truck or rail. Type B containers have a long history of safely shipping nuclear materials without release of any nuclear material. The TRUPACT-II has been certified by the NRC as a Type B container. (See Appendix L for additional information.)

- The risks of transporting TRU waste in Type B containers are significantly less than the risks of transporting many hazardous materials. The programs for managing waste preparation, carrier monitoring, vehicle satellite tracking, and emergency response training and preparedness would all provide significant safety factors to ensure that even if an accident were to occur with a release of TRU waste, the impacts would not be devastating and uncontrolled.

- A "preoperational checkout" program would be scheduled by the DOE to provide a minimum of two dry-run shipments from each generating or storage facility to the WIPP. During these dry-run shipments, the DOE and State participants would gain actual experience with the equipment, the drivers, the tracking equipment, and other safety measures. More dry runs would be scheduled if necessary.

The DOE acknowledges that many citizens have concerns about the shipping of TRU waste. However, the DOE is taking precautions to protect citizens against the hazards of transporting these materials. Throughout the proposed Test Phase (approximately the first 5 years), the DOE would assess how well the transportation system is operating. Any additional safety precautions and activities that emerge from this experience would be evaluated and included if they improve the overall safety of the program. Public information programs and emergency response training would continue to occur along the shipping routes.

7.3.5.1-13 **Comment**

A few commenters questioned why the draft SEIS did not address the psychological effects on people living near the transportation routes, contending that increased stress and anxiety from knowing that a transportation accident might occur with unknown consequences constituted an environmental impact that must be considered under NEPA.

7.3.5.1-13 **Response**

The U.S. Supreme Court has determined that the evaluation of psychological effects from the fear of risks, such as a transportation accident, is not required by NEPA. The scope and effects of stress induced by fear of the proposed shipments of TRU waste along routes already carrying hazardous materials therefore are not analyzed in this SEIS.

7.3.5.1-14 **Comment**

Several commenters questioned the manner in which the RADTRAN II computer code was used for the transportation-probabilistic-radiological-risk-assessment of the proposed waste shipments to the WIPP. Some were concerned because RADTRAN II uses averaging, fraction multiplication, generic data, and other modeling techniques, and thus, the risks derived may not be conservative. Others suggested that a comparison of RADTRAN II with the most recent version of RADTRAN be prepared or that all probabilistic-transportation-radiological-risk-assessments be calculated, using a more recent version of RADTRAN than RADTRAN II. Some commenters questioned the routes and corresponding mileages used in the risk analysis. Others claimed that the RADTRAN II model failed to consider the possibility of an accident causing a release of radioactive material to the environment. Finally, some commenters suggested that the lifetime probabilistic radiological risk results, based on per shipment radiological risk output from the RADTRAN II code, failed to consider the additional risk of the generation of intersite shipments that they claim could occur for the Alternative Action.

7.3.5.1-14 **Response**

The RADTRAN transportation risk assessment code was originally developed and has been updated by the staff at the Transportation Technology Center of Sandia National Laboratories. RADTRAN uses the aggregated characteristics of a transportation system (average trailer loads of waste), and a modeled environment of aggregated human population (three population density zones) and ecological system characteristics (see Appendix D, Subsection D.3.1). Because the RADTRAN model is designed to primarily use generalized, aggregated input parameters (see Table D.3.7), it is also designed to calculate very conservative estimates of risk with some of the built-in default values such as the accident rate defined in the model. Therefore, the use of such averaged input data as population density, shipment travel speed, and trailer-load curies of waste will still produce very conservative estimates of risk. The DOE is confident that the actual radiological doses to the environment would be much lower than the lifetime exposure projections listed on Tables 5.4.0, 5.4.1, D.4.6 through D.4.11.

The RADTRAN code calculates two types of risks. One involves routine very low doses of radiation to workers and the public at levels allowed by transportation regulations, and it is termed an incident-free risk, because it is assumed to occur under non-accident conditions. The second type of risk that the RADTRAN code calculates is an accident-related risk that is based not on specific accidents but on the likelihood and consequence of accidents of various severities, with more severe accidents having a higher release fraction of radioactive material, but a lower probability of occurrence, (see Subsection 5.2.2.1 and Tables 5.9 through 5.14). Therefore, RADTRAN does consider the possibility of a radioactive material release.

In response to comments regarding the averaged distances of alternate routes used as the input for the RADTRAN model, it should be emphasized that these averaged alternate route distances (rather than the usually shortest preferred route shipment distance values) added yet another degree of conservatism to the radiological risk results. As is stated in Subsection D.3.2.1, the HIGHWAY model was used to select the alternate routes to the WIPP and calculate their distances for the truck mode alternative, and the INTERLINE model was used to do the same for the rail mode alternative. As is stated in the Appendix D References, the HIGHWAY model is documented in Joy et al., (1982) and Peterson (1984). The purpose of using an average of alternative routes was to bound the potential, but unlikely, chance of additional future radiological risk due to changes in a preferred route caused by bad weather, facility construction, or route policy changes. It was decided that it would add confusion to the SEIS to graphically display the computer-selected alternate shipment highway and rail routes which were used as the basis for the average shipment distances used by RADTRAN.

In response to the commenters who asked why the most recent version of RADTRAN was not used for the probabilistic risk assessment and what the differences are between RADTRAN II and the most recent RADTRAN version, the latest version of a particular computer code is not necessarily always the best one to use. In the case of the various RADTRAN codes, RADTRAN II (Taylor and Daniel, 1982) is the most recent version that has been well documented. The most recent RADTRAN code available for use, RADTRAN 3.1, has been a continually changing code over the past few years without published documentation regarding internal sub-models, default values, and so forth.

As is stated in Subsection D.3.1, the radiological risk results of this SEIS are updated versions which originally appeared in the 1986 DOE report, Transuranic Waste Transportation Assessment and Guidance Report, (TAGR) (DOE, 1986b) which used RADTRAN II. If RADTRAN 3.1, would have been utilized, comparability with the earlier TAGR results would have been lost, which is an important verification check on the reasonableness of methods of determining revised input parameters for the model, due to new knowledge of the TRU waste contents and proposed shipment system characteristics.

By February 1986, RADTRAN 3.1 developers at Sandia National Laboratories-Albuquerque published a preliminary set of the major revisions to RADTRAN II, (Madsen et al., 1986). Of these revisions, the one that had the potential to significantly change risk values calculated by RADTRAN II, was the addition of a new sub-model in the accident-related risk dose pathways model to calculate internal dose exposure from ingestion of radiation contaminated food.

In order to determine if this would cause a major change in TRU waste shipment accident-related probabilistic risk, RADTRAN 3.1 results for a Rocky Flats Plant CH TRU waste truck shipment to the WIPP were evaluated. Identical results for the accident-related risk as were calculated by RADTRAN II were obtained. The dose value calculated for food ingestion for a single shipment was 1×10^{-12} person-rem, too small to make a significant difference in the overall accident-related component of probabilistic risk of even a single shipment.

In response to the comment that there was no RADTRAN II code estimate of per shipment radiological risk of intersite shipments that would occur in the Alternative Action, Subsection D.3.2.2 of this SEIS shows that the predominant incident-free component of the radiological risk of the Alternative Action intersite truck shipments of CH TRU waste were calculated. Since the resultant lifetime cumulative incident-free radiological risk that was estimated is so low (0.035 person-rems occupational incident-free and 0.02 person-rems nonoccupational incident-free), it was not included with the WIPP-bound shipments in the cumulative radiological risk tables for the Alternative Action.

7.3.5.1-15 **Comment**

Some commenters raised questions about whether the DOE was complying with the NEPA in not preparing a "worst-case analysis" of the planned transportation activities.

Others asked if another version of the draft SEIS would need to be produced once the TRUPACT-II and the NuPac 72B were certified. One commenter asked why a comparison of risks with the original FEIS for the WIPP was not made. Another suggested that the DOE is illegally segmenting the health and safety from other issues associated with transporting TRU waste.

7.3.5.1-15 **Response**

The requirements for "worst-case analysis" under NEPA were revised by the CEQ in 1986; these analyses are no longer required in environmental impact statements. This revision was upheld in May of 1989 in two companion United States Supreme Court cases. This SEIS, however, includes "bounding case" risk analyses where the effects of very severe accidents were analyzed in compliance with Section 1502.22 of the CEQ regulations.

The approach of the transportation risk analysis has been to conservatively evaluate the risk associated with transporting TRU waste. Where information has not been available, conservative, although reasonable, estimates have been used.

For example, the integrity of Type B certified containers has been demonstrated in actual tests with staged accidents involving railroad locomotives. However, since there is little actual experience to draw from (there has never been an accident of a Type B container with a significant release of radioactive materials), this SEIS risk analysis relies on judgments of what would be expected to occur during and after hypothetical accidents. In nearly every case, these judgments have been conservative in an effort to "bound" what could be expected.

The risk analysis in this SEIS includes substantially more shipments from more facilities than were considered in the FEIS. In addition, the facilities have better information now on the characterization of their waste. More is known about the concerns of gas generation and mixed waste. The TRUPACT-II is now certified as a Type B container with double containment capacity. All these factors plus others make a direct comparison of radiological risks between this SEIS and the FEIS inappropriate. The transportation risk analysis was prepared to compare the risks of the various alternatives considered in this SEIS. Rather than segmenting the health effects to minimize the impacts, the risk analysis presents cumulative risks in terms of exposures and health effects from normal and accident conditions during transportation for radiological, chemical, and nonradiological/nonchemical hazards.

As noted elsewhere in this final SEIS, the DOE will prepare a new SEIS at the conclusion of the Test Phase and prior to a decision to proceed to the Disposal Phase. It is anticipated that information regarding the status of the NuPac 72B will be considered in the new SEIS.

7.3.5.1-16 **Comment**

Several commenters asked why the risk assessment methodology does not include a comparative discussion of other transportation hazards to the public, such as chemical, liquid petroleum, or gasoline shipments, in that these materials seem to present a greater hazard than shipments of radioactive materials.

7.3.5.1-16 **Response**

Accident-related frequency statistics have been collected in recent years in the U.S. related to accidents, injuries, and fatalities involving truck and rail shipments of hazardous chemical, liquified gas, and gasoline shipments. These statistics appear to show these shipments to be a greater environmental hazard than the proposed TRU waste shipments to the WIPP (See response to comment 7.3.6-002). Lack of specific statistics showing comprehensive accident rate, injury rate, and fatality rate per vehicle-mile or per train-mile of travel for these classes of hazardous material shipments prevent a quantitative one-to-one comparative risk assessment between these hazards and an expected TRU waste material shipment.

7.3.5.1-17 **Comment**

Several commenters questioned why the draft SEIS transportation risk analysis did not project population densities along routes for the 25-year duration of the WIPP shipping campaign, instead of using only the three densities specified in RADTRAN (urban 3861/km^2, suburban 719/km^2, rural 6/km^2). One asked why the urban density assumed in the draft SEIS analysis was different from that used in NRC's 1977 study (NRC, 1977) (15,444/km^2 or 40,000/mi^2), particularly given that waste shipments to the WIPP from Lawrence Livermore National Laboratory will pass through Los Angeles, California.

7.3.5.1-17 **Response**

There is serious difficulty and limited utility in assembling an agreed-upon set of forecasted population densities for say, the year 2010, from every metropolitan regional planning agency and State planning agency along all of the WIPP shipment corridors in all of the corridor States. In many instances, these forecasts are controversial and include more than one alternative forecast value. Even if more specific population growth estimates were available, there would be very small changes in the probabilistic transportation risk assessment results. For example, analysis of the truck shipments using RADTRAN shows that a 1 percent change in the fraction of travel in a given population density zone changes the risk of a radiological dose to the environment by a very small amount.

The urban people per square kilometer (3,861), suburban people per square kilometer (719), and rural people per square kilometer (6) population densities used represent average national U.S. demographic values from the 1970 census, and were originally developed in the 1977 study (NRC, 1977). This SEIS follows that study in its use of population densities for incident-free and probabilistic accident transportation risk assessment. Only in the bounding case transportation analysis (Appendix D.3.4) did the population density vary with the 1977 NRC study.

For the bounding case accident, the NRC use of 15,444 people per square kilometer or 40,000 people per square mile was judged too conservative for a residential population density. This is because that density only applies now and for the foreseeable future to certain neighborhoods of New York City and other urban neighborhoods in the country where no WIPP shipments are planned.

The preferred route of Lawrence Livermore National Laboratory shipments to the WIPP is proposed to pass through the greater Los Angeles urban area on I-5 (from the Kern County Line to I-210, Sylmar), I-210 (from I-5, Sylmar to I-10, Pomona), I-10 (from I-210, Pomona to I-15, Ontario), and I-15 (from I-10, Ontario to the urban area north limit). According to existing year and long range (Year 2010) forecasts by the Southern California Association of Governments, the only community within two miles of the route with a forecasted population density of greater than 3,861/km^2 or 10,000/mi^2 is a three-mile long segment through central Pasadena. All other segments are forecasted to have less dense populations, and some significantly less. For the bounding case accident analysis, it is possible to define an accident occurring in the near or long range future with an Lawrence Livermore National Laboratory origin shipment on I-215 in Pasadena, producing an elliptical plume of radioactive aerosolized, respirable particles that would stretch to the greater than 3,861 people per square kilometer or 10,000 people per square mile population density neighborhood of central Los Angeles. However, since the maximum curie limit for a trailer-load truck shipment of Lawrence Livermore National Laboratory waste allowable by the Waste Acceptance Criteria and for the Payload Compliance Plan is only 406 PE curies compared to 1,080 PE curies for Los Alamos National Laboratory, 1,100 PE curies for Savannah River Site, and 1,200 PE curies for Idaho National Engineering Laboratory, a Lawrence Livermore National Laboratory shipment would not represent the systemwide bounding case accident scenario (See revised tables D.3.29 through D.3.34.).

7.3.5.1-18 **Comment**

A few commenters questioned whether the TRUPACT containers would be contaminated on their exterior surfaces and if this would add to exposure risks.

7.3.5.1-18 **Response**

The exterior surfaces of the TRUPACT-II must be surveyed and smear-tested prior to leaving the generator/storage facility, to determine the presence of any radioactive contamination. In the event that surface contamination in excess of either DOT or the WIPP-WAC limits is observed, the surfaces will be decontaminated.

7.3.5.1-19 **Comment**

The States of Idaho, Nevada and Washington and other commenters questioned the purpose of the risk assessment presented in the draft SEIS. The commenters expressed the view that the analysis should be used to optimize the transportation system (routes, modes, packages, etc.), rather than simply justify transportation modes and routes already selected.

7.3.5.1-19 **Response**

The purpose of the transportation risk analysis presented in both the draft SEIS and this final SEIS is to evaluate the transportation risk impacts of various alternatives. The probabilistic risk assessment for transportation presented in this SEIS was prepared because the risks of transportation are an important factor to consider when comparing the Proposed Action to the alternatives. The assessment was conducted by considering probabilities and consequences of a range of transportation events, and the total potential risk is the resulting sum of these individual risks. In addition, transportation scenarios were developed and analyzed which reflect very severe accidents; these were presented to bound the probabilistic risk analysis and to illustrate clearly what the effects of such unlikely, severe accidents would be. Means to mitigate these risks are addressed in Section 6.0 of the final SEIS.

7.3.5.1-20 **Comment**

A specific comment stated (in relation to the following subsections of the draft SEIS):

Page D-57, Severity Categories. The claim that 99.5 percent of truck and 99.6 percent of rail accidents are less severe than regulatory criteria is not consistent with other statements and the calculations presented in this subsection. For example, the statement is made on Page D-68 that Severity Category II slightly exceeds the regulatory limits and Tables D.3.15 and D.3.16 (which are used in the calculations) show that 9 percent of truck and 20 percent of rail accidents are Category III or higher.

Page D-73, Table D.3.19. The EEG believes the Total Respirable Release Fraction (TRRF) values given for the various Severity Categories are conservative. In fact, they are more conservative than the values used in EEG-33 for a doubly contained, non-vented TRUPACT, except for the Category VIII accident.

Page D-79, Resuspension. We do not agree with the assumption that governmental authorities will impound foodstuffs and clean up contaminated land to the level necessary to result in zero dose from ingestion. The RADTRAN III model can calculate ingestion doses, and it should be used here.

7.3.5.1-20 **Response**

In response to the comment on accident severity categories, the text has been rewritten to clarify different estimates of risk of accidents exceeding regulatory criteria. See Subsections D.3.3.1.1 and D.3.3.1.2 of this final SEIS.

In response to the comment on the Total Respirable Release Fraction, the values given in Table D.3.19 for the Total Respirable Release Fraction (TRRF) are, as stated in the comment, more conservative than the values given in EEG-33 (1986). A more conservative value was chosen to present results giving an upper bound to the analysis. The probability of an accident occurring that would exceed the regulatory limit Severity Category II is very low - .005 percent. The probability of a Severity Category VIII accident is three orders of magnitude less - .000005 percent.

In response to the comment suggesting that ingestion doses be calculated for the probabilistic risk assessment, it is noted that a comparative analysis was performed to check for the significance of an ingestion component of the total probabilistic risk. Results for a Rocky Flats Plant CH TRU waste truck shipment to the WIPP using RADTRAN 3.1 with the ingestion model were compared with RADTRAN II, which does not calculate ingestion. Total doses calculated for the accident-related risk component were identical; the dose calculated for ingestion for this case was 1×10^{-12} person-rem, too small to make a significant difference in either the per-shipment or cumulative accident-related component of probabilistic risk.

7.3.5.1-21 **Comment**

A specific comment stated:

The draft SEIS states that the routes discussed are only "general proposed routes," (page D-13), and assumes a wide range of shipping distances (page 3-22). Given these concessions, how can the DOE assume that the specific routes shown on page 3-20 will be used? In fact, the routes described on pages D-34 to D-36 are frequently different from those shown on the maps. For example, the description always assumes waste coming on I-40 will use US 54 in New Mexico, whereas the map never shows that highway being used. Which is correct? The draft SEIS page D-36 states that no waste will come from Lawrence Livermore National Laboratory during the 5-year Test Phase, but the draft Test Phase Plan, page 3-5 asserts that such waste will arrive at WIPP during those first five years? The commenter asked which is right? Did the draft SEIS calculate Lawrence Livermore National Laboratory waste coming during the first 5 years for the purposes of analyzing transportation risks during the Test Phase? The traffic segment analyses for Savannah River Site, Argonne National Laboratory and Oak Ridge National Laboratory contain no data for Texas, alleging instead that it is "to be determined" (draft SEIS, pages D-104, D-105 and D-113). A revised and re-released draft SEIS must analyze Texas-specific data.

7.3.5.1-21 **Response**

The routes provided in the draft SEIS are the "preferred" currently planned routes (i.e., interstates, direct accesses to interstates, or State-designated routes) to be used for the WIPP shipping campaign. The text description inaccurately described these routes as "general" and has been revised in this final SEIS. There was a cartographic error on Figure D.2.4 that may have misled readers; "bolding" on U.S. 285, U.S. 54, and U.S. 62 was inadvertently left off of this figure and has been corrected in this SEIS. There has been no change between the routes stated in the text and those provided on the figures.

The SEIS presents risk assessment data for shipments from Lawrence Livermore National Laboratory for the WIPP Test Phase to provide the reader with an upper bound risk analysis for the Test Phase (i.e., shipments from all facilities to the WIPP during the Test Phase are assumed). It is now likely that the initial waste for the Test Phase would come from Rocky Flats Plant and Idaho National Engineering Laboratory.

This final SEIS includes traffic segment analysis for Texas. The interested reader will find the data in Table D.4.12. The requested reissuance of the draft SEIS is responded to in comment 2.3.3-1.

7.3.5.1-22 **Comment**

A specific comment stated: "What, please explain, are incident free conditions? The DOE has documented 173 vehicular accidents in the past 12 years of shipping waste. Thirty-four occurred in New Mexico, more than in any other State. It is not hard to imagine an accident if you've traveled the winter highways of New Mexico".

7.3.5.1-22 **Response**

Incident-free conditions are defined as shipments where no accidents occur. The analysis in this SEIS recognized that accidents are bound to occur in performing its overall transportation risk assessment, and assigned a probability of accidents at a very conservative rate per shipment mile of travel. See new Tables D.4.13 and D.4.14, which show that for segments of most preferred routes, including those in New Mexico, the actual recent year accident rate, injury rate, and fatality rate for regular truck shipments have been lower than the rates used by the NRC and Sandia National Laboratories to project extremely low radiological and nonradiological impacts from proposed truck shipments. In fact, TRU shipments will be controlled much more closely than average freight truck shipments to maximize safety.

7.3.5.1-23 **Comment**

A specific comment stated: The number of persons represented by a collective CEDE of 1,240 person-rem and an average CEDE of 0.0774 rem is approximately 16,000 persons. The text indicates that the affected area is assumed to be an area of 1,000 km2 in an urban area (population density of 3,861 persons per km2). It appears that the affected population should be 3.861×10^6 persons.

7.3.5.1-23 **Response**

The reference on page 5-19, Subsection 5.2.2.1 of the draft SEIS referring to an affected area of 1,000 km^2 as the RADTRAN modeled size of the populated area, where radiological release accidents are analyzed, is incorrect and misleading. The text has been corrected to state that the maximum size area that the RADTRAN code was set to analyze for the probabilistic accident radiological risk is approximately 1,400 square kilometers or 540 square miles, but that a considerably smaller area is often modeled as the maximum extended area of the radioactive air plume release from a bounding case accident scenario.

For calculating the radiological consequences of the "bounding case" accident scenarios (in Appendix D, Subsection D.3.4 of this SEIS), the RADTRAN III model calculated depletion of the airborne plume from deposition process prior to transport to the outer dispersion areas. This resulted in a lower affected population of 16,022 in an area of only 1.62 square miles having a higher average individual committed effective dose equivalent (CEDE) than would have resulted if the contamination plume had spread further out. For the same source term release, both the small 1.62 square mile area dispersion case and the maximum 540 square mile area dispersion case would have comparable collective population dose commitments.

7.3.5.1-24 **Comment**

The State of California expressed the need for accurate projections of the quantities and types of shipments to be made in order to appropriately prepare for these shipments. In February 1988, California representatives met with DOE representatives to discuss future WIPP shipments and were told these shipments averaged 12 alpha curies. More recent information from the DOE stated these shipments typically contain approximately 190 alpha curies (over twice the projected maximum shipment). Table D.3.3 of the draft SEIS shows average shipments from Livermore to be approximately 223 alpha curies per shipment. In contrast, the projected total annual average alpha radioactivity for Lawrence Livermore National Laboratory in 1988 was projected to be 350 alpha curies. The discrepancy between a single average shipment of 223 alpha curies, as shown in the draft SEIS, and the entire annual production for the facility, as estimated in 1988, should be explained. What assurances are there that similar increases in the radioactivity and number of TRU waste shipments in California will not continue to occur over the 25-year shipping campaign for the WIPP?

7.3.5.1-24 **Response**

Due to misapplication in the draft SEIS of the source data from the DOE reports, (DOE, 1988b; 1989g), there have been some revisions to Table D.3.3 in this final SEIS. The average trailer-load of CH TRU waste from Lawrence Livermore National Laboratory is now determined to be only 96.2 curies, or 19.3 plutonium-equivalent curies, using the weighting factors in Table F.12.

As is recognized elsewhere in the written comments by the California Energy Commission on the draft SEIS, the estimates of the number of future shipments of TRU waste and the radionuclide source term content of those shipments from each of the storage/generator facilities are subject to change over the 25-year shipping campaign for the WIPP. Therefore, there can be no assurances that values of average trailer-load radionuclide source term curies will not continue to fluctuate. Because of the possibilities of such fluctuations, this final SEIS has been conservative in its transportation risk assessment. For example, there is deliberate over-estimation of the average shipment distance length by using the longer average of alternative routes rather than the usually shorter preferred route distances. Conservatism is also added in the scale-up of the total volume and number of shipments from each facility in order to represent a total volume equal to the design capacity of the WIPP. Finally, conservatism influences the RADTRAN computer code input values shown in Table D.3.7 in order to assure that the WIPP lifetime radiological impacts are bounding.

7.3.5.1-25 **Comment**

A commenter stated: "Expression of calculations throughout the draft SEIS to two significant figures indicates a degree of confidence that may not be accurate considering the uncertainty associated with exposure and risk estimates."

7.3.5.1-25 **Response**

Nearly all input values used as resources for developing resultant calculations shown throughout the draft SEIS are provided to at least two significant figures. To have used only one significant figure in final calculations throughout this SEIS would be too cautious and too conservative and would cause a loss of significant information for larger magnitude summary calculations. By using conservative estimates for the values of key parameters (i.e. waste volume of 6.2 M cubic feet), this SEIS analysis bounds transportation impacts. Any uncertainties in the parameters are thus conservatively considered by this bounding analysis approach.

7.3.5.1-26 **Comment**

Referring to page D-59, Table D.3.12 in the draft SEIS, a commenter stated: "Regarding the Rocky Flats Plant entry under the "Alternative Action Rail" column, it appears that the "-1" superscript is a typographical error. If not, what is the reason for the factor of 100 decrease from the Proposed Action?"

7.3.5.1-26 **Response**

The "-1" superscript was a typographical error in the draft SEIS. It has been corrected along with other revisions to Table D.3.12, in this final SEIS.

7.3.5.1-27 **Comment**

Regarding page D-77, Figure D.3.3 of the draft SEIS, a commenter stated: "If it is not a drawing error, what is the meaning of the arrow going from 'Dose to Man' to 'Inhalation'?"

7.3.5.1-27 **Response**

The inhalation exposure pathway to man illustrated in Figure D.3.3 incorrectly incorporated double arrows. This has been corrected.

7.3.5.1-28 **Comment**

A commenter from the State of Nevada stated: "The basis for assuming that a single train will carry approximately twice the number of TRUPACTs carried by a truck should be explained. This assumption does not appear logical, since a few points of origin comprise the majority of waste to be shipped to the WIPP. This also is not consistent with historical experience of the DOE shipping multiple waste cars by train (e.g., Three Mile Island). Considering that efficiency of rail transport increases as the number of cars in a train increases, the [draft] SEIS should explain the impacts of using a variety of train sizes on the number of shipments, shipping costs, fleet requirements, logistics, risk, etc."

7.3.5.1-28 **Response**

The capacity limitations of underground emplacement at the WIPP restrict the maximum rail shipment size that can be received at one time to six TRUPACTs of CH TRU waste or two NuPac 72Bs of RH TRU waste. Other reasons that larger train shipment sizes were not considered include:

1) requiring an excessively large burden of surface storage of TRU waste for small generator facilities until they generate enough waste to fill larger train loads, and

2) requiring a larger number of TRUPACT-IIs and NuPac 72Bs which would be less efficient, since there would be longer periods of being empty and idle, and waiting for use in larger train load shipments.

7.3.5.1-29 **Comment**

A specific comment regarding Page D-72, Subsection D.3.3.1.3, second paragraph stated "The word 'principle' should be 'principal'."

7.3.5.1-29 **Response**

The correction has been made in this final SEIS.

7.3.5.1-30 **Comment**

A commenter stated: "Has the DOE ever published a sensitivity analysis for the version of RADTRAN which it used to do the risk assessment in the draft SEIS? If not, the DOE should make such an analysis part of a revised and rereleased SEIS."

7.3.5.1-30 **Response**

Different sensitivity analyses for RADTRAN II and early versions of RADTRAN III have been published. See the following documents:

Madsen, M.M. et. al., 1983. RADTRAN II User Guide, SAND 82-2681, TCC-0399, Sandia National Laboratories, Albuquerque, New Mexico.

Yocolano, J.T. and Jurczak, J.A., 1984. RADTRAN II User Guide Supplement, WAESD-TR-84-0014, Westinghouse Electric Corporation, Waste Technology Services Division, Madison, Pennsylvania.

Madsen, M.M. et. al., 1986. RADTRAN III, SAND 84-0036, TTC-0470, Sandia National Laboratories, Albuquerque, New Mexico.

Neuhauser, K.S. and Reardon, P.C. A Demonstration Sensitivity Analysis for RADTRAN III, SAND 85-1001, TTC-0557, Sandia National Laboratories, Albuquerque, New Mexico.

7.3.5.1-31 **Comment**

Many commenters disagreed with the assumptions presented in the draft SEIS regarding the bounding case transportation accident. Specific concerns included: 1) the assumption that no major breach of the TRUPACT-II was possible in the accident scenario, 2) the use of average Rocky Flats Plant CH waste as the source term, 3) no analysis of an RH bounding case accident, 4) assumptions regarding release fractions, 5) an analysis of other exposure pathways and effects on responders and the surrounding area where such an accident might occur, 6) assumptions regarding the probability of the accident, 7) examples of real-world accident conditions that would represent the bounding case accident, and 8) assumptions regarding the fire event part of the accident.

7.3.5.1-31 **Response**

Based on the questions received, the discussions of the bounding case transportation accident analysis were expanded for this SEIS. The revised discussion of the bounding case assumptions and results are presented in Appendix D.3.4. However, to briefly address the specific concerns listed above:

1. Based on the design and tested performance of the Type B TRUPACT-II container and the historical performance of Type B radioactive containers in general, a major breach of these containers in an accident is not considered reasonable or probable. Additional information on the TRUPACT-II design and performance is found in Appendix L of this SEIS.

2. The source term for the bounding case CH accident was revised; instead of average-load of Rocky Flats Plant waste, this final SEIS analysis considered maximum allowable loads, per the WIPP Waste Acceptance Criteria or the TRUPACT-II Payload Compliance Plan limits, of CH waste from the Idaho National Engineering Laboratory, Savannah River Site, and Los Alamos National Laboratory. Radionuclide mixes were the same as presented for average trailer-loads from each facility (Table D.3.3).

3. A bounding case accident scenario was analyzed for RH maximum allowable loads from the Hanford Reservation and Idaho National Engineering Laboratory. Results substantiated the conclusions in the draft SEIS that consequences from an RH accident were, in general, less severe than from a CH accident in terms of population exposures and resultant calculated health effects (See Tables D.3.33 and D.3.34).

4. The assumptions regarding release fractions were not changed for this final SEIS. The explanation of the assumptions and the methodology used to calculate release fractions was expanded in Subsection D.3.3.1.2.

5. Population doses from bounding case accidents were calculated in this final SEIS using both RADTRAN and AIRDOS models; input parameters and values are shown in Tables D.3.29 and D.3.30. Exposure pathways analyzed included inhalation, resuspension, groundshine, cloudshine, and ingestion. The latter three pathways contributed minor amounts to the overall population doses. An estimate of a maximally exposed individual made using AIRDOS results in an overestimation of the dose that may be received. The overestimation is consistent with the conservative analyses presented in this SEIS.

6. No attempt was made to estimate the probability of a bounding case accident scenario; this SEIS analysis focused on the consequences of such an accident that caused the postulated release of radioactive material in an urban area under assumed weather conditions. The bounding case accident scenario was thus explicitly separated from other probabilistic risk assessment results presented in this SEIS.

7. As stated above, no accident circumstances were specified for the bounding case accident. The focus of the analysis was on the consequences of these events which, because they cause a release of radioactive material, would be very severe accidents exceeding Type B packaging design criteria. Such accidents would be more severe than the two real-world accidents described in Appendix D which were, in fact, quite severe, but were still below Type B design criteria.

8. The thermal driving force for the bounding case accidents was assumed to be a fuel-rich fire with an average temperature of approximately 1300 degrees Kelvin. These data were taken from Volume 1 of a Sandia National Laboratory report (Clarke et al., 1976) and are discussed in more detail in Appendix D.

7.3.5.1-32 **Comment**

The State of Nevada and other commenters questioned whether the population densities assumed in the draft SEIS transportation risk analysis (urban, suburban, rural) were too aggregated to be useful and whether the urban value of 10,000 people per square mile was representative of urban workday populations.

7.3.5.1-32 **Response**

Using only three zones of population density (urban, suburban, rural), based on national averages, does not overly aggregate the land use definitions of adjacent areas along the proposed WIPP routes for transportation risk analysis purposes. As with other input data for the RADTRAN probabilistic transportation risk assessment code, it is not necessary to have route-specific population density data to perform the analysis.

As for the value of the urban density population zone (3,861 persons per square kilometer or 10,000 persons per square mile), the reader is reminded that this value is used in the analysis to represent the population density of the urban areas of the U.S. It is recognized that there are existing or forecasted subareas of some urban areas along the preferred WIPP routes with a population density exceeding 10,000 people per square mile. Where there are employment centers with weekday office densities greater than 10,000 per square mile, it must be remembered that the probabilistic transportation risk is simultaneously being mitigated by a weekday working hour period decrease of population in outlying suburban areas, where the commuting employees reside during nonworking hours.

However, the net impact of such uncertainties in the fraction of travel through urban zones is actually negligible. Analysis of truck shipments using RADTRAN shows that a 1 percent change in the fraction of travel in a given population density zone changes the resultant risk of a radiological dose to the environment by a very small amount. While special events at stadiums and arenas can create population densities several times greater than 10,000 per square mile for short periods of time, such events occur rarely enough that they do not affect the calculation of average urban area population density for probabilistic transportation risk assessment purposes.

See also response to comment 7.3.5.1-17.

7.3.5.1-33 **Comment**

Several commenters questioned how a transportation risk assessment could be done using package designs rather than the fabricated, certified containers which have yet to be delivered.

7.3.5.1-33 **Response**

In an agreement with the State of New Mexico, the DOE committed to have all TRU waste transported to the WIPP in Nuclear Regulatory Commission (NRC) Type B certified packages. The TRUPACT-II, which is a reusable packaging for the transport of CH TRU waste, received NRC certification on August 30, 1989. The NuPac 72B package (intended for the transport of RH TRU waste) has not yet received NRC certification, but it will meet NRC regulation (10 CFR Part 71) before the DOE would use it to transport RH TRU waste to the WIPP.

Compliance with the NRC regulations not only provides acceptable performance standards for the package design, but also confirms that quality assurance requirements have been properly established for the fabrication of the packagings to meet the design specifications. Thus, the design specifications are the foundation of the transportation system and serve as the starting point for the risk assessment. This assessment is intended to compare transportation risks among the alternatives in this SEIS using very conservative assumptions (i.e., overestimation of impacts). It is not intended to provide absolute predictions of transportation risks. As a comparative analysis, using packaging designs, rather than as-built, measured parameters is justified because these parameters would equally affect the various alternatives.

This approach to assessing risks is standard in all engineering, in that designs serve as the basis for estimating performance. Performance is usually verified by tests of prototype units as well. If the design is predicted to perform acceptably and this is verified by prototype testing, steps (QA, etc) are established to ensure that actual parts and assemblies are built to the design specifications. Once in operation, if unforeseen circumstances or flaws become apparent that affect risks, corrective actions would be taken to change both designs and previously produced parts.

7.3.5.1-34 **Comment**

The Environmental Evaluation Group, the Georgia Department of Natural Resources, the Nevada Agency for Nuclear Projects, the Western Interstate Energy Board, the State of Oregon, the EPA, and a number of other commenters raised the concern that the release fraction used in the transportation risk analysis was unrealistically low and that not enough information was included in the draft SEIS to determine the validity of the release fraction. Other commenters suggested that the draft SEIS analysis should include a range of release fractions based on a commensurate range of assumptions. Also of particular concern was the assumption made in the draft SEIS that a major breach of a TRUPACT-II container during an accident is not a credible event, and that this may influence combustion release mechanisms. In addition, some commenters requested supplemental details on the calculations for particulate releases due to combustion and entrainment. Typographical errors in the subsection discussing the release fraction were also pointed out.

7.3.5.1-34 **Response**

The radionuclide release fractions utilized in the draft SEIS for transportation accidents have been retained in the analysis. Calculated maximum release fractions are consistent with the accident scenario analysis presented in Chapter 6 of the FEIS (DOE, 1980) and the NRC Modal Study (NRC, 1977) and are based on experimental data from Huerta (1983), Shirley (1983), Mishima and Schwendiman (1973), Alexander (1986), and Lorenz (1980) as discussed in Appendix D, Subsection D.3.3.1.2. It is agreed that several uncertainties exist regarding specific release fraction values. The analysis methodology used representative values, where published data and test results are applicable and reasonable and conservative estimates were used where uncertainties exist. The analysis discussion in Subsection D.3.3.1.2 has been expanded and the release fraction calculation tables modified to improve understanding of the analysis approach. Typographical errors have been corrected.

7.3.5.1-35 **Comment**

Public comments were received which described the calculated bounding case transportation accident release as "appear[ing] to be pulled out of thin air" and as though "no basis is given for the assumed release rate." One commenter questioned whether the 0.02 percent release fraction accounted for a "full fire" and the influence of waste container (e.g., 55 gal drum) failures on the analysis. Another commenter stated that the bounding case accident incorrectly assumes that all drums are breached. A question was raised why shipments originating from facilities other than the Rocky Flats Plant were not considered since the radioactivity of sites such as the Savannah River Site are 12 times higher.

7.3.5.1-35 **Response**

The bounding case accident release fraction was determined on the basis that all waste containers within the transportation package (e.g., TRUPACT-II/RH cask) are breached and subjected to a fire event. The calculated release fraction value is consistent with the prior accident scenario analysis presented in the WIPP FEIS (DOE, 1980) and the NRC Modal Study (NRC, 1977). Accident scenarios for shipments of waste from generator/storage facilities other than Rocky Flats Plant were considered in this final SEIS (see response to comment 7.3.5.1-31). The analysis discussion in Subsection D.3.3.1.2 has been expanded to enhance reader understanding of the analysis approach. Additional scenarios for bounding case accidents were also analyzed using waste from facilities in addition to Rocky Flats Plant (see response to comment 7.3.5.1-31 and Tables D.3.31 through D.3.34).

7.3.5.1-36 **Comment**

Commenters questioned why several specific population groups were not included in the transportation risk analysis (children, emergency responders, transport crews during accidents, etc.).

7.3.5.1-36 **Response**

Potential radiation exposures to emergency responders and transportation workers during a very severe transportation accident are bounded by the hypothetical, maximally exposed individual analyses presented in Subsection D.3.4. This analysis assumed that the individual is present for the full duration of the accident and received an additional 50-year exposure from inhalation of resuspended particulates released at the time of the initial accident. These exposure conditions encompass occupational exposure pathways due to the initial accident. Any subsequent occupational exposures would be controlled using appropriate radiological measures and protective equipment. Several uncertainties remain regarding dosimetry modeling for children. Currently, no recognized standards exist. Consequently, the SEIS analyses incorporate accepted dosimetry models (ICRP) for a reference adult, which provide representative health effects.

7.3.5.1-37 **Comment**

Specific comments were received that questioned the use of only respirable releases of radioactive material in determining environmental impacts from transportation accidents. Comments were also received that the analysis does not consider ingestion, including incidental ingestion from inhalation and contaminated skin surfaces, cloudshine, or groundshine, and therefore is not conservative.

7.3.5.1-37 **Response**

Because inhalation is the primary exposure pathway for TRU elements to expose the body, only respirable releases were used in the accident risk analysis. In addition, respirable exposure is limited to particles smaller than ten microns, since larger particle sizes would be eliminated from the body and, consequently, would not pose health risks. As such, the release fraction analysis determined the quantity of radioactive material released in a respirable, airborne form.

The dose from incidental ingestion is inherent in the ICRP models, in that some small fraction is retained in the Nasal-pulmonary region. The small fraction is subsequently swallowed leading to ingestion. The dose is typically small. Internal uptake through incidental ingestion from contaminated skin surfaces would be expected to be much less than through the inhalation/resuspension pathway. Even for equal uptakes, the committed effective dose equivalent via the ingestion route is two or more orders of magnitude less than the inhalation route for the radionuclides of greatest concern (americium and plutonium) and one to two orders of magnitude for the other radionuclides (such as uranium). External exposure pathways from groundshine and cloudshine were also considered, though only from the respirable, aerosolized, release component. In consideration that external exposure risks are two to four orders of magnitude less than internal (inhalation) exposure risks, exclusion of larger aerosolized particles (approximately equal to respirable release fraction for the RADTRAN loose powder waste form model) has a negligible effect on the risk analysis results.

7.3.5.1-38 **Comment**

A few commenters inquired how the Transport Index (TI) was calculated in the transportation risk analysis and whether there should be a difference in TI values for waste packaged in steel drums versus waste in wooden boxes. The commenters also wanted to know how TI values for wastes from the same facility (e.g. Hanford Reservation) could be so different.

7.3.5.1-38 **Response**

The method for developing the TI is discussed in Appendix D of the SEIS (Subsection D.3.2.1 and Table D.3.3) and is based on actual measurements of maximum radiation dose rates from sample drums. To introduce conservatism into the SEIS risk analysis, the assumption was made that the wastes were not shielded by any containers. The only credit taken for shielding in the TI calculation is from the TRUPACT-II itself. As discussed in Subsection D.3.2.1, the TI calculation is sensitive to gamma-emitting fission products. The radionuclides listed in average curies per TRUPACT-II trailer are alpha-emitting radionuclides and therefore do not influence the TI values. Also see response to comment 7.3.5.1-5.

7.3.5.2 **ROUTINE EXPOSURES**

7.3.5.2-1 **Comment**

A specific comment stated: "The draft SEIS, in Table 5.10 (Alternative Action, see Table 5.47) lists the annual cumulative radiological exposure to the public from CH TRU waste shipments to the WIPP. The public cumulative dose equivalent is stated to be 2.4 person-rem for the 5-year Test Phase, and 5.5 person-rem for the 20-year Disposal Phase, assuming 100 percent truck transport. The cumulative dose equivalent to the public for the 20-year phase appears proportionally much less than the 5-year Test Phase, particularly in view of the population density increase to be expected over a twenty-year period."

7.3.5-2-1 **Response**

The exposures shown in Tables 5.10 and 5.47 are average annual exposures for workers and the public. The annual cumulative radiological exposures to the public for the 20-year phase of the 100 percent truck Proposed Action are not proportionally much less than the exposures for the 5-year Test Phase. They are consistently greater in magnitude as shown on Table 5.10 (Alternative Action, see Table 5.47). The magnitudes of the annual cumulative radiological exposures listed in Table 5.10 (Alternative Action, see Table 5.47) depend on the percentage of shipments which occur during each year of the Test Phase. Thus, for the 5-year Test Phase, where 10 percent of the shipments occur. The annual percentage is .10/5 = .02 = 2.0 percent. For the 20-year Disposal Phase, where 90 percent of the shipments occur, the annual percentage of total projected shipments is .90/20 = .045 = 4.5 percent. Therefore, the exposure magnitude should always be 4.5/2.0 = 2.25 times higher for any given year in the 20-year Disposal Phase than any given year in the 5-year Test Phase. This information has been clarified in Subsection 5.3.

7.3.5.2-2 **Comment**

"Since the surface dose rate of a transportation cask of TRU waste coming to the WIPP can be as high as 1,000 rem per surface dose rate, then the medical consequence to a person in contact with an undamaged cask could be: a) genetic damage in 18 to 90 seconds; b) alteration of white blood cells in three minutes; and c) radiation sickness in four-and-a-half to seven-and-a-half minutes and death in 35 to 60 minutes.

Because of its cancer-causing properties, the acceptable body dose of plutonium is less than one millionth of a gram, an invisible particle. Yet even a millionth of a gram can cause cancer 10 to 30 years after the particle is inhaled.

Plutonium has a half-life of 24,000 years. It is considered dangerous for 240,000 years. That's ten half-lives.

Plutonium is absorbed from the lungs into the bloodstream where it can cause liver cancer. It is also taken up in the skeleton, producing bone cancer and leukemia.

There is evidence that it collects in the gonads (the sex organs) at a concentration twice that of its point of entry into the lungs.

There are some 2,000 diseases caused by genetic mutation; diseases like cystic fibrosis and dwarfism. Infants are especially sensitive to the substance. In pregnant women, it also crosses the placenta into the embryo where it can kill developing cells and damage the fetus.

Radiation can cause heart disease, sterility, premature aging, premature births and miscarriages. One pound of plutonium, if it could be deposited in the lungs of people throughout the world, would be enough to kill every man, woman and child on earth.

Two percent of the waste coming to the WIPP will be plutonium in powder form. If an accident happens and some of this powdered plutonium is released into one of our 30-mile-an-hour winds, we will have plutonium scattered from here to the mountains, and I don't believe they could ever clean it up."

7.3.5.2-2 **Response**

The commenter has confused the RH TRU waste canister and the RH TRU waste shipping cask. Significant radiation effects could occur if a person was in contact with the surface of an RH waste canister. However, these risks are the reason for classifying this waste as "remote handled" (RH) to prevent personnel from being in contact with the surface of the canister. Also, note that a maximum of only 5 percent of the RH waste can have surface dose rates exceeding 100 rem/hr. The surface dose rate from the RH waste shipping cask will not exceed 200 mrem/hr as specified in the DOT regulations. The dose rate at the side of the transportation trailer will be approximately 10 mrem/hr at approximately 6 ft. Therefore, the radiation exposure rate to the general public would never approach the exposure rate at the surface of the RH canister.

Although the maximum permissible body burden (MPBB) for Pu-239 is less than a microgram, the commenter has overstated the dispersion potential of the waste materials. However, other isotopes of plutonium have higher MPBBs. If a particle were inhaled, it would probably be cleared from the respiratory system by the body's natural dust clearance mechanisms. Once it entered the digestive tract, only about 0.1 percent would be absorbed into the blood. The most likely result of inhaling the "invisible particle" would be elimination from the body. If the particle did enter the deeper recesses of the lungs, much of the alpha radiation would be absorbed within the particle itself, additional alpha radiation would be absorbed by the mucous lining of the lungs. If alpha radiation did reach the tissue in the lung, the most probable effect is either the death of the cell or reproductive death of the cell. The probability of causing a chromosomal disorder resulting in cancer is very small. The implication of the comment that cancer would be caused if a particle is inhaled is not correct.

The half-life of Pu-239 is 24,000 years. However, the half-life of Pu-241 is 14.4 years (dangerous for 144 years, per the comment) and for Pu-238 is 87.7 years. These two isotopes of plutonium (Pu-241 and Pu-238) are 94 percent (by activity) of the total plutonium being placed at the WIPP and 87 percent of the total activity being placed at the WIPP.

As discussed above, 99.9 percent of the plutonium entering the digestive system is eliminated from the body. Very little is transferred to the blood stream. Only a small portion of the plutonium in the blood would be deposited in the gonads. Therefore, the genetic dose is also small (typically less than 5 percent of the "whole body" dose).

One pound of Pu-239 is approximately 28 curies. If this material were evenly deposited throughout the population of the world, each person would receive about 5×10^{-9} curies. The committed effective dose equivalent for this amount of material is 2.6 rem over 50 years or an average of about 0.05 rem per year.

If an accident released Pu-239 into the 30 mile per hour winds, using the contents of a representative RH cask and the release fraction in the SEIS, assuming a circular area with a radius of 10 miles, the average Pu-239 concentration would be about one atom per square foot. This is an extremely small number.

The comment is correct in that there are radiation hazards and concerns with TRU waste (especially RH); however, procedures and policies have been developed to minimize these risks. This SEIS evaluates these risks, both from credible scenarios and from bounding case scenarios.

7.3.5.2-3 **Comment**

A commenter stated: "Mr. Joe Goldfield submitted to you an evaluation of the potential radiological release for a worst case scenario for waste situated currently in railcars at the Rocky Flats Plant (no interim status for railcars) per your approval. He based his calculations on DOE allowable standards of 200 grams of plutonium in each drum. The EIS for WIPP determines the types of waste to be stored, details characterization and concludes that 5 grams is the expected activity per drum and 13 grams is the expected activity for plywood boxed waste to be received at WIPP. Please calculate the potential for the maximum credible accident utilizing this data. Based on both calculations for a potential release, why are you supporting this temporary storage in the Metro area? Please address Mr. Goldfield's conclusions and explain why you are permitting the Metro area residents to exceed the Maximum Credible Accident Emergency Preparedness Guidelines?"

7.3.5.2-3 **Response**

Temporary storage of TRU mixed waste at the Rocky Flats Plant is a RCRA permitted activity authorized by the State of Colorado. Only 1601 yd^3 of TRU mixed waste can be in temporary storage as a condition of the permit. Analysis of the impacts of temporary storage of TRU waste at Rocky Flats Plant is outside the scope of this SEIS.

7.3.5.2-4 **Comment**

Comments were received expressing concern that TRUPACTs would emit radiation during incident-free operations. Many commenters believed radioactive waste materials would leak in small amounts from the TRUPACT- II during normal operations.

7.3.5.2-4 **Response**

The TRUPACT-II will not leak radiation in the sense that radioactive materials will flow through holes, connections, or seals. Small amounts of radiation will pass through the shielding of the TRUPACT-II during normal incident-free transportation.

An individual who either lives or works near a transportation route and is exposed to every shipment to the WIPP would receive an estimated 1.9 mrem of additional exposure annually. One other comparison of interest would be the dose received by an individual stuck in traffic or traveling next to the TRUPACT-II. If one assumes that the individual is exposed for 30 minutes, the conservatively estimated dose received would range, depending on site-specific waste characteristics, from 0.2 mrem to 8 mrem. This is a very conservative estimate as discussed in response to comment 7.3.5.1-5, Subsection 5.2.2, and Appendix D.

7.3.5.2-5 **Comment**

A specific comment [on the draft SEIS] regarding page 5-31, paragraph three stated: "These two sentences have fires lasting for 2.0 hours and 1.5 hours. On page 5-31, paragraph five, why is the maximally exposed individual at 30m here and at 50m in paragraph seven?"

7.3.5.2-5 **Response**

The text has been revised to clarify that the total duration of the assumed fire is 2.0 hours. The maximally exposed individual in the transportation scenario is located 50 meters away from the point of release. The distance in paragraph five on page 5-31 is in error. The distance of 50 meters was correctly used in the PUFF model to determine the concentrations of hazardous chemicals in air at the receptor. The typographical error in paragraph five is corrected in this SEIS.

7.3.5.3 ACCIDENT RELEASES

7.3.5.3-1 **Comment**

A large number of commenters expressed concern about accident consequences associated with transportation. The commenters stated that data were presented in a form that was difficult for the layman to understand. Additionally, the commenters expressed concerns that the "multi-staging" or "averaging" numbers used to calculate the probabilistic risk mask the real consequences and, thus, understate the risks. Finally, commenters questioned how waiting for EPA standards to be met (Alternative Action) could result in more truck and rail latent cancer fatalities than estimated for the Proposed Action.

7.3.5.3-1 **Response**

The Text and Tables in Appendix D have been changed. The changes to both were made to present the data and analysis in terms more understandable to the layperson.

It is true the models used to estimate the radiological and nonradiological risks associated with shipping TRU waste to the WIPP rely on average values. Reliance on the average values does not mask the consequences or understate the risks. This SEIS was modified to include actual State-supplied transportation accident, injury, and fatality data. These data are presented in Table D.4.12 of Appendix D. An examination of the data indicates that accident, injury, and fatality rates used in the risk analysis are conservative. Additionally, Table D.4.15 presents data from industry and the DOE on radioactive materials transport. As indicated in the table, the accident, injury, and fatality rates are much lower than the data used in the transportation risk analysis and reflect the excellent safety record compiled by the nuclear industry.

With regard to projected latent cancer fatalities from transportation by truck and rail, these estimates bear no relationship to the issue of compliance with EPA disposal standards at the WIPP. Differences in health effects from transportation between the Proposed and Alternative Actions result from different numbers of rail shipments during the two actions (i.e., no rail shipments occur during the Test Phase of the Proposed Action, but truck and rail modes are used to move all waste in the Alternative Action).

7.3.5.3-2 **Comment**

A specific comment [on the draft SEIS] stated: "...Added to this is the proposed plan calling for the trucked transportation of this plutonium-contaminated, radioactive waste through many rural and urban areas of New Mexico.

From the DOE's own documents, it is stated that each of these trucks will carry 51 55-gallon drums, each containing up to 100 grams of plutonium that is 5,100 grams of plutonium per truck, with the trucks moving through as frequently as every six hours. As only 300 grams of plutonium are needed for one nuclear bomb, it is appalling to imagine the implications of a highway or rural road accident, and we all know the frequency of motor accidents on our roadways."

7.3.5.3-2 **Response**

Each truck and trailer combination has the capacity to carry 3 TRUPACT-II's with each TRUPACT-II carrying up to fourteen 55-gallon drums or two standard waste boxes for a maximum total trailer load of 42 drums or six standard waste boxes.

With the current Certificate of Compliance for the TRUPACT-II (issued by the NRC on August 30, 1989) the fissile material is not to exceed 325 grams Pu-239 equivalent per TRUPACT-II with no more than 200 grams Pu-239 equivalent per 55-gallon drum or 325 grams Pu-239 equivalent per standard waste box. Future revisions to the Certificate of Compliance are expected to revise this limit upward.

With a Certificate of Compliance the NRC has given their approval that the TRUPACT-II package has met all the applicable NRC and DOT regulations and has, therefore, proven its ability to safely transport CH TRU waste.

The commenter implies that an accident may result in a nuclear explosion. The plutonium and other fissionable materials in the waste are dispersed; otherwise, that plutonium would have been recovered. The materials are not in a critical or near-critical configuration, and could not produce a nuclear explosion.

7.3.5.4 **HUMAN HEALTH AND ENVIRONMENTAL IMPACTS**

7.3.5.4-1 **Comment**

Commenters asked if the DOE comply with RCRA for both transportation and disposal of mixed waste. Also, if the DOE is exempt from identifying exactly what is in the waste, how will the DOE placard the trucks in compliance with RCRA, and how will emergency first-responders handle the situation when the waste contents are unknown?

7.3.5.4-1 **Response**

The DOE will comply with RCRA for both transportation and disposal of mixed waste. The WIPP Waste Acceptance Criteria (WAC) requires that each waste generator certify the contents of each waste drum or box. Additionally, the WAC states "CH TRU waste shall contain no hazardous wastes unless they exist as co-contaminates with TRUs. Waste containers containing hazardous materials shall be identified with appropriate DOT label. . . . Hazardous materials to be reported are listed 40 CFR Part 261, subparts C and D."

The hazardous fraction of the waste will be identified when the waste is processed and certified to the WAC at the TRU waste generating and storing facility. This will be accomplished by sampling, or derived from knowledge of the processes that generated the waste. Also see responses to comments in Subsection 3.7.

Emergency first-responders will be able to identify the waste contents by the DOT placard placed on the trucks. Additionally, the waste shipping papers accompanying the shipment will provide detailed information. The information will also be available on the TRANSCOM computer system available for access by each State agency with emergency responsibilities. See Appendix C for additional details.

7.3.5.4-2 **Comment**

Several commenters questioned the doses shown in the draft SEIS transportation risk analysis for the hypothetically maximally exposed individual from incident-free transportation. Commenters thought these results were too low given other potential scenarios by which a person might be exposed to radiation during incident-free shipments.

7.3.5.4-2 **Response**

Additional analyses were performed to consider incident-free radiological impact scenarios previously overlooked. See revised Subsection D.3.2.2 and Table D.3.14 in this final SEIS for results showing higher hypothetical maximum doses to individuals than were determined in the draft SEIS.

7.3.5.4-3 **Comment**

Commenters stated that the draft SEIS failed to provide an adequate discussion of the health effects that could be caused by the transportation of TRU waste. Additionally, the draft SEIS failed to explain how people could protect themselves from exposure and care for themselves after an exposure event. The health risks presented in the draft SEIS were not understandable, but should be presented as the "number of lethal doses" that could be released; thus, the number of fatalities would be presented correctly. The draft SEIS also did not provide an explanation of "acceptable" versus "unacceptable" risks. Some commenters referred to the work by Dr. A. Petkau and suggested that the dangers of the long-term effects of low-level irradiation have never been fully studied or understood.

7.3.5.4-3 **Response**

The population doses and exposures to maximally exposed individuals (as shown in Table D.3.14) during routine transportation were converted to health effects (latent cancer fatalities) and presented in Chapter 5 (see Tables 5.14 and 5.50). Health effects from results of bounding case accidents are also presented in Chapter 5. Finally, health effects due to pollutants from the transport vehicles and injuries/fatalities due to accidents were estimated and are presented in Chapter 5 and Appendix D.

External exposure from sources outside the body are limited by moving away from the source, removing the source, or shielding the body. CH TRU waste, consists primarily of alpha-emitting radionuclides and are shielded by the packaging systems in which it is transported. Any radiation emitted from the packaging must be below limits established by both the Nuclear Regulatory Commission and the U.S. Department of Transportation.

Internal radiation exposure comes from radioactive material inside the body. If radioactive material is inhaled or ingested, part of it continues to irradiate body tissue until it decays or is eliminated by biological processes. The opportunity for TRU waste to be released to the environment from a transportation accident is limited by several important factors:

1) The double-containment offered by the Type B TRUPACT-II packaging. There has never been a significant release of material from a Type B container. One Type B container camera did fail when struck by a car. The sealed radioactive source was dislodged from the camera body. However, the sealed source remained intact and no radioactive material was dispersed.

2) The Waste Acceptance Criteria, established by the DOE, which limits the amounts of combustible waste material and the particle size fraction waste material which can be emplaced in the WIPP.

Regarding Dr. Petkau, he in fact cooperated with a National Academy of Science study known as the Biological Effects of Ionizing Radiations (BIER III Report) which evaluated his work and concluded that "the available data relative to the effects of low-dose or low-dose-rate exposures on carcinogenesis in humans and experimental animals do not, in general, support the hypothesis of an increased probability or induction at low dose rates" (NAS, 1980, pp. 463-469).

The effects of radiation from a range of doses have received extensive study; however, controversy exists concerning the risks from low dose levels. Natural background and medically-related doses of radiation account for the greatest amount of radiation that persons receive. The average background dose over the U.S. amounts to about 100 mrem per year; the average background dose near Carlsbad, New Mexico is about 70 mrem per year (Fischer, et.al., 1989). TRU waste shipments to the WIPP would add a very small amount to the natural background and medically-related doses and thus would add an extremely small number of fatal cancers. The final SEIS provides state-of-the-art estimates of these effects (see Section 5).

Additional information on transportation risks is provided in the responses to comments in Subsections 7.3.5.4 and 7.3.6.

7.3.5.4-4 **Comment**

A specific comment [on the draft SEIS] stated: "The probability of a bounding accident is not 'extremely low' as stated on page 5-24. From the tables and assumptions in Appendix D, one can calculate a probability of about 0.6 percent that an accident involving >0.75 LCF will occur during the WIPP operational period."

7.3.5.4-4 **Response**

From the content of the comment it is not possible to determine the calculation used to arrive at a probability of 0.6 percent.

The expected number of category VIII accidents (i.e. release of waste) occurring during the lifetime of WIPP operations is:

Overall accident rate	x	Total kilometers traveled	x	Fractional occurrence rate (VIII)	=

= 1.1×10^{-6} $\frac{\text{accidents}}{\text{kilometer}}$ $\times 1.21 \times 10^{8}$ kilometers $\times 1.5 \times 10^{-5}$

= .002 accidents of Category VIII severity

Since transportation with waste is only one half of the total travel, the number of accidents occurring with a radioactive shipment is half this value, or:

= .001 accidents involving radioactive material

The number of accidents occurring in a high population density zone is:

# of Category VIII accidents	x	Fractional occurrence Rate for high Pop. density zone	=

= .001 x .05

= .00005 radioactive category VIII accidents in high population zones

The probability that the accident would cause all three TRUPACT-II's to rupture is a fraction of this number (.00005). The probability of the accident occurring during adverse weather conditions is an additional fraction of this number.

Therefore, the probability of a bounding case accident is conservatively estimated at no more than 0.00005 (or .005%).

7.3.5.4-5 **Comment**

A specific comment regarding nonradiological risks on page 5-100 stated: "The LCF for CH TRU shipping by rail would be 0.088 (See Table D.4.9)."

7.3.5.4-5 **Response**

Agreed. However, the total normal transportation LCF for the Alternative Action, CH TRU rail alternative has been recalculated to reflect new projected numbers of shipments for the CH Rail mode as 0.073 LCFs. See revised Table D.4.9.

7.3.6 **TRAFFIC ACCIDENTS**

7.3.6-1 **Comment**

One commenter asked, "Are the Savannah River Site radioactive wastes significantly different than transuranic waste from other sites, and, if so, are they safe to transport to the WIPP?"

7.3.6-1 **Response**

While Savannah River Site contact-handled (CH) TRU waste is characteristically different (i.e. different TRU radionuclide mix dominated by Pu-238) than TRU waste from other waste generating and storage facilities, it still is classified as CH. As such, this waste can be safely shipped in a certified Type B package such as the TRUPACT-II. Since the DOE has suspended plans for testing high-level waste from Savannah River Site in the WIPP, any increased risks from transporting Savannah River Site high-level waste have been eliminated.

7.3.6-2 **Comment**

One commenter asked, "Why are the 7.3 deaths and 106 injuries associated with the routine shipment of transuranic wastes termed 'acceptable risks?'"

7.3.6-2 **Response**

Deaths and injuries associated with the routine operation of trucks and trains are unfortunately a condition of modern life. When transportation takes place on highways and railroads, some accidents resulting in deaths and injuries must be expected. However, compared to the amount of non-radioactive truck and rail traffic occurring over a twenty year period with the associated deaths and injuries, the additional traffic created by TRU shipments is not significant. For instance, in 1987 alone, as reported by the Federal Highway Administration's Motor Carrier Accident Reports data base (DOT, 1987b), there were 27,530 injuries and 2,822 fatalities as a result of accidents involving commercial trucks carrying all types of cargo.

The projections of injuries and fatalities, based on highway truck and railroad statistics for accidents, injuries, and fatalities are made on a per unit of distance (kilometer) traveled. These gross statistics are used to estimate truck accidents, injuries, and fatalities in this SEIS to introduce conservatism in the analysis. In reality, they apply to all classes of trucks (heavy duty, light, etc.) hauling all types of commodities, and thus are highly inflated.

Nonetheless, the DOE is instituting control and safety programs for selecting, qualifying, and training drivers of TRU waste shipments. Equipment will be constantly checked and maintained. Trucks and drivers will be monitored and tracked through the duration of waste shipments. As much as possible, the DOE is working to reduce the risk of accidents and resulting deaths and injuries.

Additional information is presented in Appendices C, D, L and M.

7.3.6-3 **Comment**

One commenter asked, "As more and more shipments take place over the 20-year life of the WIPP, doesn't the opportunity for severe accidents increase, and wouldn't these accidents be ruinous to human life and the surrounding environment?"

7.3.6-3 **Response**

The expected number of transportation accidents occurring over the 25-year operating life of the WIPP is based on the total distance traveled for the entire shipping campaign. If this total distance changes (more shipments, longer routes), the expected number of accidents would increase. However, each shipment is essentially an independent event. Therefore, as the shipping campaign progresses, there is no reason to expect that accidents would progressively become more likely. While it is to be expected that during the next 20 to 25 years, traffic patterns may change, increasing in some areas, decreasing in others, it does not follow that the potential for accidents increases as a direct result. Other factors such as road deterioration are even more difficult to predict since maintenance and improvement are expected to continue.

In fact, many positive factors should actually decrease the chance for accidents during the shipping campaign. For example, during the same time frame, better transportation equipment will evolve (e.g., improved tractors). More experience will be gained working with equipment, tracking systems, routes, and other transportation elements. The carriers and traffic managers will work out problems and develop time-tested procedures to maximize safe and efficient transportation systems. All these dynamic elements will combine to improve the safety of the shipping campaign as it progresses.

7.3.6.1 ACCIDENT RATES

7.3.6.1-1 **Comment**

Two commenters expressed concern that the draft SEIS transportation risk analysis did not consider changes in accident rate statistics which would be likely to occur over the life of the WIPP shipping campaign.

7.3.6.1-1 **Response**

The SEIS transportation risk analysis used the best, most conservative data available to estimate nonradiological injuries and fatalities due to WIPP shipments. Trying to project these injury/fatality rates into the future for the period during which WIPP shipments would be made is difficult and extremely speculative. For instance, while traffic loads may indeed increase on our highways, there follows no automatic presumption that injury/fatality rates, (based on distance traveled) as compared to total injuries and fatalities per year, will increase. It may be that improvements are made to the highway system which decrease these rates (redesigning high accident segments) or that improvements are made in vehicles (air bags) which also reduce rates. Hence, there appears to be no easy way to project injury/fatality rates into the future using only past rates and future projections of traffic volume because of the likelihood of significant improvements in highway conditions, driver competence, and vehicle safety equipment in the future. For these reasons, future truck accident rates are more likely to be lower, and not higher, than recent past year truck accident rates. Therefore, the SEIS transportation risk analysis assumption that current accident rates are applicable to future shipment years is a conservative assumption.

7.3.6.1-2 **Comment**

The Western Interstate Energy Board and other commenters endorsed the approach in the draft SEIS taken to identify transportation segments of concern and to collect more specific accident statistics information from corridor States. They questioned why these data were not used in the risk analysis and how the issue of specific accidents occurring at specific times was covered by the draft SEIS analysis.

7.3.6.1-2 **Response**

Specific attempts were made to gather from the corridor States as much information as those States could provide regarding segments of concern along proposed routes. In addition, accident, injury and fatality statistics were collected from these States for the same routes (see response to comment 7.3.6.1-3). Typically, accident, injury and fatality statistics did not correlate with the segments of concern. This may indicate that since these segments are perceived as particularly dangerous, perhaps because of a notable accident or for other reasons, drivers may be more cautious when traveling these routes.

To address the issue of a specific accident occurring at a specific time affecting a specific population, this SEIS analyzed bounding case accident scenarios. These severe accidents were assumed to occur in an urban area (such as Denver) under conditions which would result in a release of radioactive material. The draft SEIS assumed that the shipment involved waste from Rocky Flats Plant; for the final SEIS, maximally loaded shipments of waste from Savannah River Site,, the Idaho National Engineering Laboratory, and the Los Alamos National Laboratory were analyzed. RH TRU waste shipments of maximally loaded casks from Hanford Reservation and the Idaho National Engineering Laboratory were also analyzed. The consequences of these accidents were more significant than presented in the draft and are presented in Subsection 5.2.2.

7.3.6.1-3 **Comment**

Several commenters questioned the use of 1977 accident rate data in the draft SEIS transportation risk analysis and why more recent accident data was not used.

7.3.6.1-3 **Response**

The accident rates of 1.1 x 10^{-6} accidents/kilometer or 1.70 x 10^{-6} accidents/mile for the truck mode and 9.3 x 10^{-7} accidents/kilometer or 1.50 x 10^{-6} accidents/mile for the rail mode which were obtained from the 1977 NRC study (NRC, 1977) were used only in the accident-related component of the probabilistic transportation risk assessment. These figures were used because they are a useful benchmark of available national statistics on accident rates per vehicle-mile for heavy truck and rail shipments. Every year accident rates are calculated in various political jurisdictions or for various transportation facility (highway or rail) segments for the general, combined group of motor vehicles (highway mode) or trains (rail mode). However, a comprehensive accident rate study of both truck and rail Type B container shipments, exclusively, has not been performed.

Trends in recent years in composite national transportation accident rate statistics indicate a slight decline in both highway and rail accident rates. Therefore, there is an advantage to using these (NRC, 1977) accident rates for the radiological risk assessment in that it provides additional conservatism to the probabilistic radiological risk results.

For the nonradiological transportation risk assessment, these (NRC, 1977) accident rates were not used. Instead, rates calculated in 1986 by Sandia National Laboratories, based on heavy truck and Class A rail national average statistics from the RSPA of DOT, were used. See Table D.4.4.

However, for this SEIS, additional truck and train accident rate statistics from recent years have been obtained and used to revise the maximum estimate of projected WIPP lifetime injuries and fatalities, due to the risk of accidents where no radiological or hazardous chemical release occurs. See Tables D.4.12, D.4.13, D.4.14 and Figure D.4.1. These statistics, some of which are WIPP preferred-route segment-specific, show a recent trend in average truck and train accident rates that are less than the NRC (1977) rates. Also, the additional injury and fatality rate statistics in Table D.4.13 show that the WIPP systemwide weighted average truck injury and fatality rates are less than the 1986 values. Results in Table D.4.14 and Figure D.4.1 show that, with a range of forecasts of potential injuries and fatalities for the 100 percent truck alternative versus the maximum rail alternative, there is a distinct possibility of greater injury and fatality lifetime nonradiological risk with the maximum rail mode than with the 100 percent truck mode. Consequently, there is no clear advantage of one mode over the other in terms of nonradiological risk.

7.3.6.1-4 **Comment**

A specific comment [on the draft SEIS] stated: "DOE asserts that the probability of an accident exceeding design criteria is less than 0.5 percent. What data base did DOE use to derive that figure–the total number of reported accidents in the United States? The total number of accidents involving trucks in the United States? The total number of accidents involving loaded semi-tractor trailers? An extrapolation from previous accidents with nuclear materials?"

7.3.6.1-4 **Response**

The data used to derive the statistic in question was from incident reports (accidents involving injuries, fatalities, or property damage greater than $250.00) filed by large interstate motor carriers (annual operating revenues greater than $300,000). These incident reports are filed with and compiled by the Bureau of Motor Carrier Safety, Federal Highway Administration, and the Department of Transportation.

The probabilities of a truck or rail accident exceeding the NRC certified Type B container criteria and causing a radioactive material release to the environment were first cited in Section 6.8.1 of the FEIS, Accident Conditions Exceeding Regulatory Test Conditions. The source of the analysis was a paper by A. W. Dennis (Dennis, 1978). Dennis used the above-mentioned Department of Transportation data to derive probabilities for various severity categories of accidents.

7.4 LAND USE

7.4-1 **Comment**

The EEG and other commenters wanted to know what had changed since the FEIS to account for the release of land in Control Zone IV. The commenters also wanted to know how this release would impact slant drilling under the site for mineral exploration and extraction. They asked how the release would affect Control Zone IV's role as a buffer and its impact to public health and safety. Commenters also asked what the value of the WIPP site land would be if it were used for agriculture, grazing, residential development, or other beneficial uses.

7.4-1 **Response**

The DOE is allowing resource recovery in Control Zone IV (as a result of its unconditional release back to public use) of the WIPP site, in an effort to reduce the economic impact on the area. Control Zone IV was released for unconditional public use after calculations were performed that showed little or no difference in radiological risk to the public between the boundaries of Control Zones III and IV. This release does not open the area under the site for mineral exploration and extractions. To ensure that the integrity of the underground storage facility is protected, all resource recovery operations at the WIPP must be approved by the DOE, in coordination with the Bureau of Land Management (BLM), which will continue to manage the overall use of lands not under DOE control. Subsection 7.2 has been revised to include the DOE's commitment to prohibit subsurface mining, drilling, or resource exploration within the WIPP site land withdrawal boundary, including slant drilling from the released Control Zone IV.

If the No Action alternative were selected and the restricted the WIPP site area again became available, the only agricultural use would be the reversion to grazing. This area would support 18 head of cattle for a one-year period (see Subsection 5.1.3 Land Use of this SEIS). The average value of a head of cattle is $900 on public land. The total value of 18 head would be $16,200 per year in this location. There are no organized recreational uses of the land. The potential of any value for a park, residential development, or other uses is remote and certainly not demonstrated in land use patterns surrounding the site.

7.4-2 **Comment**

The EEG asked what the DOE restrictions are for mining and drilling within the WIPP site, and whether the DOE would maintain control of mining or delegate the responsibility back to the BLM. The EEG stated that Section 8 of the draft SEIS indicated that hydrocarbon resources could be reached by directional drilling from Control Zone IV and stated that this was counter to previous commitments. They also asked what natural resources are estimated to be present beneath the 16-section WIPP site. They also wanted to know the extent of private mining leases still being held within the site boundaries and distances to nearby ranches and mining operations.

7.4-2 **Response**

In accordance with the Consultation and Cooperation Agreement between the DOE and the State of New Mexico, as amended in August 1987, the DOE does not permit subsurface mining, drilling, or resource exploration unrelated to the WIPP Project within the WIPP site. This agreement with the State of New Mexico superceded a previous Memorandum of Understanding with the State Office of the Bureau of Land Management. This prohibition also precludes slant drilling under the site from within or from outside the site. Section 8 of this SEIS has been corrected to appropriately reflect this restriction. Control of mining could be administered by the BLM, which currently has that authority and expertise. See response to comment 7.4-4 for information concerning the quantity of natural resources at the site and the status of mineral leases.

Distances to ranches near the WIPP site (Mills, Smith, and Mobley ranches) or nearby mines are important for dose calculations resulting from WIPP operations or accidents. The closest permanent residence or work location occupied by members of the general public is the Mills Ranch approximately 4.5 km from the operations area of the WIPP. However, since dose calculations were done in this SEIS for a hypothetically maximum exposed individual assumed to reside at the WIPP site boundary, distances to these locations are not necessary.

7.4-3 **Comment**

Commenters questioned the reasoning behind the increase in the WIPP fenced area (from 640 acres to 1,454 acres). These commenters wanted to know the environmental impacts of this expansion on vegetation, wildlife, air quality, cultural resources, and recreational uses.

7.4-3 **Response**

Enlarging the DOE Exclusive Use Area from 640 to 1,454 acres is being proposed in order to increase the security of the facility once it receives TRU waste. This fenced buffer zone around the Secured Area would allow security forces enough time to confront potential intruders before they could cause any damage to the WIPP facilities. Subsections 2.1, 7.1.1, 7.1.2, and 9.2 have been revised to state that the DOE Exclusive Use Area, not the Secured Area, is proposed for expansion to increase the security of the WIPP. A new figure (Figure 2.2a) has been added to this SEIS to indicate the proposed exclusive use area.

As discussed in the Subsection 7.1.1, little or no significant impact on the environment would result from creating this larger restricted area. Some wildlife protection would result, since hunting inside the fenced area would not be permitted.

7.4-4 **Comment**

The EEG commented that it was misleading to merely state the percent reduction of inaccessible mineral resources resulting from the release of Control Zone IV since 7.1 percent of the free world's langbeinite resources and reserves would still be within the WIPP site boundaries. In addition, other commenters wanted to know the estimated value of the mineral rights associated with the WIPP lands, in the event that the No Action Alternative is selected, and mining becomes viable.

7.4-4 **Response**

The FEIS provides a detailed discussion of the mineral resources and reserves located at the WIPP site. The information in the draft SEIS was intended to convey a general understanding of how the release of Control Zone IV affected previously inaccessible resources and reserves and was sufficient for this purpose. The DOE has purchased all of the hydrocarbon leaseholdings within the WIPP Site Boundary (16 Sections) at a cost of about $20 million. One of the two potash leaseholds within the WIPP site boundary has also been acquired for about $200,000. The DOE has evaluated the remaining potash lease and is negotiating with the leaseholder. The value of other mineral resources is unknown at this time.

7.5 **AIR QUALITY**

7.5-1 **Comment**

Commenters asked the DOE to clarify its reasoning in regard to impacts on air quality. Specifically, they asked why the impact on air quality from decommissioning in the No Action Alternative is similar to that in the Proposed Action. The commenters expressed concern over possible airborne release of radioactivity expected during decommissioning activities related to the Proposed Action.

7.5-1 **Response**

Air quality impacts resulting from decommissioning a facility designed to emplace pre-packaged waste and operated as a "clean" facility are not expected to differ from the air quality impacts of decommissioning an unused facility. The airborne releases of radioactivity during decommissioning, following waste disposal at the WIPP, would be very small. The waste handling building and underground facilities should not have loose contamination that could become airborne. Transport, receipt, and emplacement of pre-packaged waste are expected to allow the WIPP to operate "cleanly." If contamination was encountered during operations, the area would be cleaned up, and contaminated materials would be packaged and emplaced as site-generated waste. Therefore, no sources of airborne radioactivity would be present during decommissioning. The generation of dust during dismantling of the surface facilities of the WIPP would be approximately the same for the Proposed Action and the No Action Alternative. Experience gained from constructing facilities at the WIPP indicates that dust was the most important air quality impact.

7.5-2 **Comment**

The EEG asked the DOE to explain the elevated sulfur dioxide levels and why the dust loadings exceeded air quality standards. The EEG asked if this was verified by moving the sampler, or from analysis of deposits on the filter.

7.5-2 **Response**

Measured sulfur dioxide levels at the WIPP exceeded New Mexico's air quality standard from April 29 through May 8, 1987, and again from May 15 through May 20, 1987. There were no unusual activities at the WIPP during these periods which would account for elevated levels of sulfur dioxide, and, as this was an isolated incident, tracing the source or event, whether the source was on-site or off-site, was not possible.

Dust loadings (i.e., total suspended particulates) exceeded New Mexico's air quality standard only at the WIPP Northwest area sampling location. This sampling location was adjacent to a heavily-used, caliche-topped road, which is the probable source of the high particulate loads. The WIPP Far-field sampling location was established in September 1986, and has since replaced the WIPP Northwest area as the principal down-wind air-quality sampling location. Since the site where this sample was being taken (near the road) was changed to an area less affected by traffic, no samples above the standards for particulates have been obtained. In addition, total suspended particulates at this location, and, at the other two air sampling locations (WIPP East and WIPP South), have never exceeded the State standard, supporting the hypothesis that the WIPP Northwest samples were not representative of site air quality.

7.6 BACKGROUND RADIATION

7.6-1 Comment

The EEG suggested that reference should be made to EEG's preoperational environmental radiation program in Sections 2 and 4.

7.6-1 Response

This information has been incorporated into a new Subsection 2.9.5 of Chapter 2 describing the EEG's environmental monitoring program. No modifications were made to Section 4 since results of the EEG program have not been published.

7.7 GEOLOGY

7.7-1 Comment

Several commenters were concerned over the adequacy of the Los Medanos site for the WIPP and argued that the DOE did not know enough about geologic and hydrologic conditions to make the site selection. Others commented that the current body of geologic and hydrologic evidence suggests that the WIPP site is not suitable for containing waste. One commenter stated that a seismologist told him that there is an area near the Los Medanos site that is absolutely better for this project.

7.7-1 Response

Original site selection criteria included: depth of salt, thickness of salt, lateral extent of salt, tectonics, mineral potential, existing boreholes, population density, and land availability. Primary concerns are radiation safety, mine safety, and ease of construction. Accordingly, the Los Medanos site was chosen for the WIPP after extensive deliberation. The depth of the repository was determined by geologic and hydrologic features. Refer to the 1980 FEIS (pages 2-9 through 2-15) for a more detailed explanation of why the Los Medanos site was selected. (Also, see the responses to comments 7.7-4 and 7.8-7.)

7.7-2 **Comment**

A commenter stated that "the geological and hydrological systems at the WIPP site and their effects on long-term performance at the site have been thoroughly analyzed." The comments also stated that "significant data have been recently obtained on the Salado Formation and the Rustler Formation to further enhance the analysis."

7.7-2 **Response**

Extensive studies have been conducted on site geology and hydrology since the 1980 FEIS was published; geological and hydrological investigations would continue during the proposed Test Phase. At present, these studies are focusing on the Salado Formation, and may be expanded to other geological units.

7.7-3 **Comment**

A number of commenters are concerned that the WIPP site is located in an area with karst topography. Furthermore, they pointed out that the issue of karst channels in the Rustler Formation, raised by Dr. Larry Barrows in 1982, was not considered. The predominant concern regarding potential karstlands at the WIPP site is the presence of solution cavities in the Rustler Formation, which potentially could cause groundwater flow to be very rapid. The commenters also said the SEIS does not evaluate the fact that no natural barriers exist to contain the waste.

7.7-3 **Response**

The project has spent substantial effort evaluating the potential for karst topography and assessing geochemical impacts. It has not found any evidence of karst within the boundaries of the WIPP site. Karst topography could exist farther south of the site and is known to be present within Nash Draw 8 km (5 mi) southwest, but there is no evidence of karst conditions at the site. The type of karst that is present near the WIPP site Is evaporlte karst, and not limestone karst with which most people are familiar. It is in limestone karst where caverns such as Carlsbad Caverns develop. With evaporite karst, halite anhydrite/gypsum and carbonate dissolve with preferential dissolution in the order listed. If any openings exist as a result of evaporite karst, they are small and develop in near-surface anhydrites/gypsums. Such openings are know to exist in Nash Draw in the gypsum/anhydrite members of the Rustler outcrop.

There is abundant evidence that karst is not present on the WIPP site proper. For example, the Dewey Lake Red Beds appear to be hydraulically unsaturated, while the water-bearing units of the Rustler are both saturated and confined, with heads greater than the elevation of apparently unsaturated regions within the overlying Dewey Lake. (In an active karstic system, the unit within which dissolution is active must be unconfined in an area of recharge.) Also, the head potential within the Magenta member of the Rustler is higher than that of the overlying Forty-Niner claystone. This relationship precludes modern infiltration from the surface to the Magenta at the measurement points.

Further, hydraulic and isotopic studies indicate that vertical recharge from the surface to the Rustler is not active at the WIPP site. The calculated residence or isolation time of Rustler groundwaters at the WIPP site is greater than 10,000 years. There appear to have been changes in flow directions within the Culebra Dolomite within the last (approximately) 10,000 years, with flow (or recharge) at the time of the last pluvial period (at least 10,000 years before present) probably originating to the west, from Nash Draw. There currently are no significant sources of recharge to the Rustler Formation.

There appears to have been local development of karstic channels or porosity within Rustler anhydrites due to vertical infiltration of fluids from the surface at the WIPP-33 structure, located approximately 1 km west of the western boundary of the site. However, the WIPP-33 structure is unique at and near the WIPP site and is not now active. Also, regional-scale pumping tests of the Culebra Dolomite have not identified any major high-transmissivity structures similar to those expected if karst involving the Culebra were present at the WIPP site (Lappin, 1988). Although fracturing and relatively high transmissivities have been identified in the Culebra Dolomite in the southeastern portion of the site, the transmissivities are not high enough to be characteristic of karstic conditions. Also, the unit exists under confined conditions in this area. (See Subsection 4.3.3)

The views of Dr. Larry Barrows are discussed in detail in EEG-32 (Chaturvedi and Channell, 1985). Chaturvedi and Channell's concerns regarding potential for karst processes impacting the Rustler Formation were identified in the draft SEIS, though it failed to indicate that the source was EEG-32. The text has been modified to point out Dr. Barrows' concerns.

7.7-4 Comment

Some commenters wanted to know if a salt formation was adequate as a repository host rock. Salt is geotechnically an unstable substance and is soluble in water. One commenter pointed out that "[t]he supplemental statement also does not adequately address the placement in salt and the effects that the salt might have as it creeps over the containers and encloses them." Other commenters said that salt has been inadequately studied and there is a lack of understanding of its physical properties. For example, in Kansas, salt was shown to be inappropriate for disposal of high level waste. Other commenters favored using salt deposits.

7.7-4 Response

A major reason for locating the WIPP in a deep, natural geologic salt deposit is the long-term potential of salt to encapsulate waste and heal fractures induced by excavation and later room closure. The presence of large, undisturbed salt deposits requires a history of minimal groundwater interaction. The existence of the WIPP halites indicates that they have not been exposed to halite-unsaturated brines over the last 200 million years. Similarly, the presence of nearly horizontal stratigraphic continuity at and near the WIPP repository horizon indicates very limited structural deformation over the same time frame. (Refer to FEIS, page 2-9.) Further, the salt deposits within which the

WIPP underground workings are located have been studied extensively since the publication of the FEIS. Still, it is recognized that further studies are needed. The emphasis in the Test Phase will be on gas generation and brine inflow; however, studies on salt creep, and the resultant tunnel closure and seal consolidation will also continue.

7.7-5 **Comment**

Several commenters expressed concern over the lack of stability in the climate, with resulting effects on groundwater flow.

7.7-5 **Response**

At present, long-term climatic models are highly uncertain, but there is some evidence that the trend will be toward hotter, dryer conditions in some regions (the "greenhouse effect"). In this case, the present SEIS model and assumptions concerning the absence of vertical recharge would be unaffected. Alternatively, if cooler and/or wetter conditions develop, and if local precipitation and surface infiltration sufficiently increase, vertical recharge directly to the Rustler Formation may be possible after a very long time. The effects of increased recharge would be examined through modeling studies during the Test Phase. Paleoclimatic variations that have taken place in southeastern New Mexico would also be studied during the Test Phase (see Betram-Howery and Hunter, 1989a).

Lappin et al., (1989) summarized a number of studies that pertain to long-term climatic changes and their possible effect on groundwater flow. The DOE's present understanding (see Lappin et al., 1990) is that 1) there is no local vertical recharge within the Rustler Formation at the WIPP site, and that 2) the confined Rustler system is, in fact, draining from a period of recharge more than 10,000 years ago. This interpretation is based on and is consistent with both isotopic studies (stable-isotopes, radiocarbon, and uranium-disequilibrium) and results of numerical modeling of vertical fluid flow (Davies, 1989). In addition, the effects of uncertainties in lateral boundary conditions have been examined numerically and indicate that, at least for periods of up to 1,000 years, and assuming reasonable changes in water levels, the flow directions in the immediate site area are little changed.

7.7.1 **STRATIGRAPHY**

7.7.1-1 **Comment**

The EEG commented that on page 4-7 the last sentence should be expanded to read, "The WIPP horizon is in a 26-foot-thick section bounded by Marker Beds 138 and 139, that consists mostly of halite with a few interbeds of anhydrite, clay, and polyhalite. Detailed stratigraphy of this section between the two marker beds and the location of WIPP excavations is shown in Figure __________ [sic]."

7.7.1-1 **Response**

In this SEIS, the last sentence has been changed to read "The WIPP horizon is in the approximately 26-ft-thick halite bed bounded by Marker Beds 138 and 139. The WIPP horizon consists mostly of halite with a few thin interbeds of anhydrite, clay and polyhalite. A generalized stratigraphic cross section of the Salado and Castile Formations is shown in Figure 4.5."

7.7.2 **PHYSICAL PROPERTIES**

7.7.2-1 **Comment**

Several commenters wanted to know why fractures occur in the underground repository host rock at the WIPP site, and also what would be the results of fracturing on the short- and long-term performance of WIPP. The Texas Land Commission and others noted that the DOE had failed to address the issue of fracturing, even through the cracks were discovered in 1987. Some commenters wanted to know why a more thorough analysis and description of the cracks in the walls had not been included in the draft SEIS. Another common concern was voiced regarding the DOE's ability to retrieve the stored waste from faulted, cracked rooms at the end of the 5-year Test Phase, if the DOE fails to comply with EPA standards.

7.7.2-1 **Response**

The cracks and fractures that have been noted in various comments are referred to as a disturbed rock zone (DRZ). The DRZ is a volume of rock adjacent to an underground excavation that has been stressed and fractured due to the mining of that excavation.

While DRZs are common and expected in any underground mining, a DRZ was not originally expected to develop around the WIPP, although dilation around the openings was assumed in the FEIS to be a factor. It was thought that only a minimal amount of remedial work (such as rock bolting) would be necessary to stabilize the openings.

The DRZ has raised short-term concerns regarding personnel safety and maintenance of the openings, both during the operational period and should retrieval be necessary after the Test Phase. Remedial work (removing loose rock by hand-scaling or mining, rock bolting, installing wire mesh, or installing wire mesh and rock bolts) has stabilized the openings so that the potential hazards to workers have been minimized and retrieval should be eased.

The extent of the DRZ varies laterally and vertically from about 1 to 5 yards from the excavation, depending on the size and age of the opening. The larger and older excavations have a greater degree of fracturing than do smaller or younger excavations, suggesting that the DRZ is still expanding slowly.

The fracturing within the DRZ also causes at least a localized increase in permeability. This raises the concern that the DRZ may provide pathways for fluids to bypass tunnel and shaft seals. Long-term mitigation measures addressing this concern include either grouting the fractured zones or removing fractured material in those areas where panel or tunnel seals are to be placed. The DRZ is discussed further in Subsections 4.3.2.4, 5.4.2.4, and 6.3.1 of this SEIS, and in Section 4.7 of Lappin et al., 1989.

The DOE has added an analysis of a new Case IC in Subsection 5.4.2.5 to this final SEIS, in response to concerns about the effect of the disturbed rock zone on repository performance.

7.7.2-2 **Comment**

Commenters raised concern over possible seismic activity and its effect on the repository. The commenters noted that the area's seismic activity could cause a breach in the repository's integrity.

7.7.2-2 **Response**

Although there are some slight variations in the geologic strata at the WIPP site, there is no conclusive evidence that active faults exist. The geology of the Los Medanos area of southeastern New Mexico has been studied extensively since 1975 by geologists from Sandia National Laboratories, the U.S. Geological Survey, and numerous universities. The studies were documented in the Geological Characterization Report (Powers et al., 1978) and in other such documents. No geologic anomalies of tectonic origin that would pose a problem for WIPP were identified in the repository area.

Estimates based on historical data suggest an extremely low likelihood of faulting at the site of a magnitude that could significantly affect its integrity. The strongest earthquake on record within 180 miles of the site occurred in 1931, in Valentine, Texas, and had an estimated magnitude of 6.4. Refer to FEIS Section 7.3.6, pages 7-48 through 7-60.

7.7.2-3 **Comment**

Some commenters noted recent scientific studies supporting volcanic tuff (rock formed from compacted volcanic particles) as the material best suited for a nuclear waste repository. Commenters pointed out that the Yucca Mountain site in Nevada is primarily composed of this rock. Questions were raised as to why DOE advocated the use of a salt as a host rock for a radioactive-waste repository, if the volcanic tuff is actually a better repository material.

7.7.2-3 **Response**

From a generic perspective, there is no one rock type which is considered to be the best for radioactive waste disposal. The fundamental issue is not whether salt is the best medium but whether it can be credibly demonstrated to be adequate for disposal of TRU waste. The adequacy of this site was analyzed in the FEIS and is updated in this SEIS. The process of site selection for the WIPP is discussed in the FEIS (Subsection 2.2.3).

7.7.2-4 **Comment**

Questions were raised by commenters over the possibility of salt dissolution taking place at or near the WIPP site, thereby affecting repository integrity. The commenters went on to state that these concerns had been inadequately addressed by the DOE.

7.7.2-4 **Response**

Evaporite dissolution has been considered in the WIPP site characterization for some time. Two general types of evaporite dissolution have previously been identified as potentially affecting the stability of the Castile and Salado Formations: regional-scale, stratabound dissolution (i.e., dissolution parallel to bedding) and localized dissolution from recharge (upward from the Bell Canyon Formation).

The possibility of stratabound dissolution reaching the WIPP site within 10,000 years was evaluated as part of the site characterization. It is generally agreed that stratabound dissolution will not reach the WIPP within 10,000 years. In addition, recent interpretations indicate that much of the variability in the thickness of the Castile and Salado Formations is due to deformation and original depositional variability rather than to evaporite dissolution.

The second potential dissolution postulated was dissolution of the Castile and/or Salado halites by localized upward intrusion of halite-unsaturated fluids from the upper portion of the underlying Bell Canyon Formation. If such dissolution occurred immediately beneath the WIPP site, the resulting mechanical subsidence might directly breach the WIPP.

One structure in the WIPP vicinity was proposed in 1983 to have resulted from point-source dissolution of Castile and/or Salado halites. This structure has since been investigated by drilling, coring, and hydrologically testing hole DOE-2. No evidence of evaporite dissolution was found in hole DOE-2. Also, the chemistry and hydrology of the Bell Canyon Formation do not present a favorable environment for extensive solution by this process. These conclusions suggest that point-source dissolution of Castile and/or Salado evaporites is not an issue at the WIPP site (Lappin, 1988).

7.7.2-5 **Comment**

The EPA questioned information found in Subsection 6.3.1.1 of the draft SEIS. This section indicates that the disturbed rock zone will slowly grow between the mining and closure of a backfilled disposal room. The EPA stated that an analysis needs to be presented on the potential effects of this phenomenon on both operations and long-term performance of the repository.

The EEG commented that Subsection 4.3.2.4 should describe extensive fracturing observed in the roofs of the Site and Preliminary Design Validation rooms that will also provide potential pathways for gas or brine migration.

7.7.2-5 **Response**

Subsection 4.3.2.4, entitled "Disturbed Rock Zone and Associated Fractures," has been added to this SEIS. In this final SEIS, in response to concerns about repository seal performance and the effect of the disturbed rock zone, the DOE has added Case IC, which considers a possible near-failure of these seals (Subsection 5.4.2.5). Also see the response to comment 7.7.2-1.

7.7.2-6 **Comment**

Commenters expressed concerns regarding: a) effects of salt on the steel drums, b) how long corrosion might take to breach the drums, and c) what tests have been conducted to examine the problem. The commenters, including the Texas Land Commissioner, stated their concerns that waste would migrate into aquifers if inflowing brines corroded the drums.

7.7.2-6 **Response**

The calculations for the SEIS assume that salt and brine will corrode both drums and metallic wastes contained by the drums, by processes of oxic and/or anoxic corrosion. Oxic corrosion consumes both brine and gas, without gas generation. Partly to be conservative, it was assumed that anoxic corrosion occurs, forming considerable amounts of hydrogen. It is assumed that both metal drums and metallic waste in the drums completely corrode, generating approximately 900 moles of gas per drum. No credit is taken for drums serving as long-term containers for the waste, since the drums will be breached by corrosion and/or mechanical closure within several tens of years following decommissioning.

The estimated corrosion rates, assuming that excess brine is in contact with the waste drums, are contained in section 4.2 of Lappin et al. (1989), and would lead to metals completely corroding in approximately 530 years. This estimate ignores the possibility that gases generated by corrosion may in fact, inhibit the brine inflow required for additional corrosion.

Completed lab-scale tests examining the issue of gas generation and corrosion are described in Molecke (1979). The conclusion that anoxic corrosion will dominate is based on extrapolation of experimental data, as discussed in section 4.2 of Lappin et al., 1989. In situ testing examining corrosion is ongoing at the WIPP, using full-scale (55-gallon) drums and simulated waste (Bertram-Howery and Hunter, 1989a, activity 1.3.2).

7.7.3 **SALT CREEP (CLOSURE)**

7.7.3-1 **Comment**

Commenters were concerned over the faster-than-expected closure rate and its effect on the retrievability of waste during the 5-year Test Phase. The following comment is representative: "Since the cracks suggest intense geologic pressure and more rapid creep and wall closure than planned for in the construction of the repository rooms, how will this bear on the ability to retrieve stored wastes if the DOE experiments demonstrate WIPP cannot meet EPA standards?"

7.7.3-1 **Response**

Measured closure rates due to salt creep are approximately three times the rate that was expected before access underground. With engineering modifications and structural support, these faster closure rates will not present a problem for retrieval of waste should the need arise. Engineering modifications consist of initial sizing of the excavations to accommodate for the closure rates over the next 10 years to allow room for equipment and possible retrieval. The use of rock bolts and wire mesh as structural support has been and will continue to be used for personnel safety. Refer to Lappin et al., 1989, Section 4.7.5 and Subsection 6.3 of this SEIS.

7.8 **HYDROLOGY**

7.8-1 **Comment**

The EEG commented that the draft SEIS should reference the required tests that the DOE conducted as part of the Stipulated Agreement in a lawsuit involving the New Mexico Attorney General. The EEG said that ignoring those required tests ignores the true history.

7.8-1 **Response**

The tests required for the Stipulated Agreement between the New Mexico Attorney General and the DOE have been referenced in Subsection 4.3.2.1.

7.8-2 **Comment**

The EEG said that its document EEG-35 (Chapman, 1986) provided counterarguments to the Lambert and Harvey report on recharge to the Rustler referenced on page 4-33 of the draft SEIS and that these counterarguments should be included in the final SEIS.

7.8-2 **Response**

A summary of Chapman's (1986) conclusions and counterarguments is presented in Subsection 4.3.3.

7.8-3 **Comment**

The EEG commented that the word "deposits" should not be used as a synonym for "reservoir" when describing pressurized brine.

7.8-3 **Response**

The word "deposits" was deleted.

7.8-4 **Comment**

The EEG commented that the Dewey Lake Redbeds should be included among the geologic units of hydrologic interest to the WIPP.

7.8-4 **Response**

A brief discussion of the Dewey Lake Redbeds has been added to Subsection 4.3.1.1.

7.8-5 **Comment**

The EEG noted that the brine inflow rate of 1.6 liters per day per square meter on page 4-14 of the draft SEIS was incorrect and should have been 1.6 milliliters per day per square meter.

7.8-5 **Response**

The error was typographical and has been changed to reflect the correct inflow rate.

7.8-6 **Comment**

The EEG commented that on page 4-60 of the draft SEIS, the first sentence of the last paragraph reads, "The presence of Castile brine beneath the repository is of concern only in the event of human intrusion (emphasis added)." The EEG expressed concern that gas pressures exceeding lithostatic pressure in the repository could cause fracturing to the ERDA-9 borehole and then down to the upper anhydrite layer of the Castile, where a brine reservoir is assumed to underlie the repository.

7.8-6 **Response**

The ERDA-9 borehole does not extend down to the anhydrite layer assumed to contain a brine reservoir. It was stopped short of that depth to avoid creating a potential pathway between the brine reservoir and the repository.

Lithostatic pressure within the Castile formation is on the order of 500 to 600 pounds per square inch greater than that at the repository level. There is little chance that lithostatic gas pressures from the repository could cause fracturing through the upper Castile anhydrite. Gas will instead tend to migrate upwards into regions of decreased lithostatic pressure. Also, it is presently assumed that ERDA-9 will be completed and sealed in the same manner as the repository shafts.

Final designs are not presently available for either ERDA-9 or shaft seals. Until the final designs are available, or until reliable calculations indicate that there would be no unacceptable consequence, it is assumed that gas pressures potentially exceeding lithostatic pressures at the repository level are unacceptable. Seal performance will be examined as a part of the comprehensive investigation to be conducted in the Test Phase.

7.8-7 **Comment**

A commenter stated that there is now an overwhelming body of evidence that would have invalidated the WIPP site in 1980 and questioned how one can assume current characterizations are accurate.

7.8-7 **Response**

At the time of the 1980 FEIS, the data and assumptions used in the site characterization were the best available, as were the calculational methods used. The DOE has continued experiments intended to test assumptions made then; these studies have in part been conducted as a result of agreement between the DOE and the State of New Mexico.

Even though new information has shown several of the 1980 assumptions to be inaccurate, there is no new information that would invalidate the WIPP site. The increased understanding of the geologic and hydrologic characteristics of the WIPP site and the experience underground are, in fact, extremely useful in understanding the site and its environs, and the potential effects of waste storage on them.

A great deal of attention has been given to geological, geochemical, and structural issues during the post-FEIS studies.. Studies focused on the Salado Formation (i.e., those regarding the disturbed rock zone, brine inflow, and gas generation) will continue in the Test Phase.

Some of the problems considered in the FEIS or identified as a result of the Site and Preliminary Design Validation studies, or that have arisen since, have been dismissed as of no further concern. This is the result both of the additional field data obtained and of the decision not to dispose of high-level waste in the WIPP. These "problems" include karst, slurry formation, and waste heat.

Karst in the sense of large solution cavities does not exist in the Culebra at the site proper, although fractures do. (Where Culebra transmissivity values are greater than 10^{-6} square meter per second, these fractures are allowed for in the dual-porosity, radionuclide-transport model used in the SWIFT II code.) Evaporite dissolution is of two forms: stratabound (i.e., dissolution parallel to the bedding) and localized, due to vertical fluid movements. Studies indicate that stratabound dissolution will not reach the WIPP for many tens of thousands of years, and that localized dissolution (including karst) will not take place at the WIPP site during the present climatic regime.

Brine is flowing into the repository, but at a very slow rate (estimated at 1.6 milliliters per day per square meter). This inflow is expected to continue until pressures within the repository approach equilibrium with the surrounding environment. The interaction of brine inflow with waste to form a slurry is not likely, because the total volume of brine inflow before the void porosity is reduced to below 40 percent (the approximate minimum porosity required for slurry formation) will not provide a large enough proportion of brine to waste to create a slurry. Furthermore, the waste will not be in the form of small particles, as needed to form a slurry. (The material in Subsection 5.4.2.4 on the potential for slurry formation has been rewritten.)

The issue of waste heat has also been dismissed as of no further concern, because the heat output of the TRU waste to be disposed of in the WIPP is very low; therefore, temperature effects will not arise. Even the RH-waste canisters will, on the average, only produce about 1 watt of heat per canister at installation. After 100 years, most of the fission products will have decayed away, and the average heat output will be down to 0.5 watt per canister. (See the response to comment 7.14-12.)

The new data affirm that the potential brine reservoir in the Castile is only of concern in the event of human intrusion. The Castile Formation is separated vertically from the repository by about 200 meters of evaporites, and the development of a natural connection between the Castile and the repository is unlikely. (See the response to comment 7.8-6.)

Gas is expected to be generated when the waste decomposes and the waste containers corrode. Given the total gas volume anticipated and the total storage volume available, the gas pressures in the repository horizon could approach lithostatic pressure. In fact, it is conservatively assumed as a basis for the studies that will take place in the Test Phase that 1) in the absence of engineering modifications, gas pressures will approach lithostatic and therefore be of concern; and 2) the efficacy of proposed engineering modifications to waste and backfill in absorbing brine and waste-generated gases must be demonstrated.

A disturbed rock zone (cracking) does exist around the repository. A disturbed rock zone is a common response to underground mining, and normally it necessitates remedial maintenance to protect workers and to stabilize the openings. In addition, the DOE recognizes that the existence of a disturbed rock zone will complicate sealing of the repository. This concern will be specifically addressed during the Test Phase. (See the responses to comments 7.7.2-1 and 7.7.2-5.)

7.8-8 **Comment**

The EEG commented that calculations made in its report EEG-11 (Channell, 1982) should not be construed to indicate compliance with the EPA standards.

7.8-8 **Response**

The reference to Channell's 1982 publication was not intended to indicate that the WIPP complies with the EPA standards, only that there was agreement at that time with the location of the WIPP underground workings. A current assessment of the potential impact of the Castile pressurized brines with respect to the WIPP post-operational performance is presented in Subsection 5.4.2. However, that deterministic analysis should not be construed to indicate compliance or noncompliance with EPA standards (40 CFR Part 191).

7.8-9 **Comment**

The EEG commented that the "Disturbed Zone" boundaries identified in Figure 4.20 of the draft SEIS have become enlarged with each new encounter of a Castile brine reservoir. It said that there is no rational basis for the delineation of these zones and they should be abandoned.

7.8-9 **Response**

This figure was shown only as an introduction to the pressurized brine section. Regardless, this SEIS and the draft SEIS assume that brine is present in the Castile Formation beneath the WIPP emplacement panels.

7.8-10 **Comment**

The EEG commented that the work of Stormont et al. (1987) is cited on pages 4-22 through 4-25, but not referenced at the end of the chapter.

7.8-10 **Response**

The Stormont et al. (1987) document cited in the text has been added to the reference list at the end of the chapter.

7.8-11 **Comment**

The EEG stated that the development of the concept of Salado salt as a saturated medium should be described and the work of Bredehoeft (1988) should be cited.

7.8-11 **Response**

The inherent assumption made in Subsection 4.3.2 regarding estimates of brine inflow into the repository was that the Salado salts are saturated, and the text of this subsection has been modified to say that the formation may be saturated. The qualification "may" is used because of the very low permeability environment, within which it may not be possible to determine if the system is fully saturated. Bredehoeft's paper is now cited.

7.8-12 **Comment**

The EEG commented that the discussion of gas permeability on page 4-20 should include estimates of the expected amounts of gas and the pressure to be reached, and if a modification to the waste form is required to reduce the amount of gas produced, the environmental impacts should be discussed.

7.8-12 **Response**

Subsection 5.4.2.4 describes the amounts and types of gases that current estimates indicate may be generated. These gas-generation estimates conservatively assume brine saturation.

There have been a number of comments on various specific waste treatments (see comments and responses 7.15-1 and 7.15-2). A DOE task force is studying the feasibility of various alternatives for waste treatment and engineered barriers. The task force may identify some alternatives that promise to be useful and whose performance may be examined in bin-scale tests; these would be incorporated into Phase III of the bin-scale experiments (Appendix O).

The decision on which waste treatments, if any should be required for waste to be disposed of at the WIPP, will be made on the basis of data to be obtained in the Test Phase. The environmental impacts of these possible treatments will be analyzed in the SEIS to be prepared prior to the Disposal Phase. Section 6 discusses possible treatments and other engineering modifications that could mitigate the effects of gas generation.

7.8-13 **Comment**

The EEG commented that relocation of the repository (page 4-60) and the report by Channell should be attributed to the EEG.

7.8-13 **Response**

The sentence at issue has been changed to read as follows: "The major reason for this reorientation was to accommodate a request from the EEG." The Channell report (EEG-11) (Channell, 1982) was already properly cited in the text.

7.8-14 **Comment**

A group of commenters stated that the FEIS does not accurately describe the hydrology, given the findings since 1980, and should not be referenced as providing detail in the SEIS.

7.8-14 **Response**

The understanding of the regional hydrology described in Section 7.4 of the FEIS (DOE, 1980) has not changed qualitatively, except for the increased appreciation of the roles of the fracturing, effects of variable fluid density, and an unsteady-state hydrologic setting. The understanding of the site and vicinity-specific hydrology is more complete then it was in 1980. A more complete, detailed, and complex portrayal of the WIPP hydrology than was possible in 1980 is presented in Subsection 4.3 of this SEIS.

7.8-15 **Comment**

The EEG stated that Subsection 4.3.3.4 should refer to Chapman, 1988 (EEG-39) and Ramey, 1985 (EEG-31) to describe the geochemistry of the Rustler Formation, especially since Siegel et al., 1988 has not yet been published.

7.8-15 **Response**

The Chapman (1988) and Ramey (1985) citations and a summary of their thoughts have been added to Subsection 4.3.3.4.

7.8-16 **Comment**

A group of commenters stated that studies by the EEG and other independent scientific groups receive no attention whatever and that the draft SEIS relies on studies by the DOE and its subcontractors.

7.8-16 **Response**

Studies and data interpretations performed by independent scientific groups such as the EEG have been added to Section 4. The following reports have been added: EEG-23 (Neill et al., 1983), EEG-31 (Ramey, 1985), EEG-35 (Chapman, 1986), and EEG-39 (Chapman, 1988).

7.8-17 **Comment**

A commenter asked what the effects of filling Brantley Dam on the WIPP site would be.

7.8-17 **Response**

There will be no effects on the geologic and hydrologic systems at the WIPP. Brantley Dam is situated in the Capitan Reef Limestone, which is located north of Carlsbad on the Pecos River, while the WIPP site is situated in the northern Delaware Basin. The Capitan Reef forms the northern terminus of the Delaware Basin and is located approximately 10 miles from the WIPP. The Capitan Reef is stratigraphically at the same level as the relatively impermeable Castile Formation, resulting in little or no hydraulic connection between the Capitan Reef and the Delaware Basin. Brantley Dam may cause a localized increase in recharge to the Capitan aquifer, but this would occur more than 40 miles northwest of the WIPP, and even the Capitan aquifer closer to the WIPP will likely experience little effect from the recharge.

7.8.1 SALADO FORMATION

7.8.1-1 **Comment**

A group of commenters stated that Marker Bed 139 could provide a migration pathway for contaminants and that the draft SEIS should more accurately predict the potential environmental impacts. The commenters also stated that potential mitigation techniques are not adequately analyzed.

7.8.1-1 **Response**

The discussion of the potential impacts of the DRZ presented in the SEIS has been expanded as a new Subsection 4.3.2.4. The significance of Marker Bed 139, Marker Bed 138, and other aspects of the DRZ, with respect to potential migration pathways, will be completely evaluated during the Test Phase. Additionally, the impacts of fracturing in the DRZ without mitigation has been considered as a part of the new Case IC simulation, which is presented in Subsection 5.4.2.5 of this SEIS. Also, see the response to comment 7.8.2-1.

7.8.1-2 **Comment**

Commenters expressed concern that due to decomposition and gas generation, temperatures within the repository will rise and affect the rates of salt creep and closure.

7.8.1-2 **Response**

The waste emplaced in the WIPP will generate heat because of radioactive decay and because of the chemical processes of corrosion and bacterial decomposition. An average canister of RH TRU waste will generate about 1 watt of decay heat. CH TRU waste generates a somewhat smaller amount. Heat generated by chemical and bacterial processes will be small in comparison. Thus, the effects of heat generation are principally those due to decay heat. These effects are small and will not have a significant effect on salt creep and closure rates.

7.8.1-3 **Comment**

A group of commenters stated that the draft SEIS provides a totally inadequate analysis of the impacts of WIPP underground construction on site characteristics.

7.8.1-3 **Response**

This SEIS includes a new Subsection 4.3.2.4 describing the development of fractures in the DRZ. The DRZ has developed as a consequence of mining activities.

7.8.1-4 **Comment**

A group of commenters asked how accurate the hydraulic conductivities are in "assuming" a Darcy flow model and a porous and elastic medium.

7.8.1-4 **Response**

Long-term performance simulations assume that the repository is saturated. The "assumption" that Darcy flow is the dominant flow condition, and that a porous and elastic medium is present, is the most conservative brine inflow conceptual model. Under Darcy flow assumptions, the long-term or steady state brine inflow does not decrease to zero; under "non-Darcian" flow assumptions, long-term inflow may be reduced to zero flow at some time. The DOE recognizes, however, that the assumption of Darcy flow may not be conservative with regard to the capacity of the WIPP to dissipate internally generated gas. Also see the response to comment 7.8.1-5.

7.8.1-5 **Comment**

A group of commenters stated that the hydraulic characteristics of the Salado have not yet been clearly defined and that the environment could not be assessed. Areas of uncertainty referred to include:

1) the nature of the driving mechanism for brine flow
2) presence of a gas-driven, two-phase behavior
3) whether a porous-medium Darcy flow is the predominant process.

7.8.1-5 **Response**

It is agreed that the hydraulic characteristics of the Salado Formation have not been fully characterized. Within the scientific investigation process, it is common to determine, as more data are collected, that additional data are needed to "fine tune" the conceptual model of the system that is being studied. The Test Phase will include studies that address hydraulic uncertainties such as 1) the nature of the driving mechanism of the brine flow; 2) the presence of a gas-driven, two-phase behavior; and 3) whether a porous-medium Darcy flow system realistically models Salado halites. Present data are more consistent with Darcian flow (Nowak et al., 1988). It should be noted that with respect to the latter, the Darcy porous-medium flow system, which is assumed for brine inflow calculations, is the most conservative of the conceptual brine inflow models, but may not be conservative concerning gas generation and dissipation.

7.8.1-6 **Comment**

A group of commenters inquired why very different pressures were recorded in boreholes in similar materials (silty claystone), depths, and testing procedures and suggested that the results indicate a higher degree of structural variability in the Rustler Formation.

7.8.1-6 **Response**

The test boreholes referred to are located in a claystone of the unnamed lower member of the Rustler Formation. This specific unit was not part of the data input into the transport model scenarios run for the Culebra Dolomite. It was, however, included conceptually as an underlying confining unit.

Also, there is no reason to believe that a certain amount of anisotropy would not occur, even within the same unit and especially within a fine-grained unit such as a claystone. Additional consideration of the potential for vertical fluid flow within the Rustler is presented in Haug et al. (1987) and Davies (1989).

7.8.1-7 **Comment**

A group of commenters commented that fluid-pressure profiles in Figure 4.9 at the 782-foot and 850-foot levels of the waste-handling shaft may not be reliable because of possible equipment malfunctions. The commenter states that the entire testing process is questionable and unreliable if the equipment does not function consistently.

7.8.1-7 **Response**

Acceptable simulations were achieved for most of the tests (Saulnier and Avis, 1988). The formation pressures were determined from relatively short tests, and, therefore, there are some uncertainties in the results. The results of all the test analyses, nonetheless, indicate a pattern in which the formation pressures generally increase from the waste-handling shaft into the formations. Also, the fluid pressures referred to are those related to long-term hydraulic pressure loads, not short-term stresses caused by testing.

7.8.1-8 **Comment**

Commenters asked what would be the impact if current Salado permeability estimates are off by orders of magnitude; far-field conditions have been characterized from what is admitted to be "limited data base."

7.8.1-8 **Response**

The Salado permeability testing results presented in the FEIS were based on drillholes advanced from the surface. It is now recognized that the hydraulic testing methods used during that time period were inadequate for measuring the extremely low permeabilities of the Salado Formation. Those measurements were made using oil-field-type instruments at the bottom of 2,000-foot deep holes. The more recent underground testing has been done using newly designed equipment with double packers, etc., in boreholes advanced from the WIPP underground facilities into the undisturbed Salado outside of the DRZ. This testing has yielded far-field permeabilities that range from 10^{-20} to 10^{-22} square meter. These values are 3 to 4 orders of magnitude less than those inferred from surface borehole tests. Further testing is ongoing and will continue during the Test Phase. If the far-field permeabilities of halite differ from those known now, they will almost certainly be even lower. Experience indicates that the farther into the tunnel and shaft walls the measurements are made, the lower the permeabilities are. Moreover, the earlier data interpretations did not include the effects of test-hole closure, which, when taken account of, decreases the inferred permeabilities. Lower permeability values would lower the estimates of long-term brine inflow. Gas pressure estimates presented in this SEIS would not be modified by lower permeabilities, given that these estimates already assume no dissipation beyond the DRZ. However, it should be noted that the far-field permeability of Marker Bed 139 may be 1 to 3 orders of magnitude higher than that of the far-field halite. The possible impacts of this are being and would continue to be investigated during the Test Phase.

7.8.2 CASTILE FORMATION

7.8.2-1 **Comment**

Comments were received concerning the presence of pressurized brines in the Castile Formation underlying the WIPP facility. One issue is that the brine will "erupt" and infiltrate the repository as a result of human intrusion or other means, resulting in aquifer contamination and/or flow of contaminated brine at the surface. The following comment is representative: "When a similar pocket was breached under the original WIPP site in a nearby location, millions of gallons [of brine] flowed to the surface." A commenter pointed out that the draft SEIS states that there is potential for pressurized brine to occur within the Castile in one sentence, and several paragraphs later the draft SEIS states that the brine reservoirs contain 630,000 and 17,000,000 barrels of brine. Others said that seismic activity and the resulting fractures may create hydraulic interconnections.

7.8.2-1 **Response**

The presence of pressurized brines within the Castile has been recognized and investigated. The estimate of brine reservoir volumes stated above are from ERDA-6 and WIPP-12 and are considered to be localized pockets of ancient sea water at or near salt saturation with no modern recharge. Based on data from a combination of drill holes and geophysical studies, pressurized brines within the Castile are assumed to be present beneath a portion of the WIPP waste-emplacement panels. The geophysical study, however, only indicates that there is an area underlying the repository that exhibits nonuniform response. It does not confirm the presence of brine.

Castile brines are of concern only in the event of human intrusion because they are separated from the repository horizon by approximately 200 meters of evaporites. The development of a continuous natural connection such as a fracture with a sufficiently high hydraulic conductivity or a large enough area is considered extremely unlikely, particularly if the connection must penetrate to the Castile in order to intercept a brine pocket.

Given the evidence for hydrologic isolation (i.e., the thickness of evaporites between any possible brine reservoir and the WIPP), and given that this condition has existed for about half a million years, pressurized brine in the Castile, in the absence of human intrusion, would not appear to affect the suitability of the WIPP site. However, a wellbore that penetrates a pocket would indeed provide a connection (Cases IIA, IIA[rev], IIB, IIC, IIC[rev], and IID in Subsection 5.4.2.6). These cases present four scenarios that address the penetration of the repository and an underlying Castile brine pocket by boreholes. Steps such as permanent records and markers on the site, maintenance, and surveillance will be taken to prevent human intrusion, although no credit is taken in this SEIS for these measures. Refer to Subsection 4.3.4.2 in this SEIS and Subsection 3.4.3.2 in Lappin et al. (1989) for additional discussions of pressurized brines.

Seismic activity at the WIPP site is low; see FEIS Subsection 7.3.6.

7.8.2-2 **Comment**

Commenters noted that drillholes abound in the area and could provide a release pathway for migration of radioactive waste offsite. Also, some unknown old boreholes might be present in the site area.

7.8.2-2 **Response**

The present WIPP site was selected on the basis that a minimum 1-mile "standoff" distance would be present between any boreholes and the repository horizon. This determination was made through evaluation of reliable records. Exploratory drilling in this basin began only a few decades ago, after government agencies had begun keeping careful records of drillholes. Since the WIPP site selection, holes DOE-1, DOE-2, WIPP-12, WIPP-13, and ERDA-9 have been drilled within the site area through the repository horizon. It is unlikely that unidentified boreholes penetrating the repository horizon are present in the site area, because in this arid area, signs of drilling activity are very obvious. The closest drillhole, ERDA-9, was drilled as part of the WIPP project; it will be sealed using the same methods used to seal the four shafts. See also the response to this comment in the 1980 FEIS, Subsection 15.12.

7.8.2-3 **Comment**

Several commenters noted that the draft SEIS states that a recent origin was postulated for the pressurized brines. This implies dissolution. The commenters then wanted to know if there was an analysis of future hydrologic shifts.

7.8.2-3 **Response**

The statement "relatively recent" refers to the results of Lambert and Carter (1984). They believe that the brines were emplaced in their present setting in the ERDA-6 and WIPP-12 "reservoirs" between 360,000 and 800,000 years before present, rather than as ancient seawater that would be of Permian age (230 million plus years before the present).

The matter of possible changes in hydrology is discussed in Subsection 4.3.3.

7.8.2-4 **Comment**

Regarding the variability of the Castile Formation's thickness, several commenters noted DOE's concession that localized dissolution could be a cause of this variability. They say that this is another undocumented DOE assumption with no reference.

7.8.2-4 **Response**

The references describing the documented evidence are included in this SEIS but will also be listed here: Lambert, 1983; Borns and Shaffer, 1985.

7.8.3 **BELL CANYON FORMATION**

7.8.3-1 **Comment**

A group of commenters questioned a draft SEIS reference to Lappin (1988) that argues that if a breach interconnecting the Rustler and Bell Canyon occurs, local dissolution of the Salado would occur, so that the intruding fluids would become a saturated brine solution, and downward flow from the Culebra would result. The commenters stated that there is no consensus that this "assumption" is true. They stated that waste-generated gas pressures could drive fluids both up and down.

7.8.3-1 **Response**

The occurrence of an upward driving force from a formation underlying the Salado, along a pathway caused by human intrusion is identified and discussed in Subsection 5.4.2. Specifically, the Case II transport simulation evaluates four potential scenarios in which a borehole penetrates the repository and an underlying Castile brine pocket down to the Bell Canyon Formation. Certainly, the consequence of intersecting the Bell Canyon and Rustler, in the absence of a Castile brine reservoir, is subsumed in the Case II calculations. The conclusion of downward flow to the Bell Canyon is based on relative heads and brine densities, and is not a simple "assumption."

7.8.3-2 **Comment**

A group of commenters stated that the draft SEIS cites Site and Preliminary Design Validation studies that were based on poor and limited data, and asked why the studies were referenced since they are inaccurate.

7.8.3-2 **Response**

The citation was improper. It should have referred to Wood et al. (1982) and has been changed in the text to reference the proper publication.

7.8.4 RUSTLER FORMATION

7.8.4-1 **Comment**

Some commenters said that the Mescalero Caliche and the underlying sandstones allow rainwater recharge to the Rustler aquifers.

7.8.4-1 **Response**

Both stable-isotope and radioisotope studies have been used to estimate the relative importance of vertical fluid flow within the Rustler Formation and Dewey Lake, Red Beds, and the extent to which the Rustler flow system is in a transient state. The results of these studies indicate that vertical recharge to the Rustler is not active at the WIPP site. Isotope data indicate that the water currently present in the Rustler originated from recharge that occurred during the last Pluvial event, 10,000 to 20,000 years before the present. Uranium disequilibrium studies indicate that modern flow directions within the Rustler Formation do not reflect flow from a modern recharge area to a modern discharge area, but rather reflect a recharge-and-discharge cycle. Four radiocarbon ages calculated using samples from the WIPP area indicate that these waters were isolated from the atmosphere at least 12,000 to 16,000 years ago. The Rustler flow systems are not at a steady state, but are instead in a transient discharge phase following a late-Pleistocene recharge event. Refer to Subsection 4.3.3 in this SEIS and Section 3.3 in Lappin et al. (1989).

7.8.4-2 **Comment**

Some commenters said that the rate and direction at which the Rustler aquifers flow around the site are not known with any certainty. However, they noted, the draft SEIS states there will be no problems as a result, and fails to address the issue of aquifer flow adequately.

7.8.4-2 **Response**

Currently, five water-bearing units have been identified within the Rustler, and all have been studied. The Culebra Dolomite of the Rustler is the first laterally continuous unit located above the WIPP facility to display hydraulic conductivity of any significance. This aquifer and the others have been extensively tested, and the aquifer flow rates and directions are described in Subsection 4.3.3. The analysis leading to this description took account of dual-porosity flow (i.e., took account of the effect of fractures), density (salinity) variations, and the possibility of transient conditions in the Rustler (Lappin et al., 1989, Section 3.3).

The flow system within the WIPP site and vicinity is understood well enough to predict potential migration rates of radionuclides to a distance of 5 kilometers, which is within the EPA definition of the accessible environment.

7.8.4-3 **Comment**

A commenter said that on page 4-50, Subsection 4.3.3.3, the draft SEIS states: "Double-porosity behavior can be considered dominant wherever the Culebra has transmissivities greater than 10^{-6} m^2/s" (Beauheim 1987c). The Environmental Protection Agency observed, "If contaminants are able to reach sections of the Culebra where transmissivities exceed this value, fracture flow may allow higher velocities of contaminated groundwater, permitting it to reach the accessible environment much sooner than expected. How does the DOE intend to address and analyze the dual porosity phenomenon?" Other commenters expressed concern over the waste transport pathway provided by the Culebra.

7.8.4-3 **Response**

Dual porosity behavior is explicitly included in all of the Case-II radionuclide transport calculations in this SEIS. Specifically, it is assumed in these calculations that the predominant groundwater flow is within fractures, and that all radionuclides are initially confined to fractures (see Subsection 5.4.2.6 in this SEIS and Lappin et al., 1989, Section 7.3).

7.8.4-4 **Comment**

Some commenters were concerned about the transmissivity characteristics of the Rustler formation, specifically the Culebra Dolomite. They pointed out a statement made in the draft SEIS as corroboration of their concerns: "Characterization of the Rustler Formation since the FEIS has provided considerable evidence regarding the potential for dissolution at the WIPP." They said that some studies which would provide different viewpoints regarding the inactivity of the vertical recharge to the Rustler were not cited in the draft SEIS. One commenter said that as more information is gained, the WIPP appears more unfavorable.

7.8.4-4 **Response**

This statement was taken out of context. This subsection goes on to state that this "considerable evidence" indicates that dissolution potential is very low. Also, see the responses to comments 7.7-3 and 7.7.2-4.

7.8.4-5 **Comment**

Several commenters stated that evaluation of the final multipad test is "still underway," and questioned the use of "preliminary" results.

7.8.4-5 **Response**

Since publication of the draft SEIS, evaluation of the H-11 multipad hydraulic test of the Culebra Dolomite has been completed. This SEIS provides a modification of the Culebra transmissivity distribution as a result of an analysis of the H-11 multipad interference test. These changes are relatively minor (see Subsection 4.3.3.2), but have resulted in some change in flow path and have slightly increased the path length between the intrusion well and the hypothetical stock well. This revised transmissivity distribution is used for the calculation of Cases IIA(rev) and IIC(rev). The multipad interference tests were completed using state-of-the-art design and instrumentation. From the standpoint of providing reliable, large-scale hydraulic parameter estimates, the tests clearly provide adequate data. At the time the draft SEIS was published, data from two of the multipad tests (H-3 and WIPP-13) had been evaluated; data from multipad test H-11 had only been evaluated on a preliminary basis. Detailed interpretation of the results of the H-11 multipad tests will be described in La Venue et al. (1988).

7.8.4-6 **Comment**

Commenters stated that testing limitations of single-hole hydraulic tests are described in Subsection 4.3.3.2 of this SEIS, yet their impacts are not fully addressed.

7.8.4-6 **Response**

The single-hole hydraulic tests provide only a localized measure of the hydraulic parameters at the point of the test. The single-hole and single-pad tests, therefore, provide hydraulic parameter data points that are used in conjunction with the results of the larger scale testing (conducted as part of the multipad interference tests) to develop transmissivity distribution maps, as shown in Figures 4.18 and 4.18a. The approach taken to interpolate and extrapolate between individual data points is described in Haug et al. (1987) and LaVenue et al. (1988), and is summarized in Lappin (1988).

7.8.4-7 **Comment**

A commenter said that the draft SEIS states that the Culebra fluids are partly buffered by the dissolution of rock salt and that accessory minerals are disturbed heterogeneously both horizontally and vertically. The commenter asked why then the hydraulic conductivity (flow) is assumed to be vertically homogeneous.

7.8.4-7 **Response**

Subsection 4.3.3.4, referred to by the commenter, indicates that the Culebra fluids are in equilibrium with gypsum/anhydrite and carbonate, but are unsaturated with respect to halite. However, 85 percent of the unit is composed of relatively pure dolomite and is much less sensitive to dissolution than rock salt (see Subsection 4.3.3 for a discussion of karst development).

While accessory minerals are distributed heterogeneously both horizontally and vertically, the correlation between the mineralogy and hydraulic properties of a unit such as the Culebra Dolomite is not necessarily direct or even present. Furthermore, the assumption of vertical homogeneity of hydraulic conductivity is valid for flow and transport modeling. These models rely on the overall, total properties of the Culebra through its entire thickness as expressed in its transmissivity, not on how these properties vary through the section.

7.8.4-8 **Comment**

Commenters said that the draft SEIS states that "the degree to which brecciation may have caused enhanced transmissivity or decreased the effectiveness of the confining beds . . . is not clear from the available evidence," and stated that it is important to know to what degree or why the two formations (the unnamed lower member of the Rustler and the upper Salado) are hydraulically continuous.

7.8.4-8 **Response**

To the west and southwest of the WIPP, rock salt is absent from the upper Salado and lower Rustler. Brecciation has been observed to the west in Nash Draw, but not in the area of the site. Transmissivities in these areas where dissolution of the upper Salado has occurred are on the order of 10^{-9} square meter per second, still several orders of magnitude lower than in the Culebra. Thus, horizontal flow in the Culebra would still be the dominant horizontal flow path in the Rustler in the site area.

7.8.4-9 **Comment**

Commenters stated that modeling of the Culebra Dolomite hydrologic system has undergone dramatic changes since the 1980 FEIS, and the flow system is known to be more complex. They asked what if the flow system is even more complex than our current understanding, and subsequently invalidates our current model?

7.8.4-9 **Response**

Both the conceptual model and the data available for modeling of groundwater flow and radionuclide transport of the Culebra Dolomite have undergone significant changes since the FEIS. This is to be expected as more detailed hydraulic data have become available. As stated in the SEIS, the model now incorporates the double-porosity flow characteristics. Characterization of the Culebra Dolomite is now complete, and the modeling efforts reflect these data. The double-porosity model is still valid, and the results of flow and transport simulations are presented in Subsection 5.4.2.6. Changes with respect to the hydraulic characteristics as known at the time of the draft SEIS and presented in this SEIS, due to completion of the H-11 multipad interference hydraulic tests, are minimal. These changes are discussed in Subsection 4.3.3.2. The statistical estimation of uncertainties with respect to Culebra properties, as interpreted for purposes of numerical modeling, is discussed in Haug et al. (1987) and LaVenue et al. (1988).

7.8.4-10 **Comment**

A commenter was concerned that the DOE continues to use unproven models to determine Culebra flow and transport characteristics and admits there are data gaps regarding Culebra flow characteristics but continues to reinterpret data. The commenter asked how many different interpretations are possible and which is correct?

7.8.4-10 **Response**

The models used to make long-term predictions are state-of-the art models generally accepted in the scientific community. The expanded version of SWIFT II was used for the revised Case II transport simulations (Cases IIA[rev] and IIC[rev]) presented in Subsection 5.4.2.6). The expanded version includes the complete calibration to all transient events (i.e., the shafts, the multipad tests, and the H-3 and H-11 tracer tests) for the flow simulation portion of the model. This two-dimensional treatment models the flow and radionuclide transport more realistically than was possible in the draft SEIS.

Evaluation of the H-11 multipad hydraulic tests is complete and has been incorporated into the model. The changes in transmissivity distribution as a result of the H-11 evaluation are presented in Subsection 4.3.3.2.

7.8.4-11 **Comment**

A group of commenters stated that calculations of apparent and effective transmissivity and storativity have been based on an assumption of homogeneous properties between WIPP-13 and a given observation well, as well as radial flow into WIPP-13. They asked what the assumptions are based upon.

7.8.4-11 **Response**

The inherent assumptions used in analytical methods of hydraulic stress test analysis (i.e., solutions of differential flow equations) include radial flow and homogeneous properties between the test well and observation wells (e.g., Beauheim, 1987a, 1987b). These are not completely justifiable assumptions, as noted by Beauheim. However, results based on these assumptions are sufficient to help calibrate more detailed numerical calculations which do not assume radical flow or homogeneous properties between wells. Inverse simulations (numerical modeling) of response to hydraulic stress tests take into account inhomogeneities in the natural system and provided input to the transmissivity distribution maps presented in Subsection 4.3.3.2 (Figures 4.18 and 4.18a). These hydraulic stress test evaluation approaches are accepted by the scientific community as the most effective evaluation methods.

7.8.4-12 **Comment**

Commenters said that the draft SEIS states that a porous-flow numerical approach is used to model Culebra fracture systems on a regional scale. The commenters stated, "These modeling efforts indicated that dual-porosity methods of . . . simulation are not needed at a regional scale." They believe this situation to be subject to very different interpretations.

7.8.4-12 **Response**

It is pointed out in Subsection 4.3.3.3 of the draft SEIS that where transmissivities exceed 10^{-6} square meter per second in the Culebra, dual-porosity behavior can be considered dominant. The SWIFT II code, which is used for the flow and transport calculations presented in Subsection 5.4.2.6, simulates double-porosity flow and transport. More specifically, dual-porosity calculations have indicated that a dual-porosity approach is not required to model the flow system pressure response on a regional scale. However, it has been demonstrated that a dual-porosity model is required in order to evaluate radionuclide transport on a WIPP site scale.

7.8.4-13 **Comment**

Commenters stated that water-level or fluid-pressure measurements of the unnamed lower member of the Rustler are largely unreliable.

7.8.4-13 **Response**

This is true; only those data collected at wells where unit transmissivities exceed 6×10^{-14} square meter per second are considered reliable. However, given the very low transmissivities of the lower member, it is of little consequence that the potentiometric surface of the lower member of the Rustler Formation is not well defined. The preferred lateral pathway is the Culebra Dolomite.

7.8.4-14 **Comment**

A commenter said that the draft SEIS states that the hydraulic head distributions in the Rustler Formation indicate that the flow systems are not steady state but in transient state following a major recharge event during the last pluvial period. The commenter is concerned that there is no analysis of future recharge events or their potential effects on flow systems.

7.8.4-14 **Response**

As both this SEIS and the FEIS state, the Rustler Formation was recharged during a pluvial period on the order of 10,000 to 20,000 years before the present.

At the present, long-term climatic models are highly uncertain. There is some concern that the trend will be toward hotter dryer conditions (the "greenhouse effect"). In this case, the present model and assumptions concerning the absence of vertical recharge would be reliable. Alternatively, if cooler and/or wetter conditions develop, and if local precipitation and surface infiltration increase sufficiently, then at some point vertical recharge directly to the Rustler Formation might be possible. This possibility will be examined through modeling studies and studies of the paleoclimatic variations that have taken place in southeastern New Mexico (Bertram-Howery and Hunter, 1989a).

If direct vertical recharge does occur, geochemical data indicate that the Rustler flow systems will become more easterly, because of re-established recharge conditions in Nash Draw.

7.8.4-15 **Comment**

Commenters said that independent scientists [Scientists' Review Panel (SRP)] have arrived at different interpretations regarding recharge to the Rustler Formation and that the interpretations were not cited in the draft SEIS.

7.8.4-15 **Response**

Subsection 4.3.3 has been expanded to include a summary of the differences in interpretation of the overall nature of the hydrology of southeastern New Mexico between Lambert and Harvey (1987) and Chapman (1986)(EEG-35).

7.8.4-16 **Comment**

Commenters said the draft SEIS states that "the brine-bearing residue of the upper Salado may be hydraulically continuous with the siltstone of the Rustler unnamed member." The commenters said that this is a euphemistic way of admitting flow between the formation in which the facility is located and the formation known to bear the most water and the highest risk of off-site migration. The commenters also said that the effectiveness of the confining beds is thus in doubt, and they asked why there are no analyses.

7.8.4-16 **Response**

There are approximately 1,300 feet of effective vertically non-transmissive beds (predominantly halite, anhydrite, and claystone) between the repository and the bottom of the unnamed lower member of the Rustler Formation. In addition, there is approximately another 100 feet of very poorly conductive mudstone and silty material between the base of the unnamed member and the Culebra Dolomite. There was no "euphemistic" admission that vertical flow, under undisturbed conditions, between the repository and the Culebra Dolomite, was of any significance.

7.8.5 BRINE FLOW AND PERMEABILITY

7.8.5-1 **Comment**

Several commenters expressed concern over the possibility of the brine flowing into the storage panels, mixing with the waste, forming a radioactive slurry, and then migrating to the local aquifers and contaminating drinking water resources. For example, a commenter said, "Brine could mix with waste to form a sort of 'radioactive slurry' which could then migrate off-site and contaminate nearby water supplies."

7.8.5-1 **Response**

A slurry is a suspension of firm particles in liquid that has zero or nearly zero shear strength and is easily transported by the liquid. The formation of a slurry within the repository (i.e., the entrainment of radioactive waste in brine) is not considered possible under undisturbed conditions (i.e., no intrusive activity by man), simply because the repository is expected to reach a state of sufficient compaction (less then approximately 40 percent) well before there is any significant possibility of its becoming saturated with brine.

Even with intrusive activity, the potential to produce a salt, waste, and brine slurry within the waste-emplacement zone is very slight. The porosities of the waste and backfill would need to be at least 40 percent under saturated conditions for a slurry-type environment to be present (slurry transport in pipelines is not possible until this condition is reached), assuming that a critical porosity is achieved at 40 percent. Room closure estimates indicate that 40 percent combined porosity of waste and backfill will be achieved at approximately 30 years after backfill emplacement. To achieve slurry-type conditions, 900 cubic meters of brine (the pore volume) would be required in a given room (only partially closed by salt creep at that time.) That would require over 20 gallons per day of brine per room for a period of 30 years. This represents an enormous increase in the amount of brine inflow predicted (a maximum of 5.5×10^{-4} gallon per day) and observed in controlled experiments underground. Without this volume of brine, the backfill would continue to consolidate, and would shortly be at a state where a slurry environment could not possibly occur.

This analysis does not include consideration of internal gas generation or pressurization. However, the present understanding of the relationship between gas generation and structural closure is that, even assuming the high gas generation rates estimated in the draft SEIS, closure will occur independent of gas generation in 60 to 200 years. At later times, the permeability of waste and backfill appear to be sufficient to allow gas release without rebound or re-expansion to the higher porosities initially present.

See also the response to comment 7.14-53.

7.8.5-2 **Comment**

Commenters expressed concern that the brine flowing into the repository will mix with the stored waste and migrate offsite and contaminate the local aquifer. One representative comment questioned the "schedule for WIPP's opening despite many unresolved issues--including geotechnical questions about the site's suitability raised by brine seepage and brine reservoirs." Another commenter stated, "WIPP may not be safe for nuclear waste disposal. There is evidence that WIPP may not be able to contain radioactive materials. Scientists have revealed that brine is seeping into the underground salt chambers and that there is a large reservoir of pressurized brine directly beneath the site."

7.8.5-2 **Response**

A brine-saturated repository is not a fatal flaw in the performance of the facility. At some time during the post-operational period, the fluid pressures within the repository will equal those in the surrounding salt. At this time, any migration of fluids within the repository will follow the path of least resistance, which will probably be the sealed tunnels and shafts. Modeling of this projected condition indicates that under expected conditions (Case IA), potential migration of radionuclides from the waste emplacement panels will take approximately 4,800,000 years to reach the overlying Culebra aquifer (discussions of the post-operational performance are presented in Subsection 5.4.2.5 of this SEIS, and Section 4 and Section 6 of Lappin et al., 1989).

Brine is flowing at a very slow rate into the WIPP underground openings. Steady-state inflow has been estimated at 1.6 milliliter per day per square meter (Subsection 4.3.2.1). This inflow is expected to continue until the pressures within the repository approach equilibrium with the surrounding environment (i.e., approach lithostatic pressures either due to gas generation or brine inflow). To put the inflow rate in perspective, a conservative estimate of brine inflow indicates that approximately 40 cubic meters of brine will have flowed into a room in approximately 200 years. This volume is approximately 1 percent of the initial room volume.

See also the response to comment 7.8.5-6.

7.8.5-3 **Comment**

The EEG commented that page E-18 of the draft SEIS states that hole NG252 appears to be an anomaly because of its substantially higher rate of brine flow than other comparable holes. The EEG asked how real observation and measurements can be considered an anomaly.

7.8.5-3 **Response**

The word "anomaly" is used here in the ordinary dictionary sense of the word, that is, as something that deviates in excess of normal variation, or something outside the range that would normally be expected. "Anomaly" does not carry any connotation of "unreal" or "mistaken."

7.8.5-4 **Comment**

The EEG commented that several references and figures identified in Appendix E on pages 49 through 59 were not included in the draft SEIS.

7.8.5-4 **Response**

The citations and figures omitted from this subsection have been added to this SEIS.

7.8.5-5 **Comment**

The EPA called attention to pages 4-14 through 4-20, Subsection 4.3.2, saying that since brine inflow is a key parameter for assessments related to gas generation, permeability of the Salado Formation, and recognizing the difficulties in quantifying steady-state flow, the statement "steady-state conditions may be determinable only from many years of observation" suggests that the 5-year Test Phase may not be sufficient to adequately address this issue.

7.8.5-5 **Response**

The brine inflow estimates presented in Subsection 5.4.2.4 are based on data collected from the WIPP underground test holes over a period of 2 to 3 years. These data constitute the basis for extrapolating inflow to future times. The model normally used in this kind of extrapolation is Darcy flow, a widely accepted description of groundwater flow.

Darcy flow is flow that is linearly dependent on the hydraulic gradient, no matter how small the gradient. Non-Darcy flow could arise at the WIPP from boundary-layer interactions between the brine and the material through which it is flowing. This implies a permeability and hydraulic gradient below which there is no flow. Non-Darcy flow, therefore, implies a limit to the total amount of brine inflow. In Darcy flow, on the other hand, flow never reaches steady state; it continues forever. Extrapolation by assuming continuation of present-day rates and trends tends to over-estimate long-term flow rates, because inflow rates are continually decreasing. Darcy flow, therefore, is bounding.

The basic reason for wanting a longer period of observation is to reduce uncertainties in the input parameters used in the extrapolation of the long-term brine inflow, especially host-rock permeability. See the response to comment 7.8.1-8.

7.8.5-6 **Comment**

One commenter stated that he or she had seen pictures of the WIPP site with workers wading up to their waists in brine water that had seeped into the WIPP site itself.

7.8.5-6 **Response**

The DOE suspects that the photographs referred to by the commenter are associated with the drilling of the exploratory shaft in 1981 or the ventilation shaft in 1982. The exploratory shaft was drilled using brine as the drilling fluid. The ventilation shaft was drilled without lining the shaft in the Culebra Formation. The shafts are now sealed to prevent downward flow into the repository. The brine did not originate from the Salado Formation where the repository is located. The estimated average inflow into the repository is about 1.6 millimeters per day per square meter. In almost all cases, the brine is evaporated by the mine ventilation.

7.8.5-7 **Comment**

Several commenters stated that they believe brine inflow is not a problem.

7.8.5-7 **Response**

The DOE tends to agree with this comment. The current body of knowledge on brine inflow, as represented by the material reproduced in Appendix E, is consistent with this conclusion. Nevertheless, the DOE is continuing to evaluate the potential problems associated with brine inflow such as its generating gas by corrosion.

7.8.5-8 **Comment**

A group of commenters stated that the draft SEIS states that "an attempt to estimate thermodynamic data" was made by "extrapolating" and "arbitrarily changing" data on WIPP brine, and that "unfortunately, the procedures result in order-of-magnitude uncertainties." Nonetheless, the DOE proceeded to perform calculations regarding brine flow without using the most conservative ranges available.

7.8.5-8 **Response**

This comment refers to the draft SEIS section on Radionuclide Concentrations in Brines on page 5-126. This subsection explains that there are no thermodynamic data available in the literature for these elements (Am, Np, Pu, U, and Th) in solutions with ionic strengths as high as those of the Salado and Castile brines; thus, an estimate was made. It should be noted that Case I and Case II calculations investigate both the expected solubilities (10^{-6} molar) and, conservatively, the degraded solubilities (10^{-4} molar). The draft SEIS stated that laboratory experiments in the WIPP Test Phase will provide data on the solubilities and sorption of radionuclides under expected repository conditions. No revision is necessary for this final SEIS.

7.8.6 GAS PERMEABILITY AND STORAGE

7.8.6-1 **Comment**

Comments were received concerning the generation and storage of gas within the repository. Commenters were disturbed about the possibility of these gases mixing with radioactive material and rising or traveling to where they can infiltrate and contaminate the aquifers. One commenter was concerned that the gas pressure would prop open fractures in the disturbed rock zone and serve as a driving mechanism for contaminated brine to leave the site. Concerns regarding a "limited data base" for permeability and gas generation rates were also expressed.

7.8.6-1 **Response**

Because the permeability of the host rock has been found to be about 1,000 times smaller than supposed when the FEIS was published in 1980, gas generation is now thought to be worthy of serious study.

This SEIS uses a gas-generation rate of 2.55 moles per drum per year and a total gas production of 1,500 moles per drum. Four general regions within the WIPP repository can store gas: excavations, the disturbed rock zone, bedding planes, and shafts. Given the projected gas volumes, and if the fracture volume originally in the disturbed rock zone is available, the repository horizon would be able to store this gas without exceeding lithostatic pressure (Lappin et al., 1989, Table 4-8). Case IC examines the consequences if these fractures constitute a leak path past the tunnel and shaft seals. A major reason for emplacing CH transuranic waste during the WIPP Test Phase is to help assess gas generation and permeability. (Refer to Subsection 5.4.2.4, Gas Generation.) "Gas getters" (additives that remove gas) in the backfill are also under consideration as potential mitigators.

7.8.7 **WATER QUALITY**

7.8.7-1 **Comment**

The State of Nevada commented that "TRU waste is currently being stored aboveground in DOT shipping containers. It does not appear that there is any evidence for concern on groundwater impacts from storage (in Nevada), nor is there any current reason to believe that transportation to WIPP will have any groundwater impacts."

7.8.7-1 **Response**

No response Is necessary.

7.9 **WASTE INVENTORY**

7.9-1 **Comment**

A number of State agencies, interest groups, and individuals commenting on the draft SEIS, including the EEG and the State of Washington Department of Ecology, expressed concerns about the accuracy of waste identification in the TRUPACT-II SARP and WIPP Waste Acceptance Criteria (WAC) certification programs. In light of information in the Application and Affidavit for Search Warrant for the Rocky Flats Plant that alleges mismanagement of waste, many reviewers seriously questioned the likelihood that past or future certified waste would meet the requirements for safe transport and disposal. Specific comments include:

- The DOE should review its waste certification programs for the TRUPACT-II SARP and the WIPP WAC to ensure that all the QA/QC procedures for identifying and packaging of TRU waste are implemented, and should include independent oversight of all waste management activities at the generator facilities.

- The DOE should conduct a meaningful sampling and analysis program to accurately determine the nature and extent of hazardous chemical constituents in the TRU waste as part of its evaluation of the WIPP.

- The SEIS should verify the overall quantity of TRU waste and also the percentage that contains hazardous chemical constituents that will affect waste processing, storage, and disposal at the WIPP.

7.9-1 **Response**

The DOE has initiated additional steps to ensure accurate waste characterization and compliance with the WAC and other regulatory requirements. The DOE entered into an agreement with the State of Colorado in June 1989. Under this agreement, the DOE will accelerate existing programs and increase independent monitoring and oversight by Colorado officials. The DOE will increase the number of regulatory and safety compliance personnel at the facility and expand the comprehensive environmental audit program that reviews the performance and compliance with all existing State and Federal environmental laws. As more information becomes available, the DOE will update information on the quantities and hazards associated with hazardous and radioactive waste at the Rocky Flats Plant in documents such as the Radioactive Mixed Waste Compliance Manual (WEC, 1989a).

Based on suggestions from the Blue Ribbon Panel and others, the DOE is currently working with the EPA and State of Colorado to establish acceptable sampling and analysis procedures for mixed radioactive waste to verify information on the hazardous chemical constituents obtained through process knowledge. The DOE has conservatively characterized its waste by overestimating concentrations based on initial inventories of chemicals used in processes and classifying wastes as hazardous even if a chemical is present but expected to be in concentrations below regulatory limits (e.g., many extraction procedure [EP] toxic metals under 40 CFR Part 261, Subpart C) (WEC, 1989a). However, waste shipped during the Test Phase would be certified to comply with the WAC and other regulatory requirements. This certification would be based on real-time radiography, non-destructive assay, and other methods, along with limited sampling, such as for the bin-scale tests (see Subsection 5.2.1 and Appendix P). At the beginning of the Disposal Phase, the existing inventory would be recertified to ensure compliance with any revised criteria resulting from the Test Phase.

Previous and existing sampling programs at DOE facilities provide information about the physical and chemical properties of retrievably stored and newly generated TRU waste. Results from these sampling programs validate the accuracy and reliability of WAC certification of retrievably stored waste using existing records and process knowledge as the primary source of information, and with real-time radiography (RTR) and non-destructive assay (NDA) as verification techniques. For example, the Idaho National Engineering Laboratory has developed a sampling program which ensures that transportation requirements are met. This statistical sampling program is based on previous studies including the TRU Waste Sampling Program, a controlled study to estimate gas generation rates of CH TRU waste (Clements and Kudera, 1985), and the Stored Waste Examination Pilot Plant (SWEPP) Certified Waste Sampling Program.

The DOE has been working with the regulatory community to resolve compliance issues. The DOE has also been conducting a wide variety of environmental and health and safety audits at all of its facilities. The EEG, which provides independent oversight of DOE activities relating to the WIPP, has raised various concerns and has been involved in the review of the WIPP WAC for characterizing and certifying TRU waste as well as the WIPP operating procedures. The EEG also participates in the WIPP WAC and TRUPACT-II SARP compliance audits that are conducted at the generator facilities. The DOE is working to resolve these concerns.

Since Rocky Flats Plant mixed waste is representative of mixed waste from other facilities, as discussed in Subsection 3.1.1.2, the DOE believes this SEIS bounds any risk associated with the transport and handling of hazardous chemical wastes to be sent to the WIPP.

7.9-2 **Comment**

The EEG, the Attorney General of Texas, and others commented that various DOE documents describe the fraction of stored mixed waste as 60 percent to 90 percent.

7.9-2 **Response**

Based on the most current information (WEC, 1989a), approximately 60 percent by volume of the total TRU waste to be sent to the WIPP over 25 years is mixed waste that is subject to regulation under the RCRA. The confusion on the 90 percent number may result from the projection that newly generated waste from the Rocky Flats Plant and Rocky Flats Plant waste that is currently stored at the Idaho National Engineering Laboratory comprise 86 percent by volume of the total TRU mixed waste that has been reported by DOE generator facilities (WEC, 1989a).

7.9-3 **Comment**

A number of reviewers, including the Idaho Department of Health and Welfare, asked how the DOE will provide proper emergency response during the transport and handling of TRU waste if the hazardous chemical component is not known.

7.9-3 **Response**

DOE generator facilities will not send unknown radioactive mixed waste to the WIPP. The DOE will comply with all applicable requirements in the transport and handling of TRU mixed waste. A number of regulations as well as requirements established by the DOE prohibit the shipment and handling of unknown TRU waste destined for the WIPP.

RCRA regulations require that generators must determine whether or not the waste is a hazardous waste as defined in 40 CFR Part 261, Subparts C and D. RCRA regulations do not require the testing of waste, and state that such a determination may be made based on one's knowledge of the chemical processes that generated the waste (40 CFR 262.11). Upon determination by the generator that a waste is hazardous, it must comply with manifesting and pre-transport requirements listed in 40 CFR Part 262, Subparts B and C. A hazardous waste manifest is a form that identifies the hazardous waste that is being transported as well as the names of responsible persons. Pre-transport requirements include DOT requirements on the designation of hazardous materials for purposes of transport and describe the shipping papers, package marking, labeling, and transport vehicle placarding (49 CFR Part 172).

All TRU waste also must be certified as meeting the requirements of the WIPP WAC (DOE, 1989e). The DOE has established these criteria to ensure TRU waste forms that are compatible with the WIPP emplacement and isolation requirements. One of these criteria is that the generator must identify, with the proper DOT labels, waste packages containing hazardous waste. This will provide another level of verification of compliance with the DOT regulations.

Any waste that cannot be certified to meet all of the regulations and requirements discussed above will not be transported to the WIPP without prior processing and/or identification of the hazardous waste. DOE personnel at the generator facilities and the WIPP, truck or railroad personnel involved in transporting TRU waste, and any emergency responders will know what hazardous materials are being transported and handled as required by the appropriate regulations.

7.9-4 **Comment**

The EEG commented that the process for modifying the inventory as given in Table B.2.14 was not described and that the decay/ingrowth seems incorrect.

7.9-4 **Response**

Table B.2.14 has been corrected to consistently account for the decay and ingrowth of the radionuclides over the 100-year period of institutional controls. The text and table were modified to reference the source document for the decay chains and for the justification for the inventory (Lappin et al., 1989). The inventory is given in terms of activity, not atoms. Even though each atom of Am-241, when it decays, will produce one atom of Np-237, one curie of Am-241 will produce only 0.0002 curie of Np-237. This is caused by the difference in half-lives (432 years for Am-241 and 2.14×10^6 years for Np-237). The principle also applies to the production of Am-241 from the decay of Pu-241.

7.9-5 **Comment**

The State of Washington Department of Ecology sent the following comments on the draft SEIS concerning Pre-1970 waste at Hanford Reservation:

- Quantities and physical forms of TRU and TRU mixed wastes stored and generated at each site should be fully described. A description of Hanford Reservation pre-1970 wastes is especially important because the Record of Decision (ROD) for the Final Environmental Impact Statement, "Disposal of Hanford Defense High-Level, TRU and Tank Wastes," indicated that the DOE would conduct development and evaluation efforts to retrieve and process the pre-1970 buried suspect TRU contaminated solid waste. Any retrieved waste would be processed to meet WIPP waste form disposal criteria. The final SEIS should acknowledge that pre-1970 wastes could go to the WIPP for disposal and the document should describe the impacts of such a decision.

- Many of the chemicals used in earlier separation processes are no longer used at Hanford Reservation. Adequate risk and consequence analyses using realistic assumptions concerning any chemical wastes (especially the pre-1970 wastes) should be discussed in the final SEIS.

- If vitrified TRUEX process waste from Hanford Reservation tanks is being considered for disposal at WIPP, the FEIS should include a description of these wastes. The TRUEX process is a liquid waste processing system which has been developed to remove TRU waste from Hanford Reservation tank wastes for vitrification. The vitrified wastes could go to a high-level repository or they could go to the WIPP. The final SEIS should address handling problems if the canisters go to the WIPP.

- Table 3.2 in the draft SEIS indicates that the Hanford Reservation will account for three times as much "newly-generated RH TRU waste" as does Oak Ridge by the year 2013. The forms and hazardous chemical constituents of the Hanford Reservation wastes should also be described in Subsection 3.1.1.2.

7.9-5 **Response**

All TRU waste to be sent to the WIPP must be certified to meet the requirements of the WAC and the Certificate of Compliance for transportation. The volumes of TRU waste reported in the 1987 Integrated Data Base are scaled up to the design capacity of the WIPP to provide a bounding case analysis of the potential impacts in this SEIS.

The WIPP is not intended to be a repository for pre-1970 waste. Therefore, disposal of such material is not analyzed in this SEIS. The management of pre-1970 waste stored at the Hanford Reservation is discussed in the Hanford Reservation EIS (DOE, 1987e). Additional information is being accumulated to further characterize the pre-1970 waste and to support a decision on how this material will be handled. At this time, a decision has not been made as to the retrieval of any pre-1970 waste at Hanford Reservation. Hanford Reservation's EIS requires that further studies be performed to determine final disposition. The impacts of chemical compatibility will need to be addressed at that time.

The Hanford Reservation FEIS states that the Hanford Reservation will be sending it's TRUEX generated RH TRU waste to a repository. The technology exists for the handling of RH waste and therefore the handling of RH canisters should not impose any unique problem.

Current information provided by DOE facilities for the WIPP Part A permit application under RCRA (EPA, 1980) is used in the hazardous chemical risk assessment in this SEIS. This information indicates that TRU waste from the Hanford Reservation has similar RCRA-regulated hazardous chemical constituents and waste forms as other DOE facilities. The impacts from Hanford Reservation TRU mixed wastes are bounded by the analyses provided in this SEIS. Hazardous chemical constituents are discussed in Subsection 3.1.1.2 and Appendix B.

7.9-6 **Comment**

With regard to Subsection 2.3.2 of the draft SEIS, commenters asked which facilities generate pyrophoric materials and what techniques are used to reduce reactivity. The commenter stated that no analyses of the potential environmental impacts of these materials and techniques are provided in the draft SEIS. The commenter also suggested that at least a list of the potential processing techniques the DOE may use in the future, such as waste reduction, compaction, and incineration, should be included in the final SEIS.

7.9-6 **Response**

Calcium and sodium metal are used as reductants in processes involving plutonium oxides and hydroxides. These pyrophoric metals are generated primarily at the Los Alamos National Laboratory and the Rocky Flats Plant. Salts containing pyrophoric metals are commonly oxidized at high temperatures to create nonpyrophoric compounds. Some radioactive metals are also pyrophoric but cannot be rendered safe by this procedure. The quantities of these radioactive, pyrophoric metals are controlled, and generators disperse and cement this waste in compliance with the WAC (DOE, 1989e; Appendix A).

Subsection 6.4.1 discusses the current status of three waste treatment technologies which the DOE could employ as additional mitigation measures. The three treatments discussed are immobilization, incineration, and compaction. Subsection 6.4.2 discusses how these treatments would affect the parameters of gas generation and nuclide solubility. Waste minimization, a required DOE practice, will reduce the TRU waste generated, but it is not a waste treatment.

7.9-7 **Comment**

Commenters stated that the waste certified to go to the WIPP has not been verified as TRU waste. In this context, it was stated that much of the waste stored at DOE facilities will be reclassified as low-level waste that cannot be sent to the WIPP. Some commenters asked if the level of radioactivity was decreasing during temporary storage. They questioned if the waste may be reclassified as low-level instead of TRU for convenience's sake.

7.9-7 **Response**

As stated in this SEIS, the definition of TRU waste includes the requirement that it contains greater than 100 nanocuries per gram of radioactivity. Waste with concentrations of radioactivity between 100 and 10 nanocuries per gram is classified as low-level waste, which will not be sent to the WIPP but instead to low-level waste disposal areas. During certification procedures for the WAC, each container of waste is assayed to verify that it meets the definition of TRU waste.

Levels of radioactivity do decrease over time but not at a rate to cause significant quantities of waste to be redefined as low-level waste over the near term (next one hundred years). The long half-lives of many of the TRU radionuclides make the time for potential decay to low-level waste much longer than that of temporary storage. There is no convenience in classifying a waste as low-level instead of TRU because all waste must be managed to meet applicable health and safety requirements and environmental regulations. Strict quality assurance requirements for the certification of TRU waste ensure accurate classification of waste.

7.9-8 **Comment**

The EEG stated that there are internal inconsistencies within Appendix B. For example, the average curies per trailer load in Table B.2.7 is not consistent with that calculated from Tables B.2.1 and B.2.3.

7.9-8 **Response**

Table B.2.1 has been modified to correct the inconsistency. The title has been modified to clarify that the activity is for the unexpanded volume situation (i.e., 5.6 million cubic feet for CH TRU waste). Also the values in the table have been modified to be consistent with the information in the 1987 Integrated Data Base (IDB) (DOE, 1987b). Two databases were used in determining the radionuclide source term, the 1987 IDB and Radionuclide Source Term for the WIPP, DOE/WIPP 88-005 (DOE, 1989g). The 1987 IDB is consistently used to determine the volume of waste, while DOE/WIPP 88-005 is consistently used to establish the isotopic mixes and concentrations for each facility. Since the values originally reported in Table B.2.1 dealt with the overall activities for each facility, not the isotopic mix or concentration, it indicates values derived from the 1987 IDB (DOE, 1987b).

7.9-9 **Comment**

The EEG commented that Table B.2.8 on page B-12 indicates 6.26×10^4 cubic meters of newly-generated CH waste for Rocky Flats Plant, and 1.29×10^5 containers. They stated that this implies a container volume of 0.485 cubic meter that does not match either a drum (.208 cubic meter) or a standard waste box (SWB) (1.798 cubic meters). They noted that "the value for newly generated waste in the table (6.24×10^4 m^3) is greater than the value of 5.66×10^4 m^3 (2.0×10^6 ft^3) given in Table B.2.4 (Page B-6) for both stored and new waste at Rocky Flats Plant."

7.9-9 **Response**

Although storage of TRU waste is authorized at Rocky Flats Plant, any TRU waste stored or generated at Rocky Flats Plant is considered and classified as "newly generated," in the 1987 IDB (DOE 1987b) and this SEIS.

The average volume per container (0.485 m^3) is a composite based on a mixture of both drums and SWBs. Therefore, it will not equal either the volume of a drum or an SWB. Table B.2.8 has been modified to eliminate this potential area of confusion.

The volume of waste given in Table B.2.8 is derived from DOE, 1988g, and is given as a calculations example. The values in this reference are used only and consistently to determine isotopic mixture and concentration of the radionuclides in the TRU waste. However, the estimated volume of waste to be placed at the WIPP is derived from the 1987 IDB (DOE, 1987b). The volumes in the two databases are similar, but not identical. Therefore, the values cannot be directly compared. The text in Appendix B has been modified to clarify this issue.

7.9-10 **Comment**

EEG, as part of comments on the draft SEIS, stated they had previously requested from the DOE a discussion of uncertainties in the RH TRU inventory in a review of the FSAR and had not received a reply. They stated that they suspect there is still considerable uncertainty in volumes, curies, and distribution of radionuclides in RH TRU waste. They stated that they are aware that a questionnaire is now being conducted by the WIPP Project Office on RH TRU inventories, and they have heard that there is waste that is high in activation products that may have a problem meeting the 1,000 rem per hour surface dose rate limit. They noted that although calculations in the FEIS, FSAR, and draft SEIS indicate that RH TRU waste should be less of a problem than CH TRU waste, they cannot conclude this because of the apparently greater uncertainty in the data base.

7.9-10 **Response**

The analyses in this SEIS are based on the best information available at this time. To ensure that estimates of risk are bounding, the SEIS uses conservative assumptions to analyze accidental and routine release scenarios for both CH and RH TRU waste. For example, the volumes of RH TRU waste used in the SEIS analyses represent an increase over the 1987 IDB (DOE, 1987b) projections of 163 percent to make the volume equal to the capacity of the WIPP.

The WAC (Appendix A) specifies limiting criteria for the waste to be placed in the WIPP. Wastes exceeding WAC limits, e.g., surface dose rates greater than 1,000 rem per hour limit, would not be shipped to the WIPP.

7.9-11 **Comment**

The EEG commented that the 80 percent fullness factor is incorrect and will influence many of the calculations because the factor generates more drums than the WIPP can hold. For example, the number of drums was overestimated by the erroneous use of the 0.8 fullness factor and this results in increasing the annual drum equivalents handled. They stated that the values should be about 17,000 and 38,000 drums per year in the Test Phase and Disposal Phase, respectively.

7.9-11 **Response**

The 80 percent fullness factor has been eliminated. The volume of a drum was assumed to be 0.2 cubic meter (instead of the 0.208 cubic meter implied by the commenter), a four percent difference. The annual drum equivalents are approximately 17,600 and 39,600 for the Test Phase and Disposal Phase, respectively. Also see the response to comment 7.9.1-1.

7.9-12 **Comment**

The EEG commented that on page B-13, Table B.2.9, the total RH volume of 1.98×10^4 m^3 probably should be 1.98×10^1 m^3, which would then be consistent with 2.20×10^1 containers. The 19.8 cubic meters stored plus the 5.4 cubic meters newly generated waste (page B-12) totals 25.2 m^3, somewhat less than the $1.2 \times 10^3 \times .02832 = 34.0$ cubic meters indicated by Table B.2.4 (page B-6).

7.9-12 **Response**

The comment is correct in that the value should be 1.98×10^1. The text of Appendix B has been expanded to clarify this issue. As was discussed in Appendix B, the values in Table B.2.4 are drawn directly from the 1987 Integrated Data Base (IDB) (DOE, 1987b), while the values in Table B.2.9 are drawn from Radionuclide Source Term for the WIPP, DOE/WIPP 88-005 (DOE, 1989g). The IDB values are consistently used to establish the volumes of waste at the facilities. DOE/WIPP 88-005 values are used consistently to establish the isotopic mixes and concentrations for the radionuclides in the waste. However, the volumes are similar, but not exactly the same, in these two references. Since DOE/WIPP 88-005 values were used only to determine the isotopic mixes and concentrations within the waste and the IDB values were used to determine the volume of waste, the values cannot be directly compared. Table B.2.9 has been modified to eliminate this potential source of confusion.

7.9-13 **Comment**

The EEG commented that the volumes shown in Tables 3.1, 3.2, B.2.2, and B.2.3 have up to seven-place accuracy. They stated that this accuracy exceeds statistical limitations, especially for projected volumes. A typical comment is "Table B.2.2 lacks units and contains seven-place accuracy for two-thirds of waste yet to be produced."

7.9-13 **Response**

The tables have been modified to indicate the appropriate number of significant digits, as determined by the significant digits reported in the 1987 Integrated Data Base (IDB). The tables also have been modified to indicate the units. The future volumes are fairly well known since they are based on the volumes currently being produced, which are well known. This SEIS uses the best available information to evaluate the source term. However, this SEIS conservatively scales the reference information to the capacity of the WIPP.

7.9-14 **Comment**

The New Mexico Environmental Improvement Division stated that the draft SEIS does not discuss the impact of restricting the types of waste during the Test Phase (i.e., no mixed waste). It was noted that the draft SEIS considers high-curie and high-neutron waste, excludes experiments on high-level waste and acknowledges a change in the regulatory lower limit for TRU waste from 10 nanocuries per gram to 100 nanocuries per gram. It was stated that the cumulative impact of these changes is not discussed.

7.9-14 **Response**

At this time, there are no plans to restrict "mixed-waste" as part of the Test Phase, since the DOE, NAS and others have stated "mixed-waste" is critical to proposed experiments. However, if the no migration variance is not granted, the DOE will consider other means of proceeding with the Test Phase in compliance with EPA regulations. The impacts assessed in this SEIS bound the impacts from the emplacement of reduced amounts of mixed waste or restrictions on the types of wastes during the Test Phase.

The purpose of this SEIS is to assess the impacts of the WIPP, in light of changes and new information since the 1980 FEIS. The changes since the FEIS, including those that impact the radionuclide inventories and source term, are discussed in Subsection 3.1.1. The introduction to Appendix B has been modified to discuss the impact of these changes on the source term, including the redefinition of TRU waste. High-neutron and high-curie waste are discussed in Appendix B (also see the responses to comments 7.9-20, 7.9-21 and 7.9-26). The impacts from these changes including the cumulative impacts are analyzed in this SEIS.

7.9-15 **Comment**

The EEG commented that Table B.2.13 lists the initial CH TRU inventory. They stated that a similar table should be provided with the initial inventory for RH TRU, which would include fission products and activation products.

7.9-15 **Response**

The information in Table B.2.13 is provided to describe the material-at-risk for the long-term performance assessment. Only the CH TRU waste is included in this assessment. As discussed in Subsection 5.4.2.2, the RH TRU waste does not have a significant impact on the long-term performance assessment. The RH TRU waste is less than 2 percent by activity of the total waste emplaced the WIPP. The RH TRU waste will be placed in individual boreholes and backfilled/plugged. Many of the fission products that caused the RH TRU waste to be remotely handled have half-lives much less than 100 years. For example, after 180 years beyond the end of institutional controls, the radiation dose from exposure to fission products in RH TRU waste drillcuttings drops from about 90 mrem to about 1 mrem.

Even so, if a drillhole penetrated the WIPP (e.g., the Case II scenarios) through a borehole containing RH TRU waste, the brine would have to flow out of the borehole, into the panel containing the CH TRU waste, and then into another borehole containing RH TRU waste before more than one RH TRU waste container would be included in the source term. Since the amount of RH TRU waste is so much smaller than the amount of CH TRU waste, the impacts from this scenario would be equivalent to the scenarios assessed in this SEIS with the drillhole penetrating the CH TRU waste. Therefore, only CH TRU information is provided. However, the necessary information is provided in this SEIS to calculate the total amount of RH TRU waste, by radionuclide, to be placed in the WIPP.

7.9-16 **Comment**

The State of Georgia Department of Natural Resources noted that Table 3.3 and Table B.2.5 (Subsections 3.1.1.1 and B.2.2) present a summary of average TRU waste characteristics. It was stated that a similar table showing maximum values should be prepared.

7.9-16 **Response**

These tables are provided for information purposes only; they are not used in the assessment of the radiological impacts. Tables B.2.4, B.2.6, B.2.7, B.2.10, B.2.11, B.2.12, B.2.13, and B.2.14 provide the source terms for the radiological assessments. The maximum values are addressed in the WAC (DOE, 1989e), as discussed in Appendix A.

7.9-17 **Comment**

The EEG commented that in Table B.2.1, the term "newly generated" is used to describe waste that has yet to be produced and that a better term might be "to be produced".

7.9-17 **Response**

The comment is noted. However, the 1987 IDB (DOE, 1987b), which is the reference for volume information, uses the term "newly generated." To be consistent with the reference, this SEIS also uses the term "newly generated." The text in the introduction to Appendix B has been modified to clarify that the term "newly generated" refers to waste to be produced after the publication of the 1987 IDB (from 1987 through 2013).

7.9-18 **Comment**

The EEG commented on the description of waste in the standard waste box (Table B.2.11 in the draft SEIS). It was stated that the mass and activity should not be shown as "grams per drum" and "Ci per drum," but rather should be "g/box" and "Ci/box."

7.9-18 **Response**

The units have been corrected in Table B.2.11.

7.9-19 **Comment**

The EEG commented that the last paragraph on page 3-6 of the [draft] SEIS states "that the average Pu-238 activity content has increased from 1.2 percent in the FEIS (correct) to 17 percent." They stated that "this does not agree with the tabulation in Table B.2.13, page B-19, in Volume 2, which indicates that 42 percent of the total radioactivity and 81 percent of the alpha-emitting transuranic radioactivity is Pu-238." The State of Georgia was concerned that the transportation risks associated with this "high curie waste" may not have been adequately assessed in the draft SEIS.

7.9-19 **Response**

Table B.2.13 now indicates that plutonium-238 is 46 percent of the total radioactivity of the WIPP. The text in Section 3 has been revised to be consistent. The text in the introduction to Appendix B has been modified to discuss why the plutonium-238 activity has changed. This is due primarily to the inclusion of Savannah River Site as a facility that would ship TRU waste to the WIPP. The Savannah River Site contributes 92 percent of the plutonium-238 that would be being shipped to the WIPP. Obviously, the inclusion of the Savannah River Site as a shipper greatly changes the plutonium-238 inventory. Additional changes in the inventory have occurred as a result of the further, and continuing, characterization efforts that the DOE has sponsored at the facilities. This is discussed in Appendix B and in Subsection 3.1.1.1. Regarding the comment on the 1980 FEIS using "more dilute concentrations," one of the purposes of this SEIS is to provide new information since the 1980 FEIS, which this clearly illustrates. The transportation risks evaluated in the draft SEIS and this SEIS utilized the source terms presented in Appendix B of the respective documents. These source terms included the high curie waste from the Savannah River Site. However, a bounding case accident analysis using waste from the Savannah River Site has been added to Appendix D of this final SEIS. Therefore, the transportation risks due to this change in the WIPP inventory have been evaluated in both the draft and final SEIS.

7.9-20 **Comment**

Commenters stated that the nature and characteristics of RH TRU waste are not adequately described in the draft SEIS. They stated that the characteristics and specific activity of RH TRU waste or how it will be transported and emplaced are not explicitly discussed in the draft SEIS. It was noted that the draft SEIS states that the surface dose rates for RH TRU waste assumed now are lower than those used in the FEIS (page 3-6). The commenter noted that this discrepancy should be discussed. He/she also stated that "the potential impacts on public health and safety and the environment are not discussed in the [draft] SEIS."

7.9-20 **Response**

Appendix B provides the total curies by facility, the volumes by facility, and the concentration (specific activity) in terms of curies per trailer load by facility for RH TRU waste. The nature and characteristics are adequately described.

The introduction to Appendix B has been modified to discuss the reasons for the changes in the RH TRU waste since the FEIS. Characterization data were not available for RH TRU waste for the FEIS. The waste was assumed to be similar to defense high-level waste which contains a lot of short-lived fission products and which has much higher surface dose rates due to these fission products. This SEIS uses information on the RH TRU waste gained through continuing characterization efforts sponsored by the DOE. Also discussed in Appendix B is the fact that the shipment of RH TRU waste from additional facilities to the WIPP are assessed in this SEIS. The waste from these facilities would result in changes in the average waste characteristics.

The assessment in this SEIS uses the best available information for the characteristics of the RH TRU waste. The impacts on public health and safety and the environment from RH TRU waste are discussed in this SEIS. The WAC limits (Appendix A) surface dose rates for RH waste to 1,000 rem per hr; however, this does not imply all (or even any) of the canisters will be at the limit. The results of the continuing characterization efforts on existing waste indicate that the typical canister dose rate is much less than the limit; however, this does not preclude individual canisters from approaching the limit.

7.9-21 **Comment**

Commenters asked if having the same surface dose equivalent rate restrictions for neutron-emitting waste means that no unique handling, storage procedures, or precautions are necessary. It was asked if the neutron waste creates any new transportation concerns.

7.9-21 **Response**

Having the same dose equivalent rate does mean no unique handling, storage procedures, or precautions are necessary for neutron-emitting waste. The dose equivalent is the energy deposited per unit mass (in terms of rads) multiplied by a quality factor to give the dose equivalent (in terms of rem). This quality factor is derived from the relative biological damage caused by the various radiations. Since the surface limits are dose equivalent (rem), the relative damage caused by the differing radiations has been factored into the criterion. Therefore, special handling is not necessary.

Similarly, the Transport Index is based on dose equivalent. Therefore, any additional biological impact from neutron-emitting waste is factored into the value of the Transport Index. No additional transportation concerns are caused by the neutron-emitting waste.

7.9-22 **Comment**

A commenter asked what is known about spontaneous fission, and asked if "the fact that californium-252 decays by spontaneous fission indicates that it has no half-life?"

7.9-22 **Response**

Spontaneous fission is a method by which certain radionuclides decay. The nucleus splits into two fission product nuclides, plus associated radiations, such as neutrons and gamma rays. It is equivalent to fission caused by the injection of a particle (e.g., neutron) into a nucleus. This process has been extensively studied and discussed in most standard nuclear physics textbooks. Spontaneous fission is also discussed in publications of national and International technical organizations such as the National Council on Radiation Protection and Measurements.

Californlum-252 decays by both alpha decay (97 per cent of the time) and spontaneous fission (3 per cent of the time). As indicated in Table B.2.13, the half-life for californium-252 is 2.64 years. The half-life for the spontaneous fission mode of decay is 85 years.

7.9-23 **Comment**

The EEG commented that additional information on the radioactive waste inventory has been drafted in a report (DOE, 1989g) and constitutes the fundamental basis for analyses reported in the draft SEIS and in the WIPP FSAR. They stated that because the DOE has not provided the report to the EEG, no conclusions can be drawn as to its value.

7.9-23 **Response**

The document has been published. The correct reference is DOE, 1989g.

7.9-24 **Comment**

Commenters asked why the draft SEIS does not (in Subsection 3.1.1.1.) include the new americium-241 concentrations.

7.9-24 **Response**

The information for americium-241 is given in Appendix B. Table B.2.13 gives the total activity (curies) of americium-241 for CH waste. Tables B.2.6 and B.2.7 give the concentration of americium-241 in terms of curies per trailer load for both CH and RH waste.

7.9-25 **Comment**

The EEG commented that while Table B.2.12 in the draft SEIS is technically correct in telling the reader that the radionuclides resulting from radioactive decay (daughter products) are not included in the reported 260 curies per container of RH TRU waste, it is deliberately misleading because the contribution of Y-90, 250 curies, is not included and only half of the actual radioactivity present in the container, (510 Ci), is reported. They stated that the Y-90 was included in the FEIS, Volume II, page E-4, which shows 5.1×10^6 curies per canister. They also stated that this deletion masks the 12-fold reduction of radioactivity in each container. They asked that differences be explained in the final SEIS.

7.9-25 **Response**

Table B.2.12 has been modified to indicate the curies per container, excluding daughter products, for both the FEIS and draft FSAR values. This allows the values to be directly compared. The reason the activity of Y-90 was not included in the FSAR/SEIS values is that the facilities do not provide information on Y-90 activity in either the 1987 IDB (DOE, 1987b) or the source term document (DOE, 1989g).

Yttrium-90 has a short half-life (64 hours); therefore, within 3 weeks it effectively has the same activity as its parent radionuclide (Sr-90). Since it is in equilibrium with its parent in such a short time, the committed effective dose equivalent for internal exposures due to Y-90 is included in the rem per microcurie of intake value for Sr-90. Therefore, the impacts of Y-90 are included in the calculations. Listing Y-90 by itself would include its impact twice.

Yttrium-90 is a pure beta emitter. Its radiation would not penetrate the metal containers. The external radiation exposure from Y-90 in the waste would not be significant.

The change in the activity per canister from that given in the FEIS to that in the SEIS is due to two main factors. First, RH TRU waste from 4 additional generators has been included in the source terms used in this SEIS. Second, the present curies per canister value is based on actual characterization data for RH TRU waste. The value in the FEIS was based on characterization data for defense high-level waste. This waste contains significant amounts of short-lived fission products and overstates the radioactivity of RH TRU waste. The introduction to Appendix B, WASTE CHARACTERISTICS, has been modified to include a discussion of the reasons for the changes in the source term since the FEIS.

7.9-26 **Comment**

The EEG and others commented that the changes in the radioactive inventories and source terms, especially for RH TRU waste, should be explained. Typical comments were "Provide an explanation for the 10-fold reduction of RH TRU from 5.1×10^6 curies," and "Some explanation should be provided for the enormous changes in waste concentrations and amounts shown in the draft SEIS in comparison to the FEIS."

7.9-26 **Response**

The reasons for the changes in the radionuclide inventories and source terms are discussed in several sections in this SEIS, such as the Summary and Subsection 3.1.1. However, this information, especially as it applies to the source terms, has been added to the introduction of Appendix B, which deals with waste characteristics. Specifically discussed are the reasons for the changes in the RH TRU waste source terms (i.e., using actual characterization data for RH TRU waste instead of characterization data for defense high-level waste, and the addition of four facilities as generators of RH TRU waste). Also discussed is the impact of including waste characteristics from eight additional generators of CH TRU waste on the amount of Pu-238 and Pu-241 that will be placed in the WIPP.

7.9-27 **Comment**

The EEG commented that the equation in Table B.2.8 includes a factor of "3 m^3/TRUPACT." They stated that "it is actually 2.9 m^3/TRUPACT for drums and 3.6 m^3/TRUPACT for SWBs [Standard Waste Boxes]."

7.9-27 **Response**

Table B.2.8 has been modified to eliminate this equation. An equivalent equation, with more discussion, has been added to the text. The calculations are done in terms of drum equivalents; therefore, the volume of an SWB is not involved in the calculation. The volume per drum equivalent used in the calculation is 0.2 cubic meter, 4 percent less than the volume used by the commenter. The correct volume per TRUPACT used in the analyses in this SEIS is 2.8 cubic meters.

7.9-28 **Comment**

The State of Oregon inquired if soils contaminated with TRU waste will be retrieved and sent to the WIPP, and if so, this volume needs to be considered in the WIPP inventory estimates.

7.9-28 **Response**

Soils contaminated with TRU waste (or buried waste) will not be retrieved for disposal at the WIPP. The waste to be disposed of at the WIPP has been placed in retrievable storage since 1970. This post-1970 waste contains the majority of the radioactivity in all of the TRU waste, including pre-1970 waste.

7.9.1 VOLUME

7.9.1-1 Comment

The EEG and others commented that the drum equivalent capacity for CH TRU waste in the WIPP was incorrectly determined because of the 80 percent fullness factor and the incorrect volume for a drum. They stated that the correct number of drum equivalents should be 843,537 (or 843,624). The commenters recognized that using the original number is conservative since it increases the number of shipments and the number of vehicle accidents. A typical comment is ". . . those numbers are based on an incorrect assumption of the volumes of waste coming to WIPP. . . . The 6.2×10^6 ft^3 design capacity of the WIPP is based upon the total volume of emplaced containers and not their contents. . . . this corresponds to 843,537 drum equivalents. Each drum represents a value of 208 L (0.21 m^3). The draft SEIS makes a fundamental error that permeates the entire document. The draft SEIS takes the 6.2×10^6 ft^3 waste capacity at face value, assumes this represents the volume of container contents, and generates a fictitious number of drums that cannot fit into the WIPP. They assume the average drum is 80% full, round off the total drum volume to 0.2 m^3, and obtain . . . 1.10×10^6 drums . . . This is 256,463 drums more than the capacity of the WIPP . . ."

7.9.1-1 Response

The 80 percent fullness factor has been eliminated from this SEIS. However, the assumed value for the volume of a drum is 0.2 cubic meter in this SEIS. The commenters suggest the correct volume is 0.208 cubic meter, or 4 percent more. Admittedly, 55 gallons does convert to 208 liters or 0.208 cubic meter. However, using 0.208 cubic meter implies that the volume of the drum is known within plus or less 0.5 liter (or about 0.5 quart). The volume is not known to this accuracy. Similarly, the number of drum equivalents is not known to six-place accuracy (about 6×10^{-5} percent), as implied in the commenters' values.

Using a drum volume of 0.2 cubic meter gives a drum equivalent capacity of 880,000 for CH TRU waste, about 4 percent higher than the values suggested by the commenters. This number is calculated by dividing the CH TRU waste capacity of the WIPP, 6.2 million cubic feet, by 0.2 cubic meter and 35.3 cubic feet per cubic meter. The result is then rounded to two significant digits. This number also is the number of drums being shipped to the WIPP based on the number of shipments times 42 drums per shipment (14 drums per TRUPACT times 3 TRUPACTs per shipment).

7.9.2 CURIE CONTENT

7.9.2-1 Comment

The Georgia Department of Natural Resources stated that consistent with the accident analyses for the WIPP, Tables B.2.6 and B.2.7 should include calculations of activity in

"PE-Ci per trailer load." A clarification was also requested to explain how the PE-Ci concept accounts for differences in half-lives for radionuclides.

7.9.2-1 **Response**

The dose and health impact calculations for the transportation assessments used in both the draft and this SEIS do not use the plutonium-equivalent curie values. These are based on the actual radionuclide mixtures listed in Tables B.2.6 and B.2.7. PE-Ci values are only used for the operational analyses. Information on the PE-Ci are presented in Appendix F for the operational analyses. The half-life is explicitly included in the determination of the PE-Ci values. As shown in Appendix F, the 50-year dose conversion factor is used in the calculation to determine the radiotoxic hazard index relative to Pu-239. This dose conversion factor includes the radiological half-life as one of the evaluation parameters. Therefore, the PE-Ci concept does include the half-life as a factor.

However, this applies only to a specific radionuclide mix. The PE-Ci concept does not account for the changes in the radionuclide mix caused by the various rates of radioactive decay (which are indicated by the half-lives). Since the PE-Ci concept is only used for the radiological assessment for operations, which are based either on a typical, specific radionuclide mix or on a bounding, maximum possible PE-Ci, the affects of radioactive decay on the radionuclide mix are not included in the analyses. Therefore, the PE-Ci concept does not need to account for changes in the radionuclide mix caused by the various half-lives.

7.9.3 HAZARDOUS CHEMICALS

7.9.3-1 **Comment**

The EEG and other individuals commented that the draft SEIS is inadequate because it fails to comprehensively address questions concerning characterization of hazardous chemicals. Specific comments and questions included the following:

- Why are data not available on the hazardous chemicals in TRU mixed waste?
- The DOE is required by law, under the RCRA, to characterize the hazardous chemical components of radioactive mixed waste.
- The [draft] SEIS conceals the fact that chemical components of some waste cannot be adequately characterized.
- If it is true, as the DOE has claimed, that sampling and analysis of waste poses unacceptable radiation hazards, then transportation of this waste would too.

- Process knowledge is not adequate for identifying old waste for which no records exist.

- The DOE should use remote sampling and analysis techniques to decrease the potential for radiation exposures.

- The DOE should quantitatively substantiate the claim that sampling and analysis of the waste will generate additional waste.

7.9.3-1 **Response**

A discussion of the hazardous chemical components in TRU mixed waste and the methods of characterizing this waste are provided in Appendix B.3. The complex waste matrices (e.g., materials such as mixtures of paper, glass, or plastics) make obtaining a representative and accurate sample for chemicals such as volatile organic compounds and metals difficult. The potential for unacceptable radiation exposure to personnel has also limited the amount of TRU waste that has been sampled in the past. Headspace gas can be analyzed without opening containers; therefore, this type of analysis is most prevalent.

DOE generators of potentially hazardous waste must establish whether their waste is subject to RCRA regulations. For listed waste, a relatively straightforward determination can be made by examining the waste codes under 40 CFR Part 261, Subpart D. Most listed waste codes rely on specific descriptions of the waste, its processes, or its chemical compounds. According to the regulations (40 CFR Part 262.11), characteristic waste, described in 40 CFR Part 261, Subpart C, must be identified by either testing or applying knowledge of the hazardous characteristics of the waste, in light of the materials or the processes used. A No-Migration Variance Petition does not remove the waste characterization requirements under the RCRA. The RCRA, NRC, and DOT regulations include specific requirements for waste identification.

DOE generators have relied primarily on knowledge of the waste and the processes that generate it to characterize their hazardous waste. Unknown waste will not be sent to the WIPP. For older waste that cannot be identified by process knowledge, further analysis will be required, prior to its shipment to the WIPP. The DOE is currently working with the EPA to establish procedures for sampling and analyzing radioactive mixed waste. Opening the containers and the multiple layers of inner bags to obtain waste samples poses the risk of exposure to radioactivity. However, this risk is not related to any risk posed by transporting this waste in NRC-approved transportation containers such as the TRUPACT II.

As pointed out by one commenter, the safe sampling of radioactive waste will require that workers use remote-handling equipment or wear appropriate protective suits when handling the waste. Previous sampling programs at the Rocky Flats Plant have demonstrated that, because of the potential contamination of equipment and clothing used during sampling, additional material must be managed as radioactive-contaminated waste. The quantities of additional waste vary, depending on the procedures and types of sampling conducted. No volatile organic compounds have been reported in RH TRU mixed waste (WEC, 1989a); therefore, the release of these compounds is not postulated for RH TRU waste.

7.9.3-2 **Comment**

Officials of the State of Oregon commented that the Rocky Flats Plant has approximately 50 percent of the total CH TRU waste to be disposed of at the WIPP, and that the Oak Ridge National Laboratory has about 90 percent of the total RH TRU waste that will go to the WIPP. They stated that no other site-specific information is available in the draft SEIS, and that because 10 defense program facilities may transport waste to the WIPP, some commenters said that the final SEIS must include the maximum concentrations of hazardous chemical constituents at each facility. Members of the EEG and others commented that they were not confident that the hazardous chemical inventory used in the draft SEIS is accurate and representative of all TRU mixed waste.

7.9.3-2 **Response**

The statements taken from the draft SEIS on the quantity of CH TRU mixed waste were in error. Of the total TRU waste inventory to be sent to the WIPP, it is estimated that approximately 60 percent by volume is subject to regulation under RCRA (WEC, 1989a). CH TRU mixed waste from the Rocky Flats Plant currently in retrievable storage at the Idaho National Engineering Laboratory, and newly generated waste from the Rocky Flats Plant, is estimated to comprise about 86 percent, by volume, of the total inventory of TRU mixed waste to be emplaced over the 25 years of the WIPP's operation. Subsections 5.2.4 and B.3.1 have been revised to reflect this correction.

The DOE believes the newly-generated TRU mixed waste from the Rocky Flats Plant plus the TRU mixed waste from the Rocky Flats Plant stored at the Idaho National Engineering Laboratory are typical for mixed waste at all facilities. The types and quantities of hazardous waste are based on the best available information and are updated as more information becomes available.

The site-specific information collected from each DOE generator of TRU mixed waste indicates that other facilities have smaller volumes of TRU mixed waste and fewer types of hazardous chemical constituents (WEC, 1989a). The "Radioactive Mixed Waste Compliance Manual" includes information from all DOE facilities planning to send mixed waste to the WIPP. This information was used to prepare the WIPP RCRA Part A permit application and includes a conservative characterization of TRU mixed waste based on knowledge of the waste and the processes that generate it. Because the inventory used in the risk assessment for this SEIS contributes approximately 86 percent, by volume, of the total TRU mixed waste to be sent to the WIPP, it is considered reasonable to use the Rocky Flats Plant's estimated concentrations in this risk assessment.

Analytical data on the headspace gas concentrations are used to estimate risks during transportation and in on-site accident scenarios. It is also conservatively assumed that every drum of waste will contain these concentrations of chemicals, when in reality, at least 40 percent of the waste will not contain any RCRA-regulated hazardous waste

(WEC, 1989a). This 40 percent of the total TRU waste will come primarily from facilities other than the Rocky Flats Plant and the Idaho National Engineering Laboratory. Results of actual headspace gas analyses on TRU mixed waste from the Rocky Flats Plant (Table 5.34) indicate that a large percentage of the waste contained below-detectable levels of volatile organic compounds. The hazardous chemical source term used in the transportation accident scenario and the risk assessment for routine and accident scenarios at the WIPP reasonably estimate any potential risks during the transport or handling of TRU mixed waste from any of the DOE facilities.

7.9.3-3 **Comment**

Officials from the State of Oregon and other commenters were concerned about the short list of hazardous chemical constituents. They stated that the draft SEIS should confirm that all possible constituents are included, and that the reactivity, corrosivity, and volatility of the mixed waste and their effect on the fate and transport of the radioactive components should be discussed. It was felt that there is no understanding of the types of reactions that might occur when different wastes come in contact with each other. Some commenters asked if the hazardous chemicals would increase the solubility of the radionuclides.

7.9.3-3 **Response**

The list of chemicals provided in Tables 5.31 and 5.32 include all hazardous chemical waste reported by the DOE generator and storage facilities for preparation of the RCRA Part A permit application for the WIPP (WEC, 1989a) (EPA, 1980). All generators reported very similar types of waste because they are all involved in research and development or in production operations related to DOE defense operations.

The WAC (DOE, 1989e) include limits for the safe handling and long-term disposal of TRU waste at the WIPP. A summary of these criteria is provided in Appendix A of this SEIS. These criteria restrict pyrophoric and explosive materials in the waste and require that corrosive materials be neutralized or contained in a manner to ensure container adequacy through the design lifetime of the container.

The NRC TRUPACT-II Certification of Compliance for the safe packaging of TRU waste during transport is discussed in Appendix L of this SEIS. The NRC has established additional requirements which each generator must comply with prior to shipping TRU waste. The transportation parameters include the form, properties, and compatibility of the chemicals in the waste to ensure TRUPACT-II integrity.

The DOE is planning to include experiments during the Test Phase to address the RCRA-regulated components of TRU mixed waste. Tests will be conducted with mixed waste to verify chemical compatibility and potential changes in the chemistry of the waste over the long term. The long-term risk assessment includes conservative estimates of radionuclide solubilities intended to encompass the potential interactions of chemicals with radionuclides that may increase their solubilities.

7.10 WASTE PROCESSING OR TREATMENT

7.10-1 Comment

Some commenters asserted that waste volume reduction efforts should be encouraged at the Rocky Flats Plant, as well as at all facilities in the nuclear weapons complex. These commenters stated that for the purpose of waste minimization, the Rocky Flats Plant compactor should be made operational soon, in order to reduce waste volumes and transportation risks.

7.10-1 Response

The DOE encourages both minimization of the volume of waste generated and reduction in the volume of waste after it is generated as a means of optimizing waste disposal and storage capacity. The direction for waste minimization is explicitly stated in the guidelines set forth in the DOE's Radioactive Waste Management Order (DOE, 1988f). Waste volume reduction is being pursued at various DOE facilities. Subsection 6.4.1.3 of the SEIS indicates that the DOE has two operational compactors for TRU waste. The Rocky Flats Plant supercompactor, for which an environmental assessment is in preparation, is scheduled to be operational in 1990 to reduce the volume of Rocky Flats Plant waste requiring storage or disposal.

Discussions of waste processing and treatment activities have been added to Section 5 and a new Appendix P has been added to this final SEIS that includes discussions of waste processing and treatment at representative DOE facilities.

7.10-2 Comment

The Governor of Idaho and others asked how much of the Idaho National Engineering Laboratory radioactive waste will be processed and shipped to the WIPP.

7.10-2 Response

Table 3.1 of the draft SEIS states that 1,073,710 cubic feet of CH TRU waste is retrievably stored at the Idaho National Engineering Laboratory. Of this, approximately 318,000 cubic feet will require some type of treatment, in order to meet the WIPP Waste Acceptance Criteria (DOE, 1989e). Please refer to Appendix B for more information.

7.11 TEST PHASE

7.11-1 Comment

The EEG and many other commenters said that the draft SEIS did not justify the proposed Test Phase nor was there any scientific justification for this phase of the

WIPP. Many of these commenters cited criticism of the DOE's draft Test Plan by independent reviewers as support for this statement. These commenters also questioned the ability of the proposed Test Phase to yield valid and useful data. The following specific issues were raised.

- The draft Plan for the Test Phase does not provide the information and analyses necessary to determine whether data essential for the performance assessment would be developed. In fact, the draft plan states that the detailed plans needed to implement the Test Phase have not yet been developed.

- It is not possible to seal the underground test rooms effectively, and gas leakage into and out of these rooms would adversely affect the quality of the data gained from testing. Also, it is not possible to test an open, operating repository for 3 to 5 years to predict a closed repository's performance over 10,000 years. The proposed bin-scale tests are considered to be more reliable for obtaining gas generation data than are the alcove-scale tests.

- The waste types used in the tests may not be representative of the waste types proposed for permanent disposal at the WIPP. For example, the DOE does not currently have a certified transportation packaging for shipping RH TRU waste to the WIPP, and the WIPP is not currently permitted to receive radioactive mixed waste under the RCRA. A lack of representative waste types may delay meaningful gas generation tests at the WIPP for some time.

- Five years may not be long enough to yield valid and useful gas generation data. Some gases, especially those generated by organic decomposition, take years to develop.

- The waste for the gas generation tests would be contained in drums and, thereby, it would be isolated from conditions that could affect gas generation (e.g., brine seepage).

- Many of the commenters believe that the Test Phase experiments would be more properly conducted in a controlled laboratory setting, at a location other than the WIPP underground. They believe that this would not only be safer, but more cost effective. The State of New Mexico recommended that bin-scale tests be performed immediately at one or more of the generator or storage facilities; this would produce early data for the performance assessments, and it would minimize transportation impacts at a time when corridor States are preparing for TRU waste shipments.

- The integrated operations demonstration could be adequately and more safely performed using simulated waste. This would avoid radiation exposure to workers and the impact of any transportation accidents. Commenters asked if the DOE wanted to expose workers to radiation to determine acceptable levels of exposure from handling TRU waste.

Many of the commenters stated that without scientific justification, the Test Phase is an excuse for "fast track" opening of the WIPP to alleviate political pressure.

7.11-1 **Response**

The following addresses each point:

1) The draft Plan for the Test Phase does not support a determination of whether data essential for the performance assessment would be developed...

   . . .This is a comment on the Plan for the Test Phase (DOE, 1989b), not on the draft SEIS. The Plan for the Test Phase provides an overview of all experiments and field investigations to be performed during the Test Phase; details necessary to evaluate individual experiments are provided in advance of the experiments. The DOE in December, 1989, published a revised Draft Final Test Plan for the WIPP which is currently undergoing review by the NAS, EEG, EPA and others.

2) Underground rooms cannot be properly sealed . . .

   The test plan for the alcove-scale tests (Molecke, 1989) specifies the engineering design of an adequate room seal to be used during the underground tests. The test plan also describes how any gases released through a leak in the seal would be monitored and quantified.

3) The waste types used in the experiments may not be representative . . .

   The test plans specifically design the experiments to be representative, although the DOE recognizes that the need to include mixed waste may adversely affect the schedule of the tests. RH TRU waste is qualitatively the same as CH TRU waste, and no separate or concurrent RH gas-generation test is thought to be required, for three reasons: the curie loading of RH TRU waste is only about 2 percent of the CH TRU loading; many of the RH TRU radionuclides have half-lives less than 100 years; and RH TRU waste would be emplaced in boreholes in the pillars, isolated from waste disposal rooms. A discussion of the exclusion of RH TRU waste has been added to Appendix O.

4) Five years may not be long enough to collect accurate data . . .

   Although the alcove experiments would not address long-term changes in the waste, the bin-scale tests are specifically designed to address such changes. The combination of bin-scale and alcove-scale tests would allow long-term, large-scale effects to be calculated. In addition, the Test Plan provides for the experiments to be extended past five years if the results indicate that this is necessary.

5) The waste drums would isolate waste from conditions that could affect gas generation . . .

The gas generation experiments would simulate various times after repository closure and various conditions in the repository. Long-term or diverse conditions can only be examined by bin simulations. In the alcove tests, the drums would 'breathe' through the vents and interact both with other waste and with the mine environment.

6) Test Phase experiments would be more properly conducted in the laboratory . . .

Alcove-scale tests are intended to include the effects of the repository environment on waste degradation, and such tests cannot be adequately simulated in the laboratory. Safety is indeed a primary concern in the test design, and the WIPP is the safest place to perform these tests. The site is well equipped both for radiological safety and for monitoring. Because the tests would be performed underground, at a site and in a facility that is self-contained and isolated from the general public, the WIPP is much safer than most laboratories.

The only external condition that would affect the bin-scale tests is temperature. Emplacement of these tests in the underground environment at the WIPP would automatically result in effective control of temperature in the bins to the ambient temperature. Similar control could be maintained at some cost in an aboveground facility, if such facility were specially constructed. Both the handling and instrumentation facilities already exist underground at the WIPP, and would have to be constructed were the tests to be conducted elsewhere. These tests would, in fact, require extensive instrumentation.

7) The integrated operations demonstration could be performed using simulated waste . . .

The Secretary of Energy is evaluating the comments received from external oversight organizations regarding the scope and timing of the integrated operations demonstration including the utilization of simulated waste prior to acceptance of radioactive waste. A decision is expected in January 1990.

All radiation exposures to workers would be kept as low as reasonably achievable, in line with both DOE regulations and common sense. The DOE believes that an operations demonstration using only simulated waste would not be an adequate test. Workers do not always behave the same when handling 'simulated' materials as they do when handling real materials. Also, the use of simulated waste cannot test the radiation-safety system and procedures that have been designed, e.g., monitoring systems and dosimetry badging.

As noted in Subsection 3.1.1.4, waste requirements for the integrated operations demonstration are currently undergoing DOE review. The DOE in December, 1989, published a detailed phased plan for the Test Phase

(DOE, 1989b; also see Appendix O) that focused on the methods and activities required to demonstrate compliance with the long-term performance standard of 40 CFR 191, Subpart B. In addition several of the tests planned for the Test Phase would provide data that would be used to support the WIPP's demonstration that there would be no migration of hazardous constituents of the waste, as required under the RCRA Land Disposal Restrictions (40 CFR 268). A separate document would be developed to describe in detail the Integrated Operations Demonstration plan.

7.11-2 **Comment**

One commenter was concerned that the draft SEIS ignored important material properties (e.g., porosity, percolation, thermomigration, etc.) and that a 5-year Test Phase was unjustified. Further, the commenter stated that experimental programs should be as long as the longest "crucial geologic time scale" and that thermal migration of a brine reservoir should be considered. Another commenter asked how the results of the gas generation tests would be extrapolated from the 5-year period of the Test Phase into the 1,000-year period of the performance assessment.

7.11-2 **Response**

This comment makes several points. First, it suggests that material properties were ignored in the draft SEIS. This is not true. Best estimates of numerous parameters were given and were used in the calculations (see Subsection 5.4 and Appendix I). Second, it suggests that no justification was provided for the 5-year length of experimental programs. The 5-year time span is approximate. Although experiments taking longer than 5 years are not currently planned, if experimental results during the proposed Test Phase indicated that longer tests are necessary, then the experimental period would be extended accordingly (such an extension, if proposed, would undergo a review to determine the appropriate level of NEPA documentation). Third, the comment suggests that experimental times must be of the same length as the expected repository lifetime to be valid. Clearly, it is impossible to run experiments for 10,000 years; it is also unnecessary. There is no basis in the geological literature for requiring such geologic timescale experiments. Geologists attempt to run experiments long enough to identify mechanisms that will act over geologic time in order to predict their long-term effects. This standard scientific practice is reflected in the DOE's experimental plans. Finally, the comment suggests that the draft SEIS should consider thermal migration of a brine reservoir. Numerous published reports indicate that the small thermal loading at the WIPP (less than 1 watt per package) will have a negligible effect on brine migration (also see response to comment 7.14-6).

7.11-3 **Comment**

The EPA and a number of other commenters believe that testing with TRU waste at the WIPP site is necessary. Testing at a site other than the WIPP (e.g., laboratory) would not duplicate the conditions at the WIPP and would therefore produce questionable results. This would also cost additional money for another testing facility and would require continued storage of newly generated waste at other DOE facilities.

7.11-3 **Response**

The DOE believes that testing at the WIPP site is necessary, although some small-scale laboratory experiments would provide useful information and would be performed. As noted in response to comment 3.1-3, the National Academy of Sciences and members of the Blue Ribbon Panel support the conduct of tests in the WIPP underground.

The DOE is also investigating the possibility of performing bin-scale experiments with radioactive waste at other facilities, in the event that the WIPP's opening is delayed beyond 1990.

7.11-4 **Comment**

The EEG, the EPA, and other commenters noted the importance of the gas generation and other tests proposed for the Test Phase. Specific issues related to these tests were raised as follows:

- The EEG emphasized the importance of the gas generation issue and the need to address it. It noted that authorization for the WIPP to receive radioactive mixed waste could substantially delay the gas generation tests and recommended that the final SEIS address the potential for and impacts of such a delay. It also asked why these tests had not been performed at the generator facilities since 1985.

- The EPA asked how not knowing the actual chemical constituents of TRU waste will affect the analyses of chemical corrosion as well as other degradation mechanisms.

- One commenter was concerned that the DOE does not know how hazardous chemical and radioactive waste mixes, and another commenter said that the draft SEIS did not adequately address gas generation. Other commenters asked why such tests had not been performed in a controlled laboratory setting. One commenter was concerned that tests would be performed in the WIPP before compliance with the EPA standards had been demonstrated.

7.11-4 **Response**

- Some analyses of gas generation were conducted in 1979 (Molecke, 1979); however, permeability data available then suggested that all gas that might be generated could leave the repository by permeating into the host Salado Formation. Recent, more accurate, permeability data are about three orders of magnitude lower than the earlier values (see Appendix E). It now seems possible that gas generation would pressurize the repository, because the formation will not accept gas at such high rates as was previously thought. Thus, the DOE now recognizes the need for more extensive gas-generation tests. The DOE also recognizes that delays in receipt of mixed waste would delay gas-generation tests at the WIPP. The DOE is investigating the possibility of conducting the tests elsewhere, if necessary, as noted in response to comment 7.11-3.

- Detailed knowledge of the chemical constituents of TRU waste is not necessary to analyze the effects of waste degradation. The planned bin-scale and alcove-scale tests would adequately characterize the behavior of representative waste as described in Appendices O and P and Subsection 5.2.1. Also see response to comment 3.7-4.

- Some of the mixed waste proposed for disposal at the WIPP already exists in storage at various facilities, so it is known that any interactions between radioactive and hazardous waste are not catastrophic. The DOE agrees that not enough is known about their interactions, however, and that is why parts of the test program have been designed to examine such interactions. The test programs (Molecke, 1989) would monitor and quantify the amount of hazardous components (i.e., volatile organic compounds) that can be released from radioactive wastes during repository storage. This monitoring of volatile organic compounds is in addition to measuring the gases generated by waste degradation. Responses to comments 7.11-1 and 7.11.2-1 discuss the disadvantages of using only laboratory tests.

7.11-5 **Comment**

Commenters had the following questions about Subsection 3.1.1.4 of the draft SEIS:

- What is "degradation product contamination"?

- The description of the bin-scale tests states that brine would be added to the TRU waste only at the WIPP site. The description of the alcove-scale tests contradicts this by stating that TRU waste including brine would be specially prepared at the generator facilities.

7.11-5 **Response**

The phrase "degradation product contamination" (page 3-28, paragraph 2, in the draft SEIS) has been replaced with "contamination by expected degradation products" in this final SEIS.

Brine would not be added to the specially prepared waste at the generator facilities for either bin- or alcove-tests. The second sentence of the last paragraph on page 3-28 (draft SEIS) has been changed to indicate that "specially prepared CH TRU waste would include added backfill materials and gas getter materials, added at the generator facilities, and brine, added during the experiments at the WIPP site."

Additional details are contained in Appendix O.

7.11-6 **Comment**

The EEG and others stated that the draft SEIS was incorrect to imply that radioactive TRU waste is needed during the Test Phase to reduce uncertainties associated with brine inflow, salt deformation, and other geotechnical issues. Gas generation is the only parameter that requires real waste. Others also commented that performance assessment is, by definition, based on probabilistic models using geotechnical data and conservative assumptions; no waste experiments are required by the EPA standards, and no experimentation would be allowed at a repository licensed by the NRC. Why are such experiments required at the WIPP?

7.11-6 **Response**

Neither the draft SEIS nor this final SEIS state or imply that waste is required for all the tests that would be conducted during the Test Phase of approximately 5 years. In fact, the DOE's plan for the Test Phase (DOE, 1989b) describes a great many tests that do not require waste (see Appendix O).

The comment that performance assessment must use conservative assumptions is incorrect; there is no such requirement in the EPA standard. What the standard does require is an analysis that provides 'reasonable assurance,' and that must therefore be based on data whose uncertainty is acceptably low. The repository to be licensed by the NRC would have an extremely uniform waste form in comparison with TRU waste proposed for disposal at the WIPP; it seems likely that the behavior of that waste can be predicted without large-scale experiments. WIPP's waste, in contrast, is laboratory and production trash with very non-uniform characteristics. Its behavior must be measured experimentally to reduce uncertainty and to provide reasonable assurance that the Performance-Assessment predictions are accurate.

7.11-7 **Comment**

The EEG stated that the claim that the integrated operations demonstration is needed to "show the ability of the TRU-waste management system to safely and efficiently certify, package, transport, and emplace waste in the WIPP" is misleading for the following reasons:

- "The certification of waste for WIPP is independent of operational demonstrations and is currently underway at the generating and storage facilities.
- The packaging of waste has been studied and perfected since 1970 and is independent of any operational demonstrations.
- The transportation of these wastes has been demonstrated in the past with the packages other than TRUPACT-II and experience with TRUPACT-II could be obtained (once it is certified by NRC) by shipments from the Rocky Flats

Plant to the Idaho National Engineering Laboratory and from the Lawrence Livermore National Laboratory to the Nevada Test Site.

- No justification has been provided for the emplacement of 83,000 drums (up to 10 percent of the WIPP capacity). Emplacement is occurring today at Idaho National Engineering Laboratory."

7.11-7 **Response**

The EEG is correct when it states that several of the individual components of the TRU-waste management system are currently in place. However, exercising the total system at rates of emplacement that approximate full scale operations at the WIPP has not been and would not be accomplished in the absence of an operations demonstration. Thus, it is considered prudent to demonstrate that all components of the waste management system can operate together in a coordinated fashion prior to initiating the Disposal Phase. The operations demonstration would allow end-to-end operations to occur, which could identify problem areas prior to full operations. This knowledge would allow problems to be corrected in a responsible manner prior to initiating the Disposal Phase. The DOE believes that the three primary elements of the operations demonstration tests were accurately presented in Subsection 3.1.1.4 of the draft SEIS. Minor modifications have been made to the same section of this final SEIS to increase clarity. Also see response to comment 5.1.1-1.

7.11-8 **Comment**

The EPA said that the DOE must be more definitive about the final forms of the TRU waste to emplaced in the WIPP. The EPA, the EEG, and others made the following comments:

- Does the DOE expect to define the final waste forms during the Test Phase or during other tests? The draft Test Plan does not identify any experiments to evaluate the benefits of using the waste treatment technologies discussed in the [draft] SEIS. If there are other tests, they should be described.

- Why are treated wastes not included in the Test Phase? If waste treatment is found to be necessary, a lack of experimentation may cause considerable delay in waste emplacement.

- The results of any tests regarding waste treatment and final waste forms should be described, especially in regards to the effects on key parameters such as gas generation and brine infiltration rates.

7.11-8 **Response**

The DOE's current plan is that the final form of the waste to be emplaced in the WIPP would be laboratory and production trash and supercompacted waste, both in boxes and 55-gallon drums. As such, the waste is and would remain in a heterogeneous state. The behavior of the waste would be characterized by the various laboratory, bin-scale, and alcove-scale tests described in the DOE's Draft Plan for the WIPP Test Phase (DOE, 1989b) (see Appendix O). The interaction of waste behavior (e.g., gas generation) and other parameters (e.g., brine infiltration) would be examined during the proposed Test Phase and during the resultant performance assessment.

The experiments are discussed in more detail in a lengthy supporting document (Molecke, 1989). In addition, the WIPP Project has and will continue to publish very detailed test plans for each individual experiment. The DOE has established an Engineered Alternatives Task Force to examine, among other things, various treated waste forms. If any treatment technologies appear to be feasible and necessary, Phase III of the bin-scale experiments would examine the effects of using such treatments.

A number of options would be considered (e.g., waste treatment, engineering modifications) and the required NEPA documentation for those options would be prepared before a decision to proceed was made. At the conclusion of the Test Phase, another supplement to the EIS would be prepared. Also, compliance with the radiation protection standards issued by the EPA for the disposal of TRU waste (40 CFR Part 191, Subpart B) would be determined and compliance with RCRA Land Disposal Restrictions (40 CFR 268) and other regulatory requirements would be confirmed. If there were a determination of compliance with the EPA standards and other regulatory requirements, and a favorable Record of Decision on the new SEIS, the WIPP would move into the Disposal Phase.

7.11-9 **Comment**

Two commenters asked why the DOE could not simulate tests with radioactive waste by using heaters or other devices. Another person asked about the DOE's future plans for an underground room at the WIPP that is designed to accommodate large amounts of high-level radioactive waste.

7.11-9 **Response**

CH TRU waste generates very little heat, and thus heaters do not provide much useful data about CH TRU, although past experiments simulating the effects of high-level radioactive waste have indeed used heaters at the WIPP. The experiments planned using radioactive waste during the proposed Test Phase are aimed at examining chemical and biological processes that might take place in the waste or as a result of waste emplacement in alcoves in the WIPP. No experimental equipment can simulate these processes. Some laboratory tests would examine selected biological processes without radioactive components of the waste.

At this time, the DOE has no plans to emplace high-level waste at the WIPP, either for disposal or for experiments (see Subsection 3.1.1.1). Because the WIPP is a research and development facility, high-level radioactive waste experiments could become useful at a later time, if the national policy on high-level radioactive waste disposal changes, and salt sites are again considered for disposal of commercial waste.

7.11-10 **Comment**

The State of Idaho requested that the draft SEIS provide more information regarding the Idaho National Engineering Laboratory as an alternative location for bin-scale testing. It was asked what volume of TRU waste would be transported to such a facility, the duration of testing, and impacts such a decision might have on delaying shipments to the WIPP.

7.11-10 **Response**

The WIPP is the proposed site at which to conduct the bin-scale experiments primarily for two reasons. First, the WIPP is the only facility that can be ready to conduct the experiments during 1990; at least two years would be required to secure permits, complete engineering designs, and construct an alternative facility. Second, permitting, design, and construction of an alternative facility would be much more expensive (see Subsection 3.2.2).

Several alternative sites for bin-scale testing are being evaluated. The Idaho National Engineering Laboratory is one site being evaluated. Preliminary information indicates that the Idaho National Engineering Laboratory would have to modify its facilities to prepare the waste or to conduct the bin-scale experiments. However, the facility already has most of the waste needed for the experiments except for supercompacted waste. Only a few of the TRU waste bins are scheduled to contain supercompacted waste (see Appendix O).

The bin-scale experiments are scheduled to be conducted for about 5 years depending on the data acquired. These experiments are needed to reduce uncertainties in the quantity of gas generated by TRU waste. The data would be used to complete the WIPP performance assessment and to compare the performance assessment to EPA standard 40 CFR 191 (and to other applicable requirements, as appropriate). If the bin-scale experiments are conducted elsewhere, it would delay shipments to the WIPP.

7.11-11 **Comment**

The EEG recommended that the discussion of the impact of bin-scale tests on resource consumption in Section 9.0 of the draft SEIS should be extended to include alcove-scale tests and to clarify how much waste would be used in the Test Phase. The State of New Mexico also called for an independent review of the volumes of CH TRU waste needed for the Test Phase.

7.11-11 **Response**

Subsection 9.2 of this SEIS has been revised to say that resource consumption by alcove-scale tests at the WIPP would be the similar to that for performing bin tests at the WIPP.

The request for independent review of proposed waste volumes is being done by the DOE. The EPA, the National Academy of Sciences, the EEG, etc., have reviewed the draft Test Plan and provided comments to the DOE. These comments have been evaluated; and although the total waste requirements are not known at this time, it is likely that the actual waste volumes used would be less than the 10 percent of total WIPP inventory assumed in the draft SEIS. Thus, the environmental impacts of the final volume selected will be bounded by the analyses contained in this SEIS.

Subsection 3.1.1.4 has been revised accordingly.

7.11.1 INTEGRATED OPERATIONS DEMONSTRATION

7.11.1-1 Comment

The State of Nevada commented that trial runs of the transportation system during the integrated operations demonstration would be a perfect opportunity for the DOE to involve the affected States in the WIPP program. State protocols could be evaluated, and scenarios could be designed and implemented to test various components of the system, including emergency response activities.

7.11.1-1 Response

The DOE welcomes State participation in preparation for initiation of TRU waste shipments from generator/storage facilities. A TRU Waste Shipment Dry Run Preoperational Checkout Plan, dated June 1989 (DOE, 1989h), has been written on the premise of State participation in these preoperational exercises. State participation will be coordinated for each facility. Specific scenarios have been included to address State participation.

7.11.2 BIN-SCALE TESTS

7.11.2-1 Comment

It was stated that gas-generation tests should be performed in laboratories and not at the WIPP site.

7.11.2-1 Response

Proposed gas-generation tests would, in fact, be performed in the laboratory; however, laboratory tests cannot be used alone, because they have the following disadvantages:

1. They would be performed on a very small scale relative to a repository, making scaling-factor effects a significant unknown.

2. They would not address interactions between waste types.

3. They would not contain the same microbial inoculants as found in actual TRU waste.

4. The impacts of radiolytic production on the anaerobic corrosion of steels would not be addressed.

5. Total synergistic reactions and interactions of all real-waste components would not be present.

6. The laboratory test system is simple and may not adequately represent the repository for thoroughly credible performance assessment analyses.

7.11.3 ALCOVE-SCALE TESTS

7.11.3-1 Comment

The EEG commented that the draft SEIS states that four alcove-scale tests would be performed but the Test Plan includes six alcoves for these tests. Which document is correct? The EEG also questioned how the short time frame of these tests would affect the test results.

7.11.3-1 Response

The Test Plan is correct, and Subsection 3.1.1.4 has been corrected (also see Appendix O).

The alcove-scale tests would run for several years; presumably the EEG is referring to the fact that some of the alcoves would be emplaced at times that give rise only to short test periods before the performance assessment is complete. If, at that time, additional data are required from the alcove-scale tests, the final performance assessment would be delayed until the information is available.

7.11.3-2 Comment

The EEG recommended that the SEIS (Subsection 2.4.2) clearly state that waste would be emplaced without backfill during the Test Phase and that backfill would be added later by moving the waste to new rooms. The SEIS should also provide the reasons for not backfilling during the Test Phase. Another commenter recommended that modified backfill tests should be conducted on a very small scale rather than using large volumes of waste.

7.11.3-2 **Response**

Subsection 2.4.2 has not been changed, because it is not true that all waste would be emplaced without backfill during the proposed Test Phase. The alcove-scale testing would involve in situ emplacement of waste and backfill(s) in a fully retrievable mode, in alcoves TA5 and TA6. This testing would provide information critical in investigating possible effects of geometric scale and time on structural response, gas behavior, and brine effects.

Initial and preliminary investigations of modified backfill tests will be conducted in the laboratory (see Bertram-Howery and Hunter, 1989a, Activities 1.1.2, 1.1.5, 1.1.6). These experiments have the advantages of being small in scale, isolating variables, being able to address a very broad range of geochemical conditions, and giving results in a relatively short time. The disadvantage of such tests is that they can provide only limited information on interactions between different processes, and they cannot investigate effects due to scale. For example, it is possible that backfill additives may be more efficient on the lab scale than on the full in situ scale of actual disposal.

The second level of testing, bin-scale tests (Bertram-Howery and Hunter, 1989a, Activity 1.3.4), would still be completely contained, except for analyzed gases. These tests would use actual waste and provide an intermediate stage at which more representative waste and backfill geometries can be investigated, including such engineering modifications as waste compaction.

The operations demonstration would emplace waste in full-size storage rooms without backfill. Since the operations demonstration waste would not provide gas test data, the addition of backfill for experimental purposes is not required. Clearances are then maintained so that creep closure does not allow the roof or walls to contact the waste and crush or breach drums, thus ensuring easy retrievability.

7.11.4 PERFORMANCE ASSESSMENT

7.11.4-1 **Comment**

The State of Nevada commented that "the [draft] SEIS indicates that a major element of the WIPP Test Phase is performance assessment" and asked why transportation components are not included in the performance assessment.

7.11.4-1 **Response**

The term Test Phase refers to a program proposed by the DOE to reduce uncertainties associated with factors that may affect repository performance. The term "performance assessment" is used in the draft SEIS and this final SEIS as it is defined by the EPA in 40 CFR 191, Subpart B, and it applies only to the analysis of repository performance after closure. As part of the Proposed Action, the operations demonstration would, in effect, be a practical "performance assessment" of the transportation system.

7.11.4-2 **Comment**

Commenters did not understand the meaning of the statement in the draft SEIS on page 3-27, "Some of these events or processes estimated to have a greater probability may be deleted if there is a reasonable expectation that the remaining probability distribution would not be significantly changed by their omission." They also asked how the DOE will choose the release scenarios for the performance standards and how will the DOE assure the public that the entire range of possible events will be examined.

7.11.4-2 **Response**

This statement is almost a direct quote from Appendix B of 40 CFR 191, the EPA standard. However, the text has been changed to read "...probability distribution of cumulative releases would not be..."

The performance assessment must examine a wide range of possible release events; external peer review and review by the NAS, the EEG, the EPA, and the public will be used to assure the public that the entire range of important release events is examined.

7.11.4-3 **Comment**

Some commenters noted that important questions regarding the safety of the WIPP remain unanswered including the effects on gas generation of radiolysis, thermal decomposition and dewatering, chemical corrosion, and bacterial action. These commenters asked if there had been an integrated analysis of the WIPP that accounts for the effects of not only gas generation but also room closure, brine inflow, and temperature.

7.11.4-3 **Response**

The combined effects of room closure and brine inflow and the separate effects of gas generation have been examined using preliminary data by Lappin et al. (1989). Very little heat is generated by CH TRU waste, but the effects of heat generation by RH TRU waste have been calculated (e.g., Arguello et al., 1989). The development and use of a model that considers the integrated effects of all important room processes is part of the DOE's plan for the Test Phase (DOE, 1989b).

7.11.4-4 **Comment**

The EEG, the State of Washington, and others commented on the performance assessment process. The EEG disagrees with Subsection 3.1.1.4 of the draft SEIS where it states that the State of New Mexico agreed to proceed with the performance assessment planning as if the remanded EPA Standards (40 CFR Part 191, Subpart B) were still in effect. The State did agree to proceed with the documentation, but only a schedule has been published by the DOE since promulgation of the standards in

1985. The EEG also suggested that it may be possible to perform a performance assessment with existing data (i.e., without Test Phase data). This assessment could be "bounding" and could be compared with the standards to justify gathering additional data in critical areas of uncertainty and sensitivity. If such an assessment has been performed, it should be incorporated into the final SEIS. The State of Washington recommended that the final SEIS describe the specific results to be expected from the performance assessment and explain why specific waste types are needed to obtain these results. This might indicate if the performance assessment process would show compliance with the EPA standards or the RCRA "no migration" variance or confirm previous predictions. The final SEIS should also graphically show the 5-km boundary for 40 CFR 191 compliance and the unit boundary for a RCRA no migration variance.

7.11.4-4 **Response**

Subsection 3.1.1.4 has been changed to delete the word "planning."

Some performance-assessment documents have been published (e.g., Rechard, 1989; Bertram-Howery and Hunter, 1989a, and 1989b); several others will be published in the first half of 1990 (e.g., Hunter, 1989; Marietta et al., 1989; Bertram-Howery et al., 1989c). In addition, the EEG and NAS have received quarterly briefings on results of ongoing performance-assessment investigations.

Bounding calculations performed in 1987 for internal use examined the effects of initial void volume, brine-influx rate, creep-closure rate, and inventory. Although these calculations were never published, the EEG and NAS received briefings on the results. A draft memo discussing the calculations will be published as an appendix to the work of Lappin et al. (1990).

Bounding calculations are probably not a sufficiently sensitive tool for use in determining either compliance with 40 CFR 191 or what experiments need to be done to support compliance calculations. Conservative bounding calculations of integrated release were presented in the draft SEIS in Tables 5.62 through 5.65. However, these are deterministic calculations, not the probabilistic calculations required by 40 CFR 191 (see Appendix I.1.5). Using conservative assumptions and calculational techniques, the results showed apparent violations of 40 CFR 191. Using the same conservative assumptions, but improved calculational techniques, the integrated release in this final SEIS was reduced; there is no apparent violation at approximately 5 kilometers, but there is still an apparent violation at the land-withdrawal boundary.

Because the boundary for compliance with 40 CFR 191 has not yet been finally determined, it is not appropriate to show a boundary in this SEIS. Possible positions of the boundary will be discussed in the DOE's compliance strategy. The boundary for RCRA compliance is discussed in the No Migration Variance Petition.

7.12 **WIPP OPERATIONS**

7.12-1 **Comment**

The State of New Mexico commented that the draft SEIS does not provide sufficient documentation regarding the DOE programs and procedures 1) for packaging, receiving, and emplacing TRU waste (at the WIPP and the 10 generator facilities); 2) surveying site personnel for radioactive contamination and decontaminating both surface and underground workers; and 3) maintaining and calibrating radiation-detection and other monitoring equipment. The State of New Mexico asked that the final SEIS include at least a descriptive overview of these programs and procedures, with explicit references to those reports where detailed information can be obtained.

7.12-1 **Response**

In addition to both the draft SEIS and this SEIS, several manuals maintained at the WIPP detail the Radiation Safety Program and related procedures:

First WP 12-11: The Radiation Safety Program Plan (WEC, 1989c)

The Radiation Safety Program Plan provides a philosophical overview of the Radiation Safety Program at the WIPP.

Second WP 12-5: The Radiation Safety Manual (WEC, 1988a)

The Radiation Safety Manual provides radiation safety rules and standard operating procedures to be followed.

Third WP 02-2: WIPP Dosimetry Program Manual (WEC, 1989d)

The WIPP Dosimetry Program Manual provides a detailed dosimetry program description and standard operating procedures to be followed in implementing this program.

Fourth WP 12-12: WIPP Health Physics Technician Training Manual (WEC, 1989e)

This manual describes and details the training requirements for Operational Health Physics technicians.

7.12.1 **LOCATION**

7.12.1-1 **Comment**

Several commenters stated that the Carlsbad Caverns are not the right location for nuclear waste storage.

7.12.1-1 **Response**

One common misconception is that the WIPP is located near or is associated with the Carlsbad Caverns National Park. This is not the case. The location of the WIPP site is in the Salado Salt Formation about 26 miles east of Carlsbad, New Mexico, and is not associated with either the Carlsbad Caverns, nor the geological formation associated with the Caverns (the Caverns are at least 30 miles from the WIPP).

7.12.1-2 **Comment**

Commenters were divided as to whether or not, from a geological standpoint, the WIPP site is the best possible location for the permanent disposal of TRU radioactive waste. In particular, the commenters noted the closure rate of the salt and the hydrology of the area.

7.12.1-2 **Response**

The location of the WIPP site in the Salado Salt Formation has been under study for over 14 years. This site is believed to be well suited for the long-term isolation of TRU waste due to favorable hydrology, and because the salt beds are thick, at the proper depths, relatively horizontal, and sufficiently removed from active dissolution fronts. Most of the water-bearing zones contain extremely briney fluids or brackish liquids. Though the closure rate of the underground storage rooms has been observed to be faster than originally anticipated, the closure rate is not anticipated to affect the long-term performance of the facility. The facility is designed to encapsulate the waste. The primary concern is one of personnel safety, since rapid closure could lead to areas of weakness which could result in potential roof falls. Therefore, an extensive mine safety program is in place at the WIPP. This program includes daily inspections, removal of loose material, and use of ground control (roof bolts, wire mesh, roof mats, etc.) if necessary to ensure worker safety.

7.12.1-3 **Comment**

Commenters asked if the WIPP site buffer zone is large enough to adequately protect all citizens living in areas adjacent to the WIPP site. The distances from the WIPP site to the communities of Carlsbad, Loving, and Malaga, New Mexico, were specifically requested. Commenters noted that the buffer zone around the Rocky Flats Plant is considerably larger than that of the WIPP and questioned why the WIPP site buffer zone did not approximate this area.

7.12.1-3 **Response**

The WIPP site boundary is intended to provide the required security perimeter and, at the same time, to provide general protection of personnel in the environment. The residences closest to the WIPP site are the Smith Ranch and the Mills Ranch. Both of these ranches are approximately 5 miles from the site, and, typically, no more than a total of about 20 individuals reside there. Several potash mines operate in the vicinity of the WIPP, but no large, continuous population exists within 20 miles of the site. Neighboring communities such as Malaga, Loving, and Carlsbad are at considerable distances from the site (Malaga is approximately 18 miles from the WIPP; Loving is about 20 miles from WIPP; and Carlsbad is 26 miles from WIPP). During the operational life of the WIPP, no significant releases are expected to affect the offsite environment. Therefore, the surrounding communities and local activities would not be affected by occurrences at the WIPP.

A facility such as the Rocky Flats Plant requires larger land areas between the facility and the public because of the sensitive or classified nature of the work being performed. Since the WIPP is handling nonclassified waste, the security requirements are much less stringent. Though multiple features exist to mitigate any potential release, a large buffer zone has been used at the site to minimize any potential impacts on the public.

7.12.1-4 **Comment**

Several commenters requested that the SEIS provide an analysis of the implications or potential environmental impacts of the DOE's decision to abandon its original plan of locating the WIPP at least 2 miles from the nearest mining activity, well, or borehole.

7.12.1-4 **Response**

Mining and drilling activities within the vicinity of the WIPP have been assessed and are not expected to affect the safety of the facility. New drilling or mining activity will be evaluated for potential impacts as part of the long-term performance assessment activities to determine if compliance with 40 CFR 191, Subpart B can be achieved.

The analysis of impacts on the accessible environment is contained in Subsection 5.4.2 of the draft and final SEIS. The process used by the DOE to analyze the environmental impacts of a borehole near the WIPP site, as well as the impacts of a borehole drilled directly through the repository, are discussed.

7.12.2 **FACILITIES**

7.12.2-1 **Comment**

Several commenters, including officials from the State of New Mexico and the EEG, requested that an explanation be given for the way in which underground storage ventilation is monitored and exhausted. They also asked how and when this air is exhausted through the high-efficiency particulate air (HEPA) filters.

7.12.2-1 **Response**

Ventilation air exhausted from the underground is monitored during its transit underground, and just prior to its release at the surface, by continuous air monitors (CAMs). These CAMs draw a standard amount of air (usually 2 cubic feet per minute [cfm]) across and through a filter, which collects the particulates contained in the air. A detector, mounted just opposite the filter, monitors the deposited particulates for radiation. If radiation above preset levels is detected, the CAM goes into an alarm condition. Two simultaneous alarms from the underground CAMs are required to activate the exhaust filtration, while any single CAM alarm in the aboveground Effluent Monitoring System can activate exhaust filtration. The activation of filtration reduces the underground ventilation from the normal flow rate of 425,000 cfm to 60,000 cfm, and redirects exhaust airflow through the exhaust filter building.

The exhaust filter building contains two separate trains of HEPA filters which remove particulates from the exhaust air. This filtration would significantly reduce the potential magnitude of impacts associated with releases from the WIPP, although credit is not taken for HEPA filtration in the modeling of hypothetical accident doses from underground releases at the WIPP (see Subsections 5.2.3 and 5.2.4). HEPA filters are not absolute, however, and an efficiency or decontamination factor is assumed for assessing releases when HEPAs are known to be active, such as in the case of postulated releases from the waste handling building.

The filters in the waste handling building and the exhaust filter building are tested when installed and periodically thereafter. In addition, the differential pressures across the filters are monitored to ensure that they are functioning properly.

Additional information has been added to Subsection 5.2.3 to eliminate misunderstandings about the filtering of underground ventilated air.

Also see the responses to comments 7.12.2-3 and 7.13.2-1.

7.12.2-2 **Comment**

Commenters expressed concern that building codes and procedures cannot be documented and proven safe.

7.12.2-2 **Response**

The design classification of each structure on the site was evaluated during the design of the facility. If the function of the building or structure was to control a potential hazard, then the design and construction of the structure was given a greater amount of scrutiny and review. Formal, documented design reviews were held at specific points of the design phase to ensure that the design would satisfy its intended purpose. During the construction of the facility, extensive quality assurance and control measures were in effect in order to verify that the facility was being constructed in accordance with the design and applicable standards. There is also an extensive review process for procedures which affect significant operations at the site. Comments on these procedures and their outcomes are also formally documented. The final procedures are verified by the performance of drills or exercises which provide a step-by-step walk-through of the procedures. Documentation of the design, construction, and development of procedures is retained at the WIPP site Master Records Center.

7.12.2-3 **Comment**

Several commenters requested that the means by which high-efficiency particulate air (HEPA) filters work be explained. They asked to what degree of efficiency are the filters expected to perform in filtering airborne particulates from the air. Others doubted the efficiency of the filter systems, noting that reported failures of HEPA filter banks at the Feed Materials Plant in Fernald, Ohio, resulted in releases of uranium dust, and that the Rocky Flats Plant daily releases measurable particulates from its exhaust systems from air that is supposedly passed through HEPA filters. The validity of efficiency testing of HEPA filters, their continued performance after a fire or explosion, and their potential effectiveness in filtering radioactive gases were seriously questioned by one commenter. Others requested that additional testing of HEPA filters be performed and that other similar air-cleaning products be considered.

7.12.2-3 **Response**

The high efficiency particulate air (HEPA) filter systems in the WIPP's waste handling building ventilation exhaust play a key role in confining the spread of radioactivity. Each system is made up of three filters: a roughing filter to capture the bulk of airborne particulates, and two HEPA filters in series. Each HEPA filter is designed to a minimum of 99.97 percent efficiency standard. Consistent with practices at other DOE facilities, credit is not taken for the efficiency of the roughing filter, and each HEPA filter is assumed to remove only 99.9 percent of the particulates entering the filter. Thus, for the waste handling building it is assumed the HEPA filters have a combined system efficiency of 99.9999 percent.

The removal efficiency assigned in the SEIS for the WIPP HEPA filters is consistent with the removal efficiency assigned in the 1980 FEIS and the WIPP draft Final Safety Analysis Report (DOE, 1989a). As such, it has been scrutinized and accepted by past DOE and independent reviews of the project. Recent NEPA documentation for other DOE facilities have utilized a similar efficiency for two-stage HEPA filtration systems, such as the 99.9998 percent removal employed in the Special Isotope Separation

Facility EIS (DOE, 1988j). On the basis of the above, the 99.9999 percent removal efficiency assumption is maintained.

As noted by several of the commenters, the use of HEPA filters as an air-cleaning device for exhaust air is a standard practice of the nuclear industry. Use of HEPA filters has successfully reduced emissions of radioactive particulates for many years by mechanically filtering radioactive particles out of the air stream. It is important that effective testing programs are in place when HEPA filters are used.

HEPA filters are tested by the manufacturer to meet a filtration efficiency of 99.97 percent for particles of 0.3 micron in diameter. This is the most difficult size to filter out, so efficiencies for all other sized particles will be higher.

The filters in the waste handling building and the exhaust filter building are tested before and periodically after installation. In addition, the differential pressures across the filters are monitored to ensure that they are functioning properly. Testing is in accordance with ANSI N510 (which requires very specific test procedures to be used to ensure valid test results). Continuous air monitors are installed downstream from the filters in order to detect any radioactive material release in the event that all the previously mentioned controls are not effective.

Fires or a large explosion can breach HEPA filters and cause releases of radioactive materials to the environment. The filters are located away from potential fire sources and petroleum fuels to reduce the potential for a HEPA filter breach. (The issue of waste-induced explosions is addressed in the response to comment 7.15-5.)

Also see the response to comment 7.12.2-1

7.12.2-4 **Comment**

The EEG commented that the buildings numbered 364 and 365 are missing from Figure 2.3, and from the listing of building names on the next page. It went on to say that these buildings are significant since they house Station A and Station B of the effluent monitoring system.

7.12.2-4 **Response**

Figure 2.3 has been revised to add Buildings 364 and 365.

7.12.2-5 **Comment**

The EEG requested that an extended explanation be provided in the SEIS concerning safety measures taken with regard to areas recently excavated due to fracturing and salt creep. Others questioned how long the excavated rooms can be maintained, and inquired if mining will need to proceed after some waste has been emplaced.

7.12.2-5 **Response**

Rock bolting and, occasionally, meshing are used to maintain facility openings in the interest of personnel safety. Due to the anticipated and desired closure of the underground facility with time, the various waste panels will be mined sequentially, so that as one waste panel is filled, the next is available. This sequential mining of panels will tend to minimize creep-closure effects. Some loose salt may need to be removed to maintain some openings such as corridors and hallways, but this is part of normal openings maintenance (see Subsections 6.2 and 6.3).

7.12.2-6 **Comment**

The EEG and others requested more detailed information on the 1982 cost reduction program decision to eliminate the fourth shaft and, later, to add it. They also requested more detailed information regarding the cost impacts of this decision.

7.12.2-6 **Response**

This SEIS describes the currently constructed facility and major changes since the FEIS. A three-shaft repository could operate safely; however, extensive coordination between scientific experiments, mining activities, and waste emplacement activities would be required to ensure adequate air circulation. A ventilation study in early 1986 indicated that more efficient operations would result from having a separate air intake shaft, so the fourth shaft was constructed.

The cost reduction proposal in 1982 included a number of changes which resulted in a total savings of $200 million. The proposal did not have a specific cost savings associated with elimination of the fourth shaft. Costs totaled $4.2 million for the construction of the air intake shaft in 1988.

7.12.2-7 **Comment**

Commenters inquired about reported allegations that detailed systems drawings, diagrams, and maps of the WIPP have not been completed or do not exist.

7.12.2-7 **Response**

Drawings of the WIPP systems do exist, and those systems have been and continue to be tested and operated satisfactorily. Errors have been found on some drawings; however, the design drawings do not always reflect the actual final construction and existing conditions. This requires WIPP personnel to carefully field-check conditions before repairing or modifying the systems. A program is underway to fully field-check and update the existing drawings.

The U.S. Army Corps of Engineers served as Construction Manager on the WIPP Project. Documentation, correspondence, submittals, reports, quality assurance reports, and so forth are stored at the Master Records Center, 401 Canal Street, Carlsbad, New

Mexico. Needed information can be retrieved if the request is specific and technically focused.

7.12.2-8 **Comment**

A County Commissioner of Santa Fe stated that the WIPP not receive shipments of radioactive waste until construction of the WIPP, including the fourth airshaft and construction of the workers' Health and Safety Building, has been completed and the Safety Analysis Report (SAR) has been brought to a close. Other commenters also requested discussion of changes to the surface facilities at the WIPP.

7.12.2-8 **Response**

The construction of the WIPP physical facility is complete. The draft Final Safety Analysis Report (FSAR) (DOE, 1989a) has been prepared and reviewed by the DOE and outside agencies and is presently being finalized. The FSAR will be finalized and approved prior to shipments to the WIPP.

The surface facilities are described in Subsection 2.2 of this SEIS.

7.12.2-9 **Comment**

Commenters requested that the costs and impacts of building the railroad spur at the WIPP site be addressed. They also asked what the tracks will be used for if all waste is transported by truck rather than rail.

7.12.2-9 **Response**

As described in the 1980 FEIS, rail shipments were considered a viable transportation option. The railway spur, therefore, was built with that consideration in mind, and evaluated in the FEIS. Total cost for the railroad spur was $3.8 million. A reconsideration of transportation options has resulted in the decision to ship waste to the WIPP via the truck mode during the Test Phase. The planned use of the truck mode was discussed in the draft SEIS, and is discussed in this final SEIS, as the preferred mode for transporting waste to the WIPP during the Test Phase. The rail transportation mode, of which the rail spur is a part, is considered as a potentially viable option during the Disposal Phase.

7.12.2-10 **Comment**

Commenters requested that the SEIS describe the capacity of the hot cell in the waste handling building and, specifically, how much RH, "high curie and high neutron," and high-level radioactive waste it can safely handle. They asked if the high-level waste capacity will be maintained, even though it was decided not to emplace high-level waste in the WIPP.

7.12.2-10 **Response**

The design and construction of the hot cell was conducted on the premise that high-level waste experiments would be conducted at the facility. Substantial shielding (e.g., leaded glass windows and 54-inch concrete and rebar walls) was included. Therefore, the hot cell is considered over-designed, and as such, it can safely handle the RH TRU waste, which has a much lower surface dose rate than waste for which the hot cell was originally designed. Four canisters may be contained in the hot cell at any one time, with storage of an additional seven canisters (six normal canisters plus one overpack) in the hot cell transfer car. The hot cell capacity is more than adequate for the expected processing rate of one canister per day.

7.12.2-11 **Comment**

Commenters inquired about the effective disposal capacity of the mined repository at the WIPP. Commenters asked how this area was calculated, and if the configuration of underground panels will be changed if this area is greater or less than what is actually needed.

7.12.2-11 **Response**

The repository has been designed to handle 6.45 million cubic feet of TRU waste. Subsequently, the panel and room sizes have been scaled to accommodate this amount. All volumes would be measured according to the external volume of the emplaced container, not according to the contents of the drums, which may or may not fill a drum. (These matters have been clarified in Appendix B.1 of the SEIS.)

7.12.2-12 **Comment**

Commenters stated that the discussion of the reorientation of underground panels, as written in the draft SEIS, was difficult to comprehend.

7.12.2-12 **Response**

In 1982, the decision to reorient the facility was made due to the observation of a disturbed zone to the north and below the planned underground waste demonstration area. Drilling into this disturbed zone indicated the presence of reservoirs of pressurized brine about 800 feet below the repository level. Subsequent drilling and seismic studies, into the south side of the demonstration area, indicated no such brine reservoirs. Though the north and south sides are considered adequate for the underground storage demonstration area, data indicated that the southern part has greater continuity and predictability in terms of stratigraphy. The facility was subsequently reoriented to the south. At this time, there is no significant indication of brine under the southern orientation of the facility. Subsection 2.2.2 of the final SEIS has been revised to clarify the reason for reorienting the underground facility.

7.12.3 **WASTE TYPES AND FORMS**

7.12.3-1 **Comment**

The EEG commented that the use of units of volume, to characterize TRU waste is misleading. It was stated that the discussion on page 2-9 of the draft SEIS should describe typical concentrations in nanocuries per gram for both weapons-grade plutonium and heat-source plutonium. It was also requested that specific volume percentages be given, and that radioactive percentages be provided as well.

7.12.3-1 **Response**

The units of volume are considered appropriate when discussing TRU waste, since this is consistent with the manner in which data are presented in other references. Also, the WIPP site limits for TRU waste are volumetric in nature (i.e., 6.2 million cubic feet for CH TRU waste and 250,000 cubic feet for RH TRU waste). In other sections of this SEIS, the activity densities per unit volume, or per container, are provided. These densities are more usable for assessing postulated accidents than a specification of density on a per gram of waste basis.

7.12.3-2 **Comment**

Several commenters inquired about the definition of TRU waste and what its half-life is. The EEG pointed out that although the definition of TRU waste excludes actinides with half-lives of less than 20 years, the DOE has committed to including curium-244, with a half-life of 18 years, and californium-252, with a half-life of 2.6 years, in the TRU waste coming to the WIPP. The DOE has also committed to including uranium-233, with a half-life of 150,000 years, which does not have an atomic number greater than 92. The EEG stated that the commitment to include these three radionuclides should be shown in conjunction with the definition.

7.12.3-2 **Response**

TRU waste is similar to normal industrial waste from medium-heavy industry, except that it is contaminated with TRU radioactive materials. Typical waste includes coveralls, paper products, metals, glass, and so forth. TRU waste, for the WIPP, is defined as defense waste contaminated with certain alpha-emitting radionuclides with an atomic number greater than 92, in concentrations greater than 100 nanocuries per gram of waste. "Nano-" means one billionth (1/1,000,000,000 or 10^{-9}). A nanocurie is one billionth of a curie. Since a curie is a special unit for radioactivity equal to 3.7×10^{10} nuclear transformations per second, a nanocurie is a unit for radioactivity equal to 37 nuclear transformations per second. There is not an upper limit for concentration of radionuclides above the 100 nanocuries per gram specified in the definition of TRU waste. However, there are upper limits for the overall radioactivity in a container specified in the Waste Acceptance Criteria (WAC) (DOE, 1989e) (see Appendix A). These include grams of fissile material and surface dose rates. As defined for DOE facilities, the half-lives of TRU radionuclides range from 20 to several thousand years. For example, plutonium-238 has a half-life of 87 years and plutonium-239 has a half-life of 24,000 years.

DOE Order 5820.2A, in its definition of TRU waste, states that "Heads of Field Elements can determine that other alpha contaminated waste, peculiar to a specific site, must be managed as transuranic waste" (DOE, 1988f).

There are some materials that have been managed as equivalents of transuranics at various facilities. The majority of this waste is the uranium-233 waste from the fabrication of the Naval Reactors light water breeder reactor (LWBR) core used in the Shippingsport Atomic Power Station. The source material was provided by the Oak Ridge National Laboratory and the core fabricated by Bettis. Consequently, uranium-233 waste was found in the transuranic inventory at the Oak Ridge National Laboratory and the Idaho National Engineering Laboratory, which is storing waste from Bettis.

Under this provision, other facilities have also placed waste that was contaminated with nonTRU radionuclides in the inventory. Generators of waste contaminated with curium-244, californium-252, or other TRU radionuclides can send this waste to the WIPP under this provision. For this reason, these radionuclides appear in the inventories, and source terms are provided within this SEIS. The waste treated as TRU, under the comparable long-term health hazard provision, makes up about one-half of one percent of the TRU waste for shipment to the WIPP through the year 2013.

7.12.3-3 **Comment**

The EEG commented that the SEIS should reference whatever data listed on page 10-6 of the draft SEIS are available for waste characterization.

7.12.3-3 **Response**

Current waste characterization data are based on knowledge of the waste and the processes that generate it. The information was compiled by the DOE for preparation of the WIPP RCRA Part A permit application (EPA, 1980). This information is contained in Subsection 3.1.1.1, "Transuranic Radionuclide Inventory," and Subsection 3.1.1.2, "Hazardous Chemical Constituents," of this SEIS. As noted in the response to comment 3.7-4, waste sampling will occur prior to preparation of the bins (see Subsection 5.2.1.7 and Appendix P.8).

7.12.3-4 **Comment**

Several commenters, including the EPA and the Pueblo of Acoma, requested that all waste be characterized before shipment to the WIPP. Other commenters were more specific and stated that the SEIS should identify by nuclide, volume, and specific activity the hazardous, radioactive, and mixed waste that will be transported to and stored at the WIPP. It was said that the SEIS should state whether or not plutonium-238 from any facility will be transported in the TRUPACT-II, or in any other vehicle, to the WIPP.

7.12.3-4 **Response**

This SEIS, primarily in Appendix B, provides much of the requested information; any of the information included is considered important in the evaluation of the impacts. For instance, the concentration (specific activity) of each radionuclide, in terms of curies per trailer load, for each facility, is given in Tables B.2.6 and B.2.7. Since the number of trailer loads is also provided in this SEIS, the total activity for each radionuclide from each facility can be determined. The volume of each radionuclide is not an important factor; for instance, 1,000 curies of plutonium-239, the maximum allowable content of any waste container, is less than 0.001 cubic meter, or less than 0.5 percent of the volume of a drum. Subsection B.3 discusses mixed and hazardous waste, and Table B.3.1 gives information on quantities. Tables B.2.6 and B.2.7 provide the information on the amount, in terms of curies per trailer load, of plutonium-238 that will be shipped from each facility to the WIPP.

Prior to shipment to the WIPP, each container will be certified as meeting the WAC. These criteria, in addition to other data, are required to be reported in the data package accompanying the shipment. The TRU Waste Acceptance Criteria for the WIPP, Rev. 3 (DOE, 1989e) lists reporting requirements as shown in Appendix A.

In the case of newly generated waste, the empty drum is brought into the facility, and a security lid and seal is attached. From that point on, anyone opening the drum to place anything in it must do so in the presence of another person, with both persons signing the record to indicate what was placed in the drum. After the material is placed in the drum, the security seal is reattached, allowing positive control of the contents of the drum.

After the drum is filled, it is inspected and all documentation is verified by other personnel. The drum is then radiographed by x-ray personnel to verify that there are no prohibited materials in the waste. The radiograph tapes are kept as permanent records and are reviewed by the Waste Acceptance Certification Committee or other parties, as needed.

For the stored waste, all drums are radiographed, assayed, and ultrasonically tested, to verify container integrity and the accuracy of the records. In addition, gas samples are taken to identify and characterize any gases present. In all cases, the contents are known in sufficient detail, to verify that the WAC (DOE, 1989e) and the TRUPACT-II shipping criteria can be met, or that the drum will require reprocessing before it can be shipped.

Prior to shipment to the WIPP, the contents of the waste packages and the necessary data to ensure safe transportation will be known.

7.12.3-5 **Comment**

The EEG commented that on page 2-7, the draft SEIS states: "Wastes with TRU concentrations between 10 and 100 nanocuries per gram are expected to be reclassified as low-level wastes, which would not be sent to the WIPP." The EEG stated that the language should say that the waste "will be" classified, as opposed to saying that the waste "may be " classified. The EEG stated that this important distinction should be made.

7.12.3-5 **Response**

Waste with TRU concentrations between 10 nanocuries per gram and 100 nanocuries per gram will be classified as low-level waste if radionuclides such as Cm-244 or Cf-252 (which by strict definition are not TRU) are not present. (Also, see the response to comment 7.12.3-2.) If these or similarly categorized radionuclides are present, then the waste may be handled as TRU waste under the special health hazard provision in DOE Order 5820.2A (DOE,1988f). This SEIS has been corrected to clarify this point.

7.12.3-6 **Comment**

A commenter asked what waste is being temporarily stored in railcars at the Rocky Flats Plant, and if it is TRU or TRU mixed waste.

7.12.3-6 **Response**

The ATMX railcars have been used to transport TRU and TRU mixed waste from the Rocky Flats Plant to the Idaho National Engineering Laboratory for temporary storage. However, railcars are not currently used for storage of TRU waste at Rocky Flats Plant. If the WIPP begins operating, this waste would be transported in the TRUPACT-II directly from the Rocky Flats Plant to the WIPP.

7.12.3-7 **Comment**

Several individuals commented on the DOE's claim that waste sampling and analysis would increase radiological exposure of personnel. It was asked what these exposure levels would be and what remote technologies were being developed to minimize exposure. One commenter voiced concern that process analysis knowledge of waste containerized years ago was not adequate.

7.12.3-7 **Response**

The DOE does not currently plan, either by remote operations or direct sampling of waste materials, to perform radiochemical analyses of all waste destined for the WIPP. (Waste characterization for preparation of bins is described in Subsection 5.2.1. and Appendix P.) Exposure levels due to opened drums would be small on a drum-by-drum basis, but any unnecessary additional exposure is contrary to policy. Real-time radiography (RTR) is being used to determine the contents of drums. Since most of this material consists of contaminated glassware, lab aprons, rags, and other "trash," it would be impossible to obtain a representative sample. The use of process knowledge to define the contents of waste containers destined for the WIPP, which is acceptable under the regulations, is being evaluated at this time by the EPA in the

DOE's No Migration Variance Petition (DOE, 1989k). The DOE believes that process knowledge is adequate to characterize TRU waste for disposal at the WIPP. After evaluation of the DOE's process knowledge information, the EPA will be used as a final determination of adequacy under the RCRA.

7.12.4 **WASTE ACCEPTANCE CRITERIA**

7.12.4-1 **Comment**

The State of Georgia inquired why the maximum thermal power and the maximum activity concentrations for CH waste are not listed in the draft SEIS, while similar values for RH waste are. Two examples from the draft SEIS were cited:

Document Section	Appendix Section	Comment
2.3.1	A.1	"These sections list the maximum thermal power for RH waste as 300 watts per container. Why is there no similar maximum value on thermal power for CH waste? The only reference to thermal power for CH waste is that containers with a thermal power density greater than 0.1 watts per cubic foot will be labelled."
2.3.1	A.1	"These sections list the maximum activity concentration for RH waste as 23 curies per liter (Ci/L). Why is there no similar maximum value for CH waste?"

7.12.4-1 **Response**

A 10 kilowatts per acre thermal limit has been adopted for the referenced WIPP design (DOE, 1989e). Since the average thermal power of CH TRU waste is very low, the typical container will not reach this design limit. Therefore, no thermal limits are specified for CH TRU waste. The WIPP will use administrative controls to separate containers identified as having high thermal loadings to ensure meeting the 10 kilowatts per acre thermal limit.

The WIPP has a limit of 1,000 curies of equivalent plutonium-239 activity (PE-Ci) per CH container (A.1), which calculates to less than 5 plutonium equivalent curies per liter for 55-gallon drums. The activity in CH TRU waste is primarily attributed to TRU radionuclides, whereas RH TRU waste also has other mixed fission and mixed activation product radionuclides with high specific activities. The 23 curies per liter activity concentration is included for RH TRU since it is a limit legally agreed to with the State of New Mexico. No similar limit for CH TRU exists because other criteria are adequately restricting.

7.12.4-2 **Comment**

A commenter asked, "What is the current 'WAC Plan' for the WIPP site? According to the EIS for WIPP, 'Incineration is considered the only [sic] feasible processing alternative for reducing the content of combustible gas-producing materials'. It goes on to say 'the limitation on combustible and gas-producing material is still a subject of much discussion. As the wastes age and degrade, they can produce gases through four processes: chemical interactions, radiolysis, thermal degradation (including pyrolysis), and bacterial action. Some of the unresolved technical issues in the analysis of waste disposal in bedded salt involve interactions between the waste and the salt. It is believed that stored nuclear waste may be able to generate substantial volume gas. Because contact-handled waste sometimes contains organic and other gas-producing material, it has received closer scrutiny than remotely handled TRU waste or spent fuel.'"

7.12.4-2 **Response**

The current WAC are specified in the TRU Waste Acceptance Criteria for the Waste Isolation Pilot Plant, Rev. 3, January, 1989 (DOE, 1989e). This SEIS discusses the WAC in Subsection 2.3.1 and Appendix A. Chapter II of DOE 1989e, describes the Transuranic Waste Certification Program.

The draft final Performance Assessment Plan for the WIPP (DOE, 1989b) has been reviewed by the National Academy of Sciences (NAS), among others, and that draft includes testing for actual gas generation rates. The final plan will, of course, respond to review comments provided by NAS and other technical organizations, and will be issued as a public document.

Gas generation is a major focus of the experimental program at the WIPP. The quantity of gas expected to be generated is larger than previously estimated. If gas is a major long-term performance concern, waste processing or waste treatment could be necessary. Section 2.3.2 of this SEIS discusses the processing of TRU waste, and Section 6.4 discusses mitigation by waste treatment.

7.12.4-3 **Comment**

The State of New Mexico and others had several comments related to the development of the WAC for the WIPP. Concern was expressed that the WAC were developed outside of the NEPA process and without involvement of the State of New Mexico. Concern was also expressed that the WAC may not satisfy RCRA requirements, and that additional discussion of the 1,000 plutonium-equivalent curies limit, liquid limits, and so forth should be added to the SEIS.

7.12.4-3 **Response**

The WAC (DOE, 1989e) were developed by a DOE-wide committee of experts on the handling and transportation of radioactive material. The basic concepts and limits chosen as WAC requirements are based on personnel safety, handling and storage restrictions at the WIPP facilities, handling equipment, and procedures. Technical justification for the selection of the various requirements is provided in the WAC supporting documents.

Revisions have been incorporated into the WAC as the WIPP has matured. These revisions have been reviewed and commented on by the DOE, the storage/generator facilities, and the EEG. At each revision, the EEG provided comments which were considered for incorporation. In fact, many revisions were to allow the incorporation of responses to EEG comments.

The WAC were not developed outside the National Environmental Policy Act (NEPA) process. Chapter 5 of the FEIS (DOE, 1980) included all of the criteria in effect at the time it was issued. When the WAC were revised, the effects of these revisions were examined to determine the significance of any impacts. This review process documented that there would be no significant impacts from these revisions. Any future revisions to the WAC will also be analyzed in appropriate NEPA documentation.

The WAC originally addressed toxic and corrosive constituents and were subsequently revised to require waste to meet the four EPA tests (EP toxicity, ignitability, reactivity, and corrosivity) in a manner which would protect workers and the integrity of the packaging. The data package requires identification and quantification of Resource Conservation and Recovery Act (RCRA) materials. The DOE has submitted a No Migration Petition (DOE, 1989k) to the EPA which, if granted, would exempt the WIPP from the land disposal restrictions of RCRA.

The concept of plutonium-equivalent curies was established to help standardize different inventories of radionuclides into a single biological or health hazard unit. The 1000 plutonium-equivalent curie limit in the WAC was developed as a bounding condition. At the 1000 PE-Ci level, all estimated exposures from postulated accident scenarios were less than the regulatory exposure limits.

The FEIS used a maximum drum limit of 85 curies. The TRUPACT-II is limited to 40 watts of heat generation due to the waste. For heat source waste, this results in a TRUPACT-II maximum alpha curie content of less than 1,180 curies. This is the maximum alpha curie content for all TRUPACT-II shipments. If one multiplies 14 drums times the 85 curies per drum reported in the FEIS, the product is 1,190 curies.

The WAC limit on fines (powders) was changed by adding a further limit to dispersible material. The original criterion only limited particles of material which become airborne. The new limit was aimed at reducing the severity of the spread of contamination, in the event of a breached container at the WIPP. Thus, there could be no negative environmental impact as a result of this WAC change.

The liquid limit was revised, because there is no such thing as no free liquids within the TRU waste. Condensation occurs over a period of time with atmospheric changes. The original intent of the criterion was to prohibit significant quantities of liquids from being included in the waste received. Admittedly, "minor liquid residues in well-drained containers" is subjective, but it meets the original intent of the criterion.

The specific activity cutoff at 100 nanocuries per gram of TRU radionuclides prevents shipment of approximately half again as much waste to the WIPP, for a large positive impact. At the time the FEIS was issued, the specific activity was 10 nanocuries per gram, which was essentially below measurement capability for waste. The state-of-the-art for assay equipment has improved to the extent that the 100 nanocurie per gram specific activity cutoff can be routinely accomplished. The WIPP waste volume is projected to be well within the 6.45 million cubic feet capacity for which it is designed.

The nuclear criticality criterion was revised upward for RH waste, only after a new technical criticality analysis was performed for the WIPP. This limit applies only to individual canisters, and has no effect on the overall quantity of plutonium and other radionuclides that the WIPP can emplace, because the vast majority of RH waste exists now, and some will be produced in the future as a result of ongoing defense activities. The totals have not changed significantly.

The activity concentration limit was added in accordance with an agreement between the DOE and the State of New Mexico. Its purpose is to limit the total activity in any one canister, but it does not affect the overall activity that will be emplaced.

The elimination of experiments with high-level waste certainly would have no negative environmental impacts. In the long term, the high-level waste would not have contributed significantly anyway, because it was conceived to be retrieved and shipped offsite within 20 years.

It is currently planned that a comprehensive revision of the WAC will begin in early 1990. One of the purposes of this revision is to coordinate existing requirements of the WAC with RCRA, NRC, DOT, and other applicable requirements to develop a comprehensive waste acceptance criteria. Waste that does not initially meet the WAC certification process, must be processed (or stored for future processing). No wastes would be transported to the WIPP unless the WAC are met.

7.12.4-4 **Comment**

One commenter stated that an average 55-gallon drum of nuclear waste inside one of the TRUPACT-II containers bound for the WIPP can contain 15 grams of plutonium, according to the WAC. The State of Georgia questioned how the plutonium-equivalent curie concept accounts for differences in half-lives among the various TRU radionuclides.

7.12.4-4 **Response**

According to the DOT regulations and the WAC (DOE, 1989e), a drum within a TRUPACT-II may contain up to 200 grams of fissile material (plutonium). The data available to the DOE show that an average drum is estimated to contain about 15 grams of plutonium.

The PE-Ci concept is based on activity, explicitly in the definition and implicitly in the committed effective dose equivalent, and therefore incorporates consideration of half-life. The PE-Ci concept does not adjust for radioactive decay, and, subsequently, changing radionuclide distributions. The concept uses the current estimate of the radionuclide distribution to calculate the equivalent PE-Ci. Since the plutonium-239 is one of the primary constituents of the waste and has one of the longer half-lives, this results in conservative calculations.

Additional information on the PE-Ci concept is available in Subsection 2.3.1 and Appendix F.

7.12.4-5 **Comment**

The EEG recommended the following changes to the draft SEIS:

1. "Table A.1.1 [page A-4] does not show a limit on the amount of transuranic waste that can have a maximum surface dose rate of 1,000 rem/hour. It should be 5 percent of the expected 93,000 cubic feet of RH-transuranic or 4,650 cubic feet as agreed in the C&C Agreement as modified. The remainder has a maximum surface dose rate of 100 rem/hour."

2. "Change the text [on page A-5] to require all CH-transuranic waste containers to have a venting feature."

7.12.4-5 **Response**

1. Table A.1.1 has been changed to show a 5 percent quantity limit on RH TRU canisters. The total volume of RH TRU waste has been corrected in this SEIS.

2. The venting of all containers is a requirement of the Certificate of Compliance for the TRUPACT-II (see Appendix L). The WIPP WAC does not specifically require all CH TRU containers to have a filtered vent. The WAC (DOE, 1989e) allows semipermeable gaskets, vent clips, and other venting devices. In the case of conflicting requirements, the DOE will comply with the most restrictive, in this case, the transportation requirements.

7.12.4-6 **Comment**

The EEG noted that the statement made on page 2-9 of the draft SEIS, "The DOE established the WAC in consideration of DOT and NRC regulations," is incorrect. The EEG commented that the purpose of the WAC was to delineate the criteria that waste packages must meet in order to permit safe handling and disposal of waste at the WIPP.

7.12.4-6 **Response**

The statement referred to is partially incorrect in that the DOE and NRC regulations were considered when the WAC were drafted. Some DOT requirements were included in the WAC as the best way to provide worker and public safety. This SEIS has been changed to correct this statement.

7.12.4-7 **Comment**

Commenters asked how the DOE intends to assess the packages labeled before 1986, since the WAC (DOE, 1989e) have been changed.

7.12.4-7 **Response**

All waste packages that were not certified according to the WAC will have to be certified under the revised stored-waste certification procedures, which are controlled just as tightly as newly generated waste certification procedures. Nondestructive methods have been developed to examine these packages--for example, real-time radiography (like the airport security luggage x-ray devices), assay systems for determining the quantities of fissile radionuclides, and ultrasonic thickness measurements to determine deterioration of the container walls. Waste packaged prior to 1986 must be certified to meet the most current regulations and requirements.

7.12.4-8 **Comment**

Commenters inquired about the process for making future changes to the WAC (DOE, 1989e).

7.12.4-8 **Response**

When items or activities are identified as being significant to the certification of waste or to the disposal of waste in the WIPP, they are evaluated by the DOE. This evaluation may or may not result in a change to the WAC. Depending on the significance of the situation, the WAC may be revised immediately, or the change may be postponed until there is a specific need to issue a new revision.

7.12.4-9 **Comment**

With regard to the immobilization of waste, some commenters stated: "While free liquids were specifically prohibited in the WAC as formulated in the 1980 FEIS, the WAC were subsequently revised to allow for 'minor liquid residues remaining in drained containers.'" The commenters asserted that the WAC allow 1-gallon containers to go unanalyzed, thereby allowing up to 1-gallon of liquid in each 1-gallon container. The commenters also stated that the WAC allow 1-gallon containers to be made of glass, which would be subject to breakage in the event that a box or drum were dropped. Finally, commenters said that if the contents of these containers are unknown, such breakage could result in the mixing of constituents which are not allowed to be stored or disposed of together.

7.12.4-9 **Response**

Two assumptions have been incorrectly paired. The WAC do not have a specific limitation on the drums total liquid content, but state that waste shall not be in free liquid form and that minor liquid residues in well-drained bottles, cans, and other containers are acceptable. Quantities of free liquids in containers are readily detected and quantified by real-time radiography. Real-time radiography works extremely well for detecting free liquids due to its ability to view events such as wave motion in progress. Many waste streams contain no free liquids, and facilities such as the Rocky Flats Plant that have newly generated waste have more stringent limits than 1 percent by volume.

It is the TRUPACT-II Safety Analysis Report for Packaging (DOE, 1989f) and the Certificate of Compliance (Appendix L, Annex 1) that allows sealed packages, up to 1-gallon in size, to be inside the package for gas generation calculations, but this is not intended to imply 1-gallon containers of liquid. Breakage of glass inside the waste package is not of concern because of the requirement that the container be DOT type A, tested to a 4-foot drop without releasing any material. In view of the WAC prohibition against a glass container full of liquids, mixing is not a consideration. However, the No Migration Variance Petition (DOE, 1989k) assumes that 1 percent of the total materials emplaced at the WIPP could be liquid.

7.12.4-10 **Comment**

The Attorney General of Idaho questioned the advisability of the DOE waste generator facilities certifying their waste for transfer to the WIPP. The State of New Mexico also felt that a clearer understanding of the waste certification process was needed and that close coordination with the States is necessary to enhance public confidence in the certification process.

7.12.4-10 **Response**

The DOE has developed a checks and balances program to ensure that the waste meets WAC (DOE, 1989e) standards. First, officials from generator facilities must write a plan stating exactly how they will meet the criteria. Second, they must formulate and describe their own independent quality assurance (QA) program to oversee their operations. Third, these plans must be approved by a central WIPP committee consisting of experts who have knowledge of the processes discussed. After comment and resubmission cycles, the plans are approved and implemented. Fourth, the committee must go to the generator facility and conduct an in-depth audit of all activities. This detailed audit would include interviews with waste-handling technicians to ensure that safety standards are being met. Fifth, the generator facility receives authorization to certify the waste, but only after the committee is satisfied that all activities meet the requirements. Sixth, the committee performs frequent audits, on a periodic basis, at each generator to assess continuing performance.

There are several layers of control in this system. The generator facility follows written procedures. The generator's own QA program independently overviews those activities. All technicians are trained in the requirements. The committee conducts frequent audits to assess the performance of both the generator technicians and the QA functions. Written audit reports are issued and maintained in working files by the committee. Additionally, the DOE headquarter's auditors, the Inspector General, Congressional Committees, and other Federal agencies review all the activities listed above.

The current waste certification process does not involve extensive State participation. Additional State involvement in this area will be evaluated by the DOE.

7.12.4-11 **Comment**

Both the EEG and officials from the State of New Mexico disagreed with the 1,000 plutonium-equivalent curie limit per package established by the DOE in the WAC.

7.12.4-11 **Response**

The basis for the 1,000 plutonium-equivalent curie limit as an acceptable WIPP site operational level is documented in the Assessment of Allowable Transuranic Activity Levels for WIPP Wastes (DOE, 1987c). This criterion is expected to be used rarely, since other criteria such as criticality or TRUPACT-II thermal limits are typically much more restrictive for waste streams. This value was derived to provide a reasonable upper level of activity which would not result in significant radiological consequences. (Also see the responses to comments 7.12.4-3 and 7.12.4-4).

7.12.4-12 **Comment**

The EEG stated: "The Waste Acceptance Criteria does not and was never intended to specify how a waste generator demonstrated compliance, and suggests a lack of familiarity by the author with regard to the intent of those criteria. By that rationale, the WAC would never have required the characterization of radiological constituents."

7.12.4-12 **Response**

This statement was incorrect in the draft SEIS and has been deleted from Subsection 2.3.1 of this SEIS.

7.12.4-13 **Comment**

The EEG commented that, contrary to the statement on page 2-9 of the draft SEIS that states "CH transuranic waste is packaged in sealed steel drums and boxes," all containers will be vented to avoid the generation of mixtures of flammable gases during shipment. It also commented that on page 2-12 of the draft SEIS, the Waste Acceptance Criteria (WAC) need to be modified to require filters in all packages prior to shipment.

7.12.4-13 **Response**

Although the WAC indicate that only containers with "waste forms known or suspected of gas generation" will be vented, the project stance is to vent all containers. The venting of all containers is a requirement of the Certificate of Compliance for the TRUPACT-II. In the case of conflicting requirements or regulations that are applicable to the WIPP, the DOE will comply with the most stringent one. In this case, the transportation requirements are more stringent than those of the WAC. The sentences referred to have been corrected in Subsection 2.3 of this final SEIS.

7.12.4-14 **Comment**

The EEG and others expressed concern that the basis for the assumptions used to calculate retrieval doses does not appear to be consistent with other assumptions and calculated doses. Also, they asked why HEPA (high-efficiency particulate air) filtration is considered for retrieval, but not for emplacement.

7.12.4-14 **Response**

The estimates of exposures to workers have been made based on good engineering judgments and knowledge of the proposed retrieval process. The average surface dose rate is estimated to be quite low (5 to 15 mrem per hour) and, therefore, occupational doses are expected to be low, on the average. Also, any contaminated containers discovered during TRUPACT-II unloading or aboveground waste handling operations, would be decontaminated or overpacked before being taken underground. Because of these aboveground actions, it is natural, therefore, to expect fewer contaminated containers underground than aboveground during disposal operations.

HEPA filtration would be used for retrieval operations, since these operations present a greater potential for release than emplacement operations. During emplacement, conditions are, for the most part, known and controlled. Retrieval operations, on the other hand, assume some contamination and present a degree of uncertainty which must be acted upon to prevent potentially adverse impacts on workers and the environment. Therefore, the use of HEPA filters is a prudent precautionary measure.

7.12.4-15 **Comment**

The EEG recommended lowering the allowable particulate limit in packages containing cellulosic materials to compensate for a potential increase in particles that may occur, due to the (radiolytic) breakdown of the cellulosic material. Another commenter expressed a concern regarding the means to limit particulates.

7.12.4-15 **Response**

The limit on particulates in the WAC is for all waste packages. The purpose of the criterion is to prohibit waste containers with large amounts of powders which could be easily dispersed and, therefore, represent a contamination control problem in the event of an accident. Waste examinations to date show few containers with significant amounts of powders. Those with potentially large quantities of powders, such as used HEPA filters, are processed to overcome noncompliance. The quantity of loose powders can be controlled by adding a suitable binder into the container. Since these containers are examined by real-time radiography to determine if significant quantities of liquids or powders are present, the presence of cellulosics which could break down, by radiolysis, to a powder is not relevant. Tests have shown that a large amount of activity is required to create substantial radiolysis and powder generation.

7.12.4-16 **Comment**

The EEG and others stated that in light of new data on gas permeabilities and gas generation levels, the WAC gas generation criteria need to be re-evaluated. The commenters further asked if the generator facilities were allowed to make a decision on the need for venting, and inquired about the purpose for providing repetitive data packaging information.

7.12.4-16 **Response**

Gas generation concerns are primarily a long-term performance issue for the repository, rather than a short-term concern for transport and emplacement of waste at the WIPP.

The WAC allow the option of venting a container based on the determination that the container's contents may generate gas. However, it is the Project stance that all containers handled at the WIPP be vented. Also, the TRUPACT-II Certificate of Compliance (Appendix L, Annex 1) requires transported containers to be vented. The information contained in the Data Package received for each container will aid in determining gas generation potential. This Data Package is described in The Data Package Format for Certified Transuranic Waste for the Waste Isolation Pilot Plant, Rev. 2 (WEC, 1989f).

The proposed Test Phase would evaluate the subject of gas generation and would determine whether changes to the WAC are necessary. Changes to the WAC would be evaluated for potential impacts prior to their implementation. The changes noted here of allowing minor liquid residues and certain levels of particulates have been assessed as having minimal operational impact.

7.12.4-17 **Comment**

The EEG and another commenter raised questions regarding waste manifest requirements.

7.12.4-17 **Response**

The reporting of hazardous materials is required by the Data Package criterion, and the format is defined in WEC, 1989f. Note that there is a distinction between hazardous materials and hazardous waste. Hazardous waste is a subset of hazardous materials.

Hazardous materials do not necessarily have to be listed on a hazardous waste manifest. Consequently, the data package will contain a more complete description of the shipment than the hazardous waste manifest. A complete data package will accompany each shipment.

The manifest is a separately required form. Hazardous waste manifests are required to satisfy regulatory requirements of the RCRA and applicable State hazardous waste programs and do not specifically address the acceptability of waste for emplacement at the WIPP.

7.12.4-18 **Comment**

Commenters asked what the basis was for eliminating site-specific radiological analyses from the reporting requirements in the WAC, as discussed in Subsection 2.3.1 of the draft SEIS.

7.12.4-18 **Response**

This statement regarding the elimination of site-specific radiological analyses in the draft SEIS is in the context of the concept of "plutonium-239 equivalent activity (PE-Ci)," and is included as a change in the WAC. The PE-Ci concept eliminates the need for reporting specific knowledge of a TRU radionuclide waste stream since the PE-Ci content of any TRU distribution provides a measure of the potential hazard of the waste. The purpose of its use in the WAC is to provide a general limit which bounds the consequences of postulated radiological accidents at the WIPP. A more detailed discussion of the PE-Ci concept is provided in Appendix F.

7.12.4-19 **Comment**

Commenters stated that changes to the WAC since 1980 included a requirement to report the quantities of toxic and corrosive constituents. The commenters asked how the DOE intends to fulfill this requirement, given its previous statement that to perform such waste sampling to determine such quantities is too dangerous and will not be performed.

7.12.4-19 **Response**

Process knowledge is used to identify potential hazardous materials that may be in the waste as it is generated. For stored waste it is more complicated because processes have changed over the years and the hazardous material estimates may be less accurate. In order to determine the quantities of hazardous materials, the DOE is requiring that limited sampling be done (see Subsection 5.2.1 and Appendix P). Using statistical methods to analyze the results, the DOE fully anticipates having quantitative values for hazardous material included in the waste. Also see the responses to comments 3.7.

7.12.5 WASTE RECEIPT, HANDLING, AND EMPLACEMENT

7.12.5-1 Comment

Officials from the State of New Mexico commented that the procedures for packaging, receiving, and handling waste aboveground at the WIPP, and at weapons facilities, do not contain sufficient details concerning human performance, contamination levels, and automated radiation detection monitors.

7.12.5-1 Response

Waste handling procedures at the WIPP have been developed to a very high level of detail. Compliance with the procedures is verbatim with sign-offs and quality assurance verification checks at key steps. The normal operating procedures refer to abnormal and emergency procedures when and if unusual situations (such as fire, radiation detector alarms, and inadvertent release of radioactive material) are encountered. These procedures provide specific steps for the immediate control of the unusual situation, as well as steps necessary, to return plant operations to normal.

Acceptable contamination levels are specified in the normal operating procedures. When these levels are exceeded, the procedures detail actions to be taken in accordance with the emergency procedures for contamination control.

The emergency procedures manual also contains specific actions to be taken in the event of a radiation monitor alarm initiated by the automated radiation detection system. The actions essentially evacuate personnel from the area of the alarming monitor and specify re-entry only after an evaluation is performed and protective clothing is donned.

The DOE has established a set of conditions applicable to the waste to be shipped to the WIPP. These conditions are designated as Waste Acceptance Criteria (DOE, 1989e). Conformance with the WAC ensures that waste received at the WIPP falls within the limits assumed during the facility design. Each shipping facility must prepare and follow written procedures designed to ensure conformance with the WAC. These procedures are reviewed and approved by the WIPP Project Office after consultation with the EEG. Compliance with these procedures is ensured by periodic audits of the shipping facility by a Wipp Project Office team, with EEG participation, and by readiness reviews to be conducted prior to operations.

7.12.5-2 Comment

The EPA said that the draft SEIS indicates that the Test Phase of the WIPP will require packages of waste prepared at the generator facilities (pages 3-28 and 6-10; Subsection 6.4). It asked what provisions the DOE has to prepare or make changes to these packages (i.e., additional processing of the wastes) at the WIPP and what precautions the DOE will use in this process to adhere to applicable radiation exposure standards regarding releases to the general environment.

7.12.5-2 **Response**

The especially prepared waste for the Test Phase of the WIPP will be generated at the existing facilities and using established procedures. The concept used in the preparation of this waste is to minimize the radiological implications of any actions taken at the WIPP. Currently, the addition of brine into the packages through specially designed ports is the only step required at the WIPP. This effort will take place under radiological safety supervision and has been designed to minimize the potential of any releases within the work area. Additional information is available in Subsection 5.2.1 and Appendices O and P.

7.12.5-3 **Comment**

Commenters asked how the DOE intends to prevent the build up of gases in containers that were packaged before 1986, and how those gases will be vented.

7.12.5-3 **Response**

The existing waste containers in retrievable storage have three mechanisms for venting gases: permeable gaskets, vent clips, or filtered vents. Due to variability in the gas flow through the gaskets, all containers of waste will be modified with the insertion of a filtered vent to meet the TRUPACT-II transportation requirements. The containers will then be allowed to aspirate in order to prevent accumulation of gases in the waste containers in order to meet the TRUPACT-II transportation requirements prior to their placement in a shipping container.

7.12.5-4 **Comment**

The EEG raised a concern regarding changes to the draft Final Safety Analysis Report (FSAR), which in turn would require similar changes to the draft SEIS.

7.12.5-4 **Response**

The specific area in question deals with accidental doses and operational practices. The FSAR (DOE, 1989a) is required to be regularly updated and is therefore expected to change after the final SEIS is prepared. However, changes to the FSAR would not necessarily impact this SEIS, and it is unlikely that any such changes in the FSAR would not be bounded by the conservative analyses in the SEIS.

7.12.5-5 **Comment**

The EEG expressed concern that the SEIS did not clearly state that no backfill would be used during the Test Phase or if backfill would be added later by moving the waste to new rooms. The EEG also wanted to know the rationale for not using backfill during the Test Phase.

to new rooms. The EEG also wanted to know the rationale for not using backfill during the Test Phase.

7.12.5-5 **Response**

The DOE does not plan to backfill around waste during the Test Phase as a normal practice. However, some of the tests being developed might entail some backfilling to either gain experience with backfilling techniques or to observe effects of backfill on a small number of drums. Thus, the statement on page 2-14 of the draft SEIS that "backfilling . . . would only be undertaken to the extent necessary to satisfy the goals of the tests and in a manner that allows for waste retrieval" is accurate and has not been changed.

One of the options being considered for backfilling around waste emplaced during the Test Phase is to move the waste to another room and add backfill as re-emplacement of the waste progresses. However, depending on the spacing of drums during the Test Phase, backfilling of test areas containing drums could be accomplished without moving the drums to another room. Therefore, the statement on page 2-15 of the draft SEIS is still applicable as stated: "If only the addition of a modified backfill is required, it could possibly be installed while the waste is in place or by moving the waste from the Test Phase locations to new locations, and emplacing it with the appropriate backfill at new locations."

If the room is completely backfilled, there is some possibility that drums would be deformed or crushed as salt creep begins closing the test rooms. Backfilling efforts during the proposed Test Phase would be performed so as to ensure easy retrievability.

The DOE is committed to ensuring that all waste emplaced during the proposed Test Phase would be fully retrievable (see Subsection 2.5).

7.12.5-6 Comment

A commenter asked whether the tests applied to the WIPP drums cover all the potential failure mechanisms.

7.12.5-6 **Response**

The drums and boxes to be used to ship and store WIPP waste are designed and have been tested to meet DOT specifications for Type A containers. The DOE feels very confident that the Type A containers are adequate for packaging and storage of TRU waste. These containers have been used for tens of years for packaging and storage of TRU waste. Transportation of the Type A packages to the WIPP would use a Type B package (the TRUPACT-II) to safely enclose the Type A package that will be for storage and disposal in the salt beds at the WIPP.

The drums will fail after the repository is sealed. Corrosion of drums, due to contact with salt and brine, is not considered a problem, because the drums' function is to provide a transportable and emplaceable container for TRU waste. Long-term isolation of these wastes is the function of the geologic system (i.e., salt) within which the repository is located.

7.12.5-7 **Comment**

Commenters wanted to know how TRUPACT-II containers would be decontaminated after use, how effective the decontamination process would be, the costs involved, and the additional risks to the workers.

7.12.5-7 **Response**

Shipping container decontamination is a routine industry activity. The design of the waste handling building at the WIPP includes the capability to handle minor cleaning requirements. Should a significantly contaminated TRUPACT-II be received, the drums would be overpacked and emplaced using normal procedures. The empty TRUPACT-II would be resealed and shipped in accordance with DOT regulations to a DOE facility equipped and staffed to perform decontamination.

The WIPP transportation analyses indicate that an incident sufficient to produce significant contamination of a TRUPACT-II will occur only very rarely, and that the added operator risks would be negligible. The decontamination process costs would be a minor addition to normal operational handling costs.

7.12.6 WASTE RETRIEVAL

7.12.6-1 **Comment**

A commenter suggested that at some point, it will be important for the DOE, the State of New Mexico, and the operating contractor to exercise good engineering judgment in deciding whether or not to proceed to fully utilize the site. It was further stated that retrievability is an "unnecessary and costly feature of the waste disposal process."

7.12.6-1 **Response**

The DOE is committed to maintaining easy retrievability until a decision on final disposal is reached after the Test Phase. The Consultation and Cooperation Agreement with the State of New Mexico requires that the DOE maintain the retrieval option, in case the results of the Test Phase indicate that the WIPP cannot meet the EPA disposal standards contained in 40 CFR Part 191, Subpart B. The DOE will continue to use good engineering judgment and the recommendations from technical review groups outside of the DOE during future development of the site. However, it is also considered good engineering judgment to design the facility to minimize the difficulty of retrieval.

7.12.6-2 **Comment**

The EEG and others commented that the reasons cited for not returning waste to the generating facilities due to "costs of double handling and transportation impacts" should be addressed in evaluating the alternative of showing the WIPP can meet the safety standards before waste is emplaced at the WIPP.

7.12.6-2 **Response**

While it is true that double handling would increase costs if waste is retrieved after the Test Phase and sent to generating facilities or a retrievable storage facility, the DOE believes that the Test Phase is necessary to reduce uncertainties in the information needed for the performance assessment used to demonstrate compliance with 40 CFR 191. The National Academy of Sciences agrees with this phased approach for proceeding with the Test Phase prior to demonstrating compliance with 40 CFR 191.

7.12.6-3 **Comment**

The EEG stated that too many DOE documents have mentioned the possibility of in-place installation of backfill without describing or demonstrating the process. It was also requested that Subsection 2.5 describe the changes (roof rock-bolting, for example) that have been introduced in the design due to fracturing observed in the SPDV rooms, and analyze the effect of these design changes on retrievability and long-term performance.

7.12.6-3 **Response**

The reason for stating that in-place backfilling (the placement of backfill material around waste containers after the containers are placed in disposal rooms) might be possible is that the backfill and specific emplacement requirements have not been identified. If backfill consists only of crushed salt, and is required to be spread only over the stack of emplaced waste, then in-place backfilling appears feasible. If a different backfill mixture is selected, handling during emplacement could be difficult. If some thickness is required to be placed under the waste stack, in addition to just over it, in-place backfilling is probably not practical.

Rock-bolting the disposal rooms enhances retrievability by stabilizing the roof of the emplacement room for several years. The WIPP routinely installs rock bolts throughout the facility on an as-needed basis. Long-term performance is not expected to be adversely affected. Rock-bolts are typically 2 to 8 feet long and do not penetrate the salt deep enough to form preferential pathways for waste migration. Rock-bolting is part of the design of the facility, rather than a change to the design; therefore, additional discussion has not been added to Subsection 2.5. Further discussion of rock bolting requirements can be found in Subsection 6.2.

7.12.6-4 **Comment**

The EPA, the State of New Mexico, the EEG, and other commenters expressed concern with potential problems that may complicate safe waste retrieval at the end of the Test Phase. Factors presented by commenters that may complicate retrieval include gas generation, cracks and fracturing within the repository, brine seeps, and salt creep. The State of Idaho asked under what circumstances would retrieval become necessary. It was asked if the DOE has an adequate plan of action if retrieval is deemed necessary, particularly if the integrity of the waste containers is not preserved during the Test Phase. The EPA specifically requested that these plans for packaging, handling, and disposal be discussed and analyzed. Others asked what was meant by a "reasonable" period in regard to waste retrievability and asked if the implications of site degradation by retrieval and clean-up operations have been considered yet. Several commenters felt that conflicting descriptions of the ease of retrievability were presented in the draft SEIS.

7.12.6-4 **Response**

The DOE realizes that waste retrieval plans are important for the WIPP, and, thus, a retrieval plan has been prepared (DOE, 1989c). A brief description of the important aspects of retrieval is presented below:

1. The retrieval of waste would be similar to the emplacement operations. Waste used during the Test Phase is expected to be retrieved as easily as it was emplaced. (See discussion of retrieval in Subsection 2.5 of this final SEIS.)

2. The waste containers have a design life of 20 years to ensure easy retrieval of the waste in the original containers during the retrieval period. If retrieval were necessary and contamination had occurred, waste would be retrieved using methods and precautions similar to those used during emplacement. Prior to retrieval a decision would be made whether to decontaminate or overpack contaminated containers.

3. The hydrological profile developed for the WIPP site has been reviewed by numerous groups and represents the best information available.

4. The facility is designed to ensure that the waste is not crushed, breached, or encased during the retrieval period, thus providing easy retrievability.

5. In the long term, the salt will creep closed and crush and breach the drums, and essentially totally encase the waste. However, during the Test Phase the amount of salt creep would not be very great and measures such as rock bolting and wire meshing would be taken to ensure ease of retrievability. Analyses of potential release of radionuclides from the WIPP repository assume that the container has no long-term effect in retarding or restricting radioactive material release.

During the Test Phase with the waste, the amount of gas generated would not be very large and will not present a safety hazard once room seals are removed and the rooms are ventilated (see the response to comment 7.15-5). Degradation and corrosion of containers should not be significant since only small quantities of brine are expected. Decomposition of waste would not be a problem because the decomposition products would be retained within the drums.

Additional information on retrieval has been added to Section 2.5 of this SEIS and a new Appendix O has been added to provide details on retrieval.

7.12.6-5 **Comment**

Several commenters expressed concern that 55-gallon metal drums and TRUPACT-II and NUPAC-72B containers would not survive the disposal process and, therefore, would not protect the environment. Most commenters were concerned that brine would corrode the emplaced metal drums.

7.12.6-5 **Response**

The waste drums are required to have a lifetime of at least 20 years by the WIPP Waste Acceptance Criteria (DOE, 1989e) in order to ensure waste retrievability. There is a common misunderstanding that the waste containers themselves will permanently isolate the TRU waste to be emplaced in the WIPP from the environment. Since the waste containers will corrode or otherwise deteriorate over time, the ultimate waste barrier is the salt beds. After an estimated 60 to 200 years, the salt formation itself will encapsulate and crush the waste containers (drums). After this occurs, the salt will prevent the waste from being released to or transported through the environment outside of the repository. In the modeling analysis conducted for long-term performance of the WIPP, waste containment by engineered barriers (drums) was not taken into account.

The TRUPACT-II container is only used to ship CH TRU waste from generator or storage facilities to the WIPP, and it is not used underground for waste disposal. Therefore, it will not be exposed to the potential inflow of brine.

7.12.6-6 **Comment**

Several commenters felt that the draft SEIS does not address several crucial areas (such as the salt closure rate and brine) that might affect safe packaging and retrieval of waste during the lifetime of the waste.

7.12.6-6 **Response**

The WIPP does not plan to provide "easy" retrievability (basically the reverse process of emplacement in unbackfilled rooms) of waste during the Disposal Phase. The regulatory requirement is only that retrieval "is not precluded for a reasonable period of time after disposal" (40 CFR 191.14[f]). The safe disposal of waste at the WIPP depends on the near-total closure of the salt around the waste to ensure minimal radioactive releases. To remove uncertainties regarding whether the facility will comply with EPA disposal standards, a Test Phase using small amounts of CH TRU waste at the WIPP is considered necessary. This approach has been endorsed by the WIPP Panel of the National Academy of Sciences. The purpose of the WIPP is to dispose of waste; however, the DOE does not plan to enter the Disposal Phase until key performance assessment questions are answered.

The faster-than-expected salt closure rate and the expected presence of brine have been discussed in the draft and final SEIS in Subsections 4.3.2.4 and 5.4.2.4. The impacts of these factors on long-term performance are also evaluated in these subsections. See also the responses to comments 7.7.2-1, 7.7.2-5, and 7.15.1-1.

7.12.6-7 <u>Comment</u>

Several commenters wanted to know where the DOE plans to store the waste from the Test Phase if it is necessary to retrieve the waste. The State of California and the State of Colorado specifically requested that the final SEIS include a risk analysis of the potential impacts on generator facilities if waste is to be returned to its place of origin. Officials from the State of Idaho inquired if their State would be responsible for storing retrieved waste, should retrieval become necessary. They further stated that the Idaho National Engineering Laboratory should not be responsible for storing waste from other DOE facilities if the WIPP fails to open. Others also asked about the responsibility that might be incurred by certifying TRU waste bound for the WIPP.

7.12.6-7 <u>Response</u>

The DOE is exploring several options for storage of waste from the WIPP if retrieval is necessary after the Test Phase. One option would be to send waste back to the generator or storage facilities that sent the waste to the WIPP. Another option would be to store the retrieved waste as close to the WIPP as possible, thus minimizing transportation costs and risks. Another option would be to send retrieved waste to a centralized storage facility. No such facility currently exists, so extensive involvement with a State selected to host such a facility would have to take place before exercising this option. (Also see the responses to comments 2.2-6 and 5.3-1).

If wastes were transported back to a generator or storage facility, the transportation risks would be very similar, if not the same, as the transportation risks incurred in the movement of wastes to the WIPP. This is because the same routes would be expected to be followed, TRUPACT-II's would be used, and the same wastes would be transported.

Certification of waste destined for the WIPP from all generator and storage facilities is determined by the WAC (DOE, 1989e). These requirements are discussed in Subsection 2.3.1 of this SEIS and presented in detail in Appendix A.

7.12.6-8 **Comment**

The EEG and other commenters expressed concern that the draft SEIS made no reference to the potential costs of mitigation or retrieval techniques should the WIPP fail to effectively isolate radionuclides from the environment.

7.12.6-8 **Response**

Costs, in terms of economic costs, are not considered in this SEIS.

7.12.7 **SITE EMERGENCY PLANNING AND SECURITY**

7.12.7-1 **Comment**

The State of Idaho and others commented on security, sabotage, and terrorism of WIPP shipments and at the WIPP site. Commenters requested that the [draft] SEIS evaluate accidents involving sabotage, security measures that would minimize public endangerment, and potential environmental and socioeconomic consequences of such actions. Several commenters were concerned that weapons-grade plutonium could be smuggled from the point of waste origin in waste barrels, and be recovered along transportation routes or at the WIPP. Others voiced concern that plutonium residues in the waste would attract hijackers or terrorists, and they asked what precautions would be taken to avoid waste diversion. One commenter was concerned that strictly enforced security measures would lead to a "police state" mentality and a loss of personal freedom.

7.12.7-1 **Response**

The upper-bounding accident in this SEIS postulates that all 3 TRUPACT-IIs on a transporter and all 14 barrels in each TRUPACT-II are breached in a highly populated area. No matter what causes the breach of the containers, terrorist acts or otherwise, the accident described in this SEIS is considered the upper-bounding case for either an on-site or a transportation accident.

Terrorism, sabotage, and general security are considered in all phases of handling the waste destined for the WIPP. Adversarial security precautions were major considerations in planning the TRUPACT-II container and WIPP facilities. Precautions include the training and equipping of staff, security personnel certification, drills, construction of special facilities, appropriate equipment, emergency-response procedures, and security audits. Specific information concerning counter-terrorism and sabotage is closely held as a security precaution and is distributed on a "need-to-know" basis.

The procedures used throughout the production of defense materials and waste are designed to contain and isolate plutonium from workers and the environment. These procedures protect special nuclear materials from being diverted. They have been effective and are continuously being modified to improve security.

The procedures for transporting WIPP-designated waste from a generator facility include the following precautions:

- Multiple waste handlers are responsible for loading drums. One loads and one verifies the contents being loaded.

- Once loaded, a tamper-indicating-device is attached to the sealing-ring lock.

- A separate work team then assays the drums.

- Another team performs drum radiography to confirm the contents. The team identifies classified shapes that would indicate the presence of non-waste materials such as weapons-grade plutonium.

Beyond the security precautions taken during packaging, additional measures are adhered to during transportation. The vehicle is staffed by a two-man crew and is never left unattended, the travel routes are predesignated, the TRANSCOM tracking and communication system routinely monitors the location of the vehicle, and designated State officials independently monitor the vehicle's progress. Any attempt to tamper with the vehicle would be detected and reported almost immediately. Since the DOE is a government agency, such a report would automatically trigger FBI and police action.

The contents and the packages make the waste destined for the WIPP very unattractive. The TRUPACT-IIs themselves are very large and difficult to transport inconspicuously, and it is not easy to extract the 55-gallon drums from the packages. Once terrorists gained access to the drums, they would find little to use other than radioactively contaminated lab glass, plumbing, celluwipes, and the like. Recovery of plutonium from the WIPP waste would be akin to recovering tomato paste from a city landfill. The tomato paste exists as residues in cans and disposed of pizza, but recovery is not considered practicable. Plutonium exists in the WIPP waste as minor residues. Recovery of such minor amounts is not considered practicable.

Assuming the police and military stood helplessly by while the TRUPACT-II carrier was hijacked, operated on, and used as terrorists might conceive, it would still be very clumsy for someone to use this waste to terrorize the public. Because of the above, it is unlikely that terrorists would choose the WIPP waste to terrorize the public; therefore, the risks to civil liberties from attempts to protect WIPP waste from terrorists would be small.

7.12.7-2 **Comment**

A commenter inquired about what emergency planning exists for areas in close proximity to the WIPP site, namely the communities of Loving and Malaga, New Mexico.

7.12.7-2 **Response**

Both Eddy County and the city of Carlsbad have well-established emergency plans. Under these plans, either or both communities are committed to responding, as needed, to any emergencies in Loving and Malaga, as well as to emergencies in all of southern Eddy County. Furthermore, the WIPP would provide technical support in the event of a radiological incident.

7.12.7-3 **Comment**

Commenters postulated several site-related emergency-response scenarios that they feel need to be considered. They were concerned that WIPP emergency-response personnel responding to an emergency in the 60-square-mile area outside the security-fenced compound would not be able to respond to concurrent emergencies, particularly at the WIPP site itself. Another commenter questioned the adequacy of response time to an emergency site, because if a TRUPACT-II, the drums, and plastic bags were breached, the high velocity winds sometimes associated with this area may quickly scatter the debris about the countryside.

7.12.7-3 **Response**

The types of off-site emergencies to which WIPP personnel would respond are quite limited. The most likely emergencies are fires or injuries rather than radioactive spills.

The number of people available to respond to emergencies outside the security-fenced compound but inside a 60-square-mile area is limited. Personnel trained to handle most emergencies onsite, such as waste handlers would not be used in response to off-site accidents.

In the years 1971 through 1985, thousands of type B (the same type certification as the TRUPACT-IIs certification) container shipments have been made in the U.S. Fifty shipments have been involved in accidents. No DOE packages have been breached (leaked their contents). The statistical probability of breaches in the future are equally small. When compounded by the excellent Type B container record, widespread contamination following an accident seems very unlikely.

Fires very likely would be controlled in the initial stages by employees using hand-held fire extinguishers. Automatic fire suppression systems are installed in all permanent facilities on the site. Flammable waste is disposed of in waste bins strategically located so as to pose little threat if they should ignite.

The probability of a fire at the WIPP site is low, and combined with the low probability that the WIPP will be called upon to respond to an off-site fire, it seems very unlikely that WIPP emergency-response personnel would be called upon to respond to simultaneous fires. As for the question "what do you do when a fire alarm is received while you are fighting a fire," the answer is always the same. Call for assistance from the outside and address the fire which poses the greatest threat to life and health.

There is always an emergency services technician on the site to attend injured personnel. During the day shift, a nurse is on duty. A large proportion of the employees have taken first-aid training and CPR. Compared to accident rates in most industries, the WIPP accident rate is very low, and the need to respond to an injury is substantially reduced.

7.12.7-4 **Comment**

Several commenters were concerned that plutonium is subject to spontaneous combustion. They asked how that threat would be combated during transportation or storage.

7.12.7-4 **Response**

Plutonium is pyrophoric only when it is in the form of metallic fines (powders) or thin chips. The WIPP Waste Acceptance Criteria specify that pyrophoric forms of radionuclides must be limited to no more than 1 percent by weight of each package and must be generally dispersed in the package. There is also a 200 gram per drum limit on plutonium. In practice, very little plutonium metal gets into the waste because it is so valuable. The metal also forms an oxide coating, which prevents further oxidation (somewhat similar to zinc coating, which protects steel or iron from oxidizing). Only if the oxide coating is physically removed would the plutonium oxidize further. The mass of any plutonium deposit in one place would be so small that even should it oxidize at high temperature, the heat it produces would be so small that it would be unlikely to raise surrounding combustibles to their flash points (kindling temperatures).

Should the material ignite during transport, any airborne radioactive material would be contained first by the payload container (drum) and second by the airtight TRUPACT-II. The TRUPACT-II will be vented at the WIPP, in rooms whose exhaust air passes through high-efficiency particulate air (HEPA) filters before going to the atmosphere. When required, exhaust air from the underground areas will also be vented through HEPA filters to effectively intercept any radioactive material.

7.12.8 **SAFETY**

7.12.8-1 **Comment**

The State of New Mexico, the EEG, the Eddy County Commission, the City of Carlsbad, the Hanford Advisory Committee, and others expressed concern for continued safety at the WIPP. It was stated that an atmosphere of safety must be provided due to the technological complexity of the operations at the WIPP. It was further stated that this atmosphere can only be achieved by quality management and a stringent quality assurance program, which should in turn reduce the number of human-error-related accidents. Some commenters questioned the DOE's commitment to these programs. Some commenters inquired about allegations concerning deficiencies in health physics programs and asked what medical services would be provided to the WIPP workers. While some commenters felt that additional work will be necessary in the area of radiation detection, other commenters expressed confidence in the safety measures adopted at the WIPP site and felt that it was designed, equipped, and managed well. One commenter's opinion of the WIPP mine rescue team was that it was one of the finest in the nation.

7.12.8-1 **Response**

Creating and maintaining a positive safety culture is a challenge to any organization. However, it has been accomplished at the WIPP. The project personnel have worked extremely hard to create an environment where safety is the first priority. This fact has been validated by a number of external agencies that have been performing pre-operational audits. None of these audits have found deficiencies in safety attitude nor have they questioned the "safety first" philosophy. In fact, the project has received a number of positive comments on this subject.

The quality assurance program for the WIPP uses proven quality assurance (QA) principles that are tailored to support the WIPP project and its mission. From its initial conception, the program has been considered an integral part of the long-term, comprehensive controls which are applied to safety-related equipment and activities to minimize undue risk to public health and safety. Top management has maintained this position from the project's early conception and up to the current start-up phase and will continue through the operational and decommission phase.

This long-term commitment has been documented in the draft Final Safety Analysis Report (FSAR) (DOE, 1989a). Additionally, contractors and suppliers of safety-related equipment or services will be required to comply with this comprehensive quality assurance program throughout the life of the project.

The overall responsibility for assuring the long-term commitment to compliance with and implementation of the program requirements mandated for this project rests with line management. To assure this QA policy is implemented by line management, the Quality Assurance Organization, independent of cost and schedule has been tasked with this assignment. This independent evaluation of the safety-related activities is performed and documented through a continuing program of audits and inspections. In addition, as a safeguard to a long-term commitment to QA, the project will be independently evaluated by the EEG and by government agencies other than the DOE such as the Mining Safety and Health Administration, the EPA, and the NRC (Transportation Packaging) to assure compliance throughout the life of the project.

The WIPP radiation safety program has been thoroughly reviewed and will continue to be scrutinized. These reviews and audits have identified program deficiencies which have subsequently been corrected or are on schedule to be corrected. After these corrections have been made, and prior to plant operations, other audits will be conducted and corrections made, if required. This will be done to assure compliance with all applicable regulations and to meet or exceed industry standards.

The positive statement concerning the safety of the WIPP is appreciated and is shared by a number of experts throughout the world. The disposal technique selected for use at the WIPP is considered safe because, among other things, each component of the process has been and will continue to be aggressively examined.

The project is proud of the accomplishments of the WIPP mine rescue teams. The WIPP project will continue to maintain the highest degree of safety possible.

7.12.8-2 **Comment**

A commenter asked if nonunion employees at the WIPP site are protected from reprisal for reporting safety violations.

7.12.8-2 **Response**

The WIPP operating contractor, Westinghouse Waste Isolation Division (WID), is firmly and deeply committed to a workplace of open, honest, two-way communications with its employees, DOE customers, and the public. Recognizing that concerns left unanswered could weaken the trust and respect between all employees, WID has several published policies in place to ensure all employee concerns, be they safety, job-related, or personal, receive immediate and thorough attention.

The Open Door Policy is a corporate policy that has been in place at WID since Westinghouse was selected as the Technical Support Contractor in 1980. The Open Door Policy provides an opportunity for all employees to voice their concerns on any issue through their supervisor, department manager, human resources manager, and even the general manager. This open door concept encourages employees to express concerns without fear or reprisal.

Upper management continually stresses the need to be aware of and to resolve employee concerns. Each month, the general manager and assistant general manager hold a roundtable discussion with small groups of employees. During these meetings, employees ask questions, voice opinions, and express concerns openly and freely without fear of reprisal. In much the same way, bi-monthly all-employee meetings provide an open floor for discussion on any topic.

WID also provides a written form that employees may use to express their concerns. The Employee Concern Forms, located at several boxes throughout the plant, allow safety and job-related concerns to be reported anonymously. The concerns are thoroughly investigated, and if the employees sign the form, they receive a personal response within 10 working days. Anonymously submitted concerns are investigated in the same manner. Any concern that is of general interest is communicated to all employees, with the response, through the weekly employee newsletter.

The Safety Training Observation Program is an important part of WID's extensive safety program. Through this Safety Training Observation Program training, employees learn to watch for unsafe acts and report them promptly. The Safety Training Observation Program cards for reporting safety hazards are widely available and provide an avenue for suggesting safety improvements as well. Supervisors regularly encourage employees to actively participate in the safety of their own areas as well as the entire project.

Employees whose safety improvements submitted via the WID Quality Achievement Program receive project-wide recognition and an award.

7.12.8-3 **Comment**

One commenter stated the following: "The procedures for receipt, emplacement and retrieval have been carefully developed. The design of the waste handling building provides a multibarrier confinement system that prevents any contaminated particulates from leaving the building. Further, excellent quality control procedures have been laid out. Very specific acceptance criteria have been established for waste coming to the WIPP. The criteria govern the physical, radiological, and chemical composition of the waste to be emplaced in the WIPP, and establish specifications for waste packaging. The Waste Acceptance Criteria (WAC) have been established in consideration of the U.S. Department of Transportation (DOT) and U.S. Nuclear Regulatory Commission (NRC) regulations for the safe handling and transport of waste. Additionally, the DOE requires that each transuranic waste generator develop and implement a program that establishes procedures for waste certification and quality assurance. Each site-specific plan identifies and describes the administrative controls and procedures required to characterize transuranic waste, segregate and process waste forms, and package waste in accordance with the WAC."

7.12.8-3 **Response**

The comment presents a brief, but fairly accurate, description of several of the controls currently in place to ensure the safe shipment of waste to the WIPP and subsequent WIPP operations. The DOE is committed to safely shipping TRU waste to the WIPP and will continue to implement programs to enhance compliance with regulations governing the shipment of waste. The confinement system at the waste handling building has been designed to minimize the potential for release of contaminated particulates and will operate as a clean (noncontaminated) facility.

7.12.8.1 OCCUPATIONAL

7.12.8.1-1 **Comment**

The EEG and one other commenter expressed concern regarding the number of WIPP-related deaths and injuries expected as a result of industrial accidents, both at the WIPP site and at the generating/storage facilities.

7.12.8.1-1 **Response**

A major emphasis is placed on the personal safety of both the public and employees at all DOE facilities. The new DOE administration has placed safety at the forefront of all of the DOE's operations. The WIPP total Injury and Incidence Rate for 1988 was 0.67 per 200,000 hours worked. Overall DOE and contractor total Injury and Illness Incidence Rates for 200,000 hours worked was 2.0 for 1988, with the previous 5-year average (1984-88) being 2.1. This is in comparison with the Bureau of Labor Statistics average rates for 1983-87 of 8.0 per 200,000 hours worked. The Lost Workday Case Incidence Rates average for the DOE and contractors for the 5-year period 1984-88 was 1.1 per 200,000 hours worked, in comparison with the Bureau of Labor Statistics rate average of 3.7 for the period of 1983-87.

The Fatality Incidence Rates average for the 5-year period from 1984-88 was 2.3 per 100,000 workers for the DOE and contractors, in comparison with the Bureau of Labor Statistics average of 5.9 per 100,000 workers. As these figures show, the deaths and injuries expected from industrial accidents at both the WIPP and the generator/storage facilities are far below the national and industry average for similar facilities. In addition, the WIPP has achieved two 1 million-worker-hour periods over the last 2 years without a lost-time injury.

7.12.8.1-2 **Comment**

The EEG commented that the draft SEIS states, "The requirements of the Occupational Safety and Health Administration (OSHA) and Mining Safety and Health Administration (MSHA) have been closely followed." A commenter asked the DOE to "include a discussion of violations and citations identified by those Federal agencies since the FEIS was issued" and explain "how these have been corrected."

7.12.8.1-2 **Response**

The WIPP Safety Program uses proven operational controls to detect and control hazards in operational activities. These programs are carried out through independent safety review inspection and analysis by a highly qualified safety department. The WIPP does in fact, as a minimum, comply with all applicable parts of 30 CFR, Parts 48, A, B, C (Training), Part 57 (Safety Requirements for Metal and Non-Metal Mines), and the OSHA requirements for general industry contained in 29 CFR. If two standards exist for the same safety concern, then the more stringent of the two is used to ensure optimal safety. Any and all violations of applicable codes which are identified by Federal agencies, namely MSHA, which performs "courtesy" inspections at the request of the DOE, are assigned high priority and corrected promptly. The corrective action is then evaluated and approved by the inspecting agency.

Types of deficiencies identified by MSHA inspectors have been relatively minor. Copies of these deficiencies and the corrective actions are routinely provided to the EEG. The DOE conducts inspections for compliance with the OSHA standards rather than a Department of Labor inspector. Deficiencies resulting from these inspections are corrected promptly.

7.12.8.1-3 **Comment**

A few commenters expressed concern that cracks could cause groundwater contamination, pose safety problems for workers, and complicate retrieval.

7.12.8.1-3 **Response**

The aggressive approach the WIPP has maintained eliminates the potential for a ground control problem to develop unnoticed.

Ground control is the process of checking and maintaining safe walls, roofs, and floors in a mining environment. Worker safety is very important, and ground control is a recognized potential hazard throughout the mining industry. The Ground Control Program at the WIPP maximizes employee protection with the use of training, inspection programs, and known, industry-accepted methods.

All mines, including the WIPP, are governed by MSHA requirements for establishing ground control programs to minimize risks to workers. It is a requirement of MSHA (30 CFR Part 57.3) and WIPP operating procedures to examine work areas daily, to establish a weekly maintenance program for primary escapeways and haulage routes, and to examine other areas used monthly. If loose material is found, it is customary to either remove (or scale) it or support it. Roof bolts, chain link fencing, roof trusses, roof mats, or steel sets can be used for support. These are normal mining activities and precautions. The method to be used would be determined by conditions and activities in that area.

Considerable discussion has been provided in Subsection 4.3.2.4 concerning the Disturbed Rock Zone and its impacts on the site hydrogeology. Also see the response to comment 7.7.2-1.

See comments 7.12.6-3, 7.12.6-4 and 7.12.8.1-4 for additional discussion concerning retrievability.

7.12.8.1-4 **Comment**

One commenter asked, "How much of an increase in occupational risk do the cracks and the more rapid closing of the rooms pose to the safety of workers? What mitigating measures in addition to bolting ceilings does the Department of Energy expect to undertake? At what additional costs?"

7.12.8.1-4 **Response**

The only risks cracks and movement of the salt pose to workers are falls of ground. The mining industry has been addressing these risks since mining began. The following mitigating steps are taken on a daily basis:

1. The workers and their supervisors daily inspect the work area for indications of ground separation through sounding the back and ribs as required under 30 CFR 57.3401.

2. Should an area of concern be located, attempts are first made to "bar" the slab down by prying on it with a suitable implement. If this action proves unsuccessful, then the area is either removed using a continuous miner or scaler, or it is bolted using standard rock bolts as addressed under 30 CFR 57.3203 and 30 CFR 57.3360.

The WIPP procedure which implements these actions is WP 04-220 (Nyman and Lucus, 1988).

Should further action be required, the area of concern is "pattern bolted" with an engineered bolt pattern. Patterns of this type are designed to support the area, normally to the first major geologic discontinuity. A specific discontinuity addressed in the storage area of the facility was anhydride "a." The rooms in Panel 1 were pattern bolted to support this 8 to 9-foot-thick slab for an indefinite period of time. Ultra-conservative estimates of the life of the ground control in Panel 1 indicate that the bolt pattern will serve its purpose for approximately 16.7 years. The cost to pattern bolt Panel 1 was approximately $360,000. This cost included the installation of approximately 7,000 rock bolts.

The more rapid than initially expected closure rate has been known for several years and has been accommodated by mining the waste rooms to sufficient size so that closure does not contact, crush, or breach stored waste drums, which would make retrieval more difficult.

7.12.9 **TRANSPORTATION EMERGENCY PLANNING**

7.12.9-1 **Comment**

A vast number of commenters, including elected and appointed officials and agencies from New Mexico, Utah, Idaho, Washington, Colorado, California, Nevada, Oregon, Missouri, Texas, Georgia, the EPA, the Sac and Fox Indian Nations, the Confederated Tribes of Umatilla Indians, the Pueblo of Acoma, the Zuni Pueblo, the cities of Albuquerque, Arvada, Thornton, Santa Fe, Carlsbad, and Denver, the Western Interstate Energy Board, the Santa Fe and Jefferson County Commissioners, and the Hanford Advisory Committee were concerned regarding the overall DOE approach to training and emergency response. Some individuals who had either reviewed or attended DOE emergency training expressed satisfaction in the programs, while others felt the training was deficient. Representative issues included the following:

- Sufficient number of first responders
- Adequacy of the training programs
- Assurance that emergency-response teams are located in all potentially impacted areas

- Continuation of and updated training for first responders throughout the lifespan of the WIPP
- Federal assistance and funding for necessary training and resources
- "Train the trainer" approach as utilized
- Public awareness and education programs
- "Dry runs" of emergency scenarios and handling procedures before shipment begin.

7.12.9-1 **Response**

Before any training is presented in a State, extensive research is performed and meetings are conducted with State officials. The DOE contractor staff analyzes each route and estimates the number of potential first responders that may be reasonably expected to respond to a transportation accident. This number is used to discuss the potential number of classes each State may want offered.

Meetings are held with the appropriate DOE Regional Coordinating Office of the Radiological Assistance Program before meetings with any State official are held. Then presentations are made to appropriate officials. After a presentation, the DOE and the officials of each State mutually decide the extent of training to be provided in each State. To date, all 11 States where an offer has been made have accepted the DOE's offer to provide training. State/local/Tribal governments are responsible for identifying class attendees. In addition, training schedules are carefully coordinated with these governments to maximize attendance and effectiveness.

The actual schedule for providing these training courses is dependent upon when shipments from a particular facility are scheduled to commence. Since an opening date for the WIPP will not be determined until after this document is issued, a detailed course schedule is not provided. To maximize the effectiveness of the courses, they are provided 1 to 4 months prior to waste shipments along a particular transportation corridor.

Training is team-taught by experienced primary and secondary instructors. The emergency-response training is an ongoing program and will continue over the active life of the WIPP Project using the "train-the-trainer" approach.

The success of this training program is difficult to evaluate at this time. No waste shipments to WIPP have been initiated, so no practical experience exists regarding dealing with emergency situations.

A description of the types of training courses provided and a summary of their contents are provided in Appendix C.

7.12.9-2 Comment

A very large number of comments were received, including many from elected and appointed officials and agencies from New Mexico, Colorado, Idaho, Nevada, Missouri, Texas, the Isleta Pueblo, the county of Santa Fe, the cities of Denver and Carlsbad, the

EPA, and the Western Interstate Energy Board, regarding the adequacy of medical supplies and training along transportation corridors. The majority of commenters, including various health care providers, felt that existing hospitals and medical personnel are neither trained nor equipped to deal with TRU waste accident victims. A large number of commenters also felt that it is the DOE's responsibility to provide the necessary equipment and training to ensure the health and safety of accident victims as well as of health care providers. A small minority of commenters expressed confidence in the existing system's ability to adequately respond to a medical emergency.

7.12.9-2 **Response**

The DOE has contracted with the Radiation Emergency Assistance Center/Training Site (REAC/TS) in Oak Ridge, Tennessee, to conduct an 8-hour course entitled "Medical Management in Radiation Accidents." The course will be offered in 5 States at 12 different locations. The primary audience will consist of physicians, nurses, health and medical physicists, lab technicians, and the like, who would be evaluating and treating accident victims. The curriculum includes protocols for treating traumatized victims who may have been exposed to radiation or contaminated with radioactive material.

The REAC/TS staff conducts national training courses in the handling of radiation accident cases, maintains a research program on human radiation exposure, and is prepared to treat radiation accident cases in a unique multipurpose facility.

Any hospital with a nuclear medicine department, no matter what the size, is capable of protecting itself if a contaminated patient enters the hospital. This is true because of the procedures the hospital is required to put in place by the hospital accreditation process. In most cases, these hospitals have developed emergency plans and conducted drills as part of their JCAHCO accreditation process.

In the event an individual absorbs plutonium into his or her body, chelator drugs (i.e., Ca and Zn DTPA) are available to 42 U.S. physicians as an investigational new drug. Oak Ridge Associated University has the Food and Drug Administration (Investigational New Drug) permit to dispense these drugs and act as principal investigator.

Through Cooperative Agreements with representative organizations (i.e. the Western Governors Association) the DOE will provide the States with funding for training and equipment along transportation routes. Modifications to Appendix C have been made as a result of these concerns.

7.12.9-3 **Comment**

Several comments were received, including those from elected and appointed officials and agencies from Colorado, Idaho, Oregon, Nevada, Georgia, Texas, the Sac and Fox Nations, the Confederated Tribes of Umatilla Indians, the Hanford Advisory Committee, and the Western Interstate Energy Board, about the DOE's involvement with State emergency planning. Commenters requested the DOE's cooperation and participation in developing State and Tribal emergency plans for potential accidents involving TRU waste shipments. Some suggested that plans offered to the DOE by individual States should be reviewed in the SEIS. Others requested that the DOE notify the corridor States when shipments are scheduled to be passing through their States to ensure emergency-response readiness in case of an accident.

7.12.9-3 **Response**

Each State, Tribal, and local government is responsible for developing plans for responding to emergencies involving radioactive material. Regarding transportation emergencies, the Federal government provides two mechanisms for assistance. The first is "Guidance for Developing State and Local Radiological Emergency Response Plans and Preparedness for Transportation Accidents," also known as FEMA-REP-5 (FEMA, 1988). This document provides guidance to each State, Tribal, and local government in developing a written response plan and training programs to enhance its response. The second resource is the Regional Assistance Committee (RAC). The RAC, described in 44 CFR 351, is charged with "assisting State and local government officials in the development of their radiological emergency plans to evaluate adequacy of the plans." To the extent that State plans require shipment schedule information, the Federal government will provide the information as part of the output of the TRANSCOM tracking and communication system.

According to FEMA-REP-5 (FEMA, 1988) (1), "the responsibility for initially responding to a transportation accident generally falls to the State, Tribal and local government." In addition, "the local government [must] determine the action required to prevent further damage to life or property." State and local statutes should be consulted to determine specific responsibilities. Cleanup and decontamination are the shipper's responsibility, not the State's.

There is no requirement, nor is there any compelling reason for State and local governments to develop separate plans for dealing with a transportation accident. The initial response (i.e., fire suppression, rescue, and property protection) to a transportation accident is no different from the response to any other incident involving radioactive material. FEMA-REP-5 (FEMA, 1988) suggests that planning for radioactive materials transportation accidents be closely integrated into generic emergency operating plans for all types of disasters and emergencies.

The DOE has offered to review the emergency-response plans the corridor States have developed for the WIPP. Current plans are not reviewed in this SEIS. Modifications to Appendix C have been made as a result of this concern.

7.12.9-4 **Comment**

Several commenters stated that the draft SEIS makes no provision for evacuation in the case of an accident. Some requested that such plans are needed for all communities along the transportation corridor, particularly around major metropolitan centers.

7.12.9-4 **Response**

In a transportation accident, the State, Tribal, or local government has the responsibility for taking emergency protective actions, like evacuation. It should be noted, however, that a transportation accident involving radioactive materials, unlike an accident involving explosives or noxious gases, is not likely to require an evacuation in the ordinary sense. At most, in the unlikely event that some radioactive material is released, it would be necessary to establish a small control zone with a radius of 150 feet from the source from which people would be excluded until cleanup was completed.

Federal agencies clearly have the authority to advise those governments. To this end, the DOE, through its States Training and Education Program, has attempted to provide decision-makers at the State, Tribal, and local levels with accurate information to develop written procedures for making protective-action decisions, such as evacuations.

For example, the DOE's States Training and Education Program training course presents the recommendations of the FEMA guidance document (FEMA, 1988) and the DOT's Emergency Response Guidebook (DOT, 1987a) to establish an upwind exclusion area of at least 150 feet after an accident involving radioactive materials. Further distances are established for the downwind exclusion area when necessary. In addition, radiological health and environment professionals at the State and county level have been given specific information about the generic contents and hazards of the waste that may cross their boundaries. This information includes radiation-exposure rates and long-term effects expressed in probabilities of developing cancer. Appendix C has been modified as a result of this concern.

7.12.9-5 **Comment**

A great number of commenters, including elected and appointed officials and agencies from New Mexico, Colorado, Nevada, Idaho, Georgia, Oregon, California, Texas, the Sax and Fox Nations, the Pueblo of Acoma, the cities of Albuquerque, Santa Fe, Arvada, and Denver, the Jefferson County Commissioners, and the Western Interstate Energy Board, expressed concern regarding the availability and adequacy of equipment supplied to first responders in the event of a transportation-related accident involving TRU waste. It was stated that, particularly in rural settings, the first responders to an accident would most likely be local police or volunteer fire departments that may not have the necessary equipment or expertise to initiate the proper emergency support to protect the public health and safety against accidents involving radiation. Others said that it is the DOE's responsibility to see to it that first responders are capable of readily assessing the severity of an accident. They also said the DOE should provide the necessary equipment to probable first responders along the transportation corridors to ensure their safety and the public's safety. Concerns were also expressed about medical facilities and equipment.

7.12.9-5 **Response**

The number of resources available to State and local responders depends on the types of industry located within the governmental boundaries. States with operating commercial reactors necessarily have more resources. States and localities on established radioactive material transportation routes have more experience in responding to all levels of inquiries and are thus more polished in their response. All States have functionally oriented radiological health and emergency management organizations. These organizations include trained staff and specialized equipment. Again, the equipment resources vary widely. Equipment ranges from portable field instruments to fixed laboratory analysis capabilities.

The Conference of Radiation Control Program Directors (CRCPD) Committee on Emergency Response Planning has taken the position that a radiation detection instrument is not necessary to respond safely to a transportation accident. With regard to first responders, firefighters are sufficiently protected by standard turnout gear and dust or surgical masks, which have been issued to most ambulance, rescue, and law-enforcement personnel. This gear provides protection from internal hazards that could be encountered when responding to a potential WIPP incident. Appendix C has been modified as a result of this concern.

7.12.9-6 **Comment**

The States of Idaho, Colorado, Oregon, Nevada, and Texas, the Isleta Pueblo, the Pueblo of Acoma, the city of Denver, the Western Interstate Energy Board, and others commented on who will be responsible and urged the DOE to accept responsibility for cleanup costs, liability payments, and long-term financial obligations from accidents involving transportation of radioactive waste to the WIPP site.

7.12.9-6 **Response**

The Price-Anderson Amendments Act (PAAA) renews, until August 1, 2002, and makes mandatory, the DOE's responsibility to provide liability protection to its nuclear contractors and the public for damages that could arise during DOE-contractor nuclear activities. Therefore, all DOE nuclear waste activities carried out by contract must be covered by the Price-Anderson system through August 1, 2002. Transportation activities continue to be covered under the system.

The PAAA raises the statutory limitation of liability for a nuclear incident to approximately $7 billion. (Under prior law, the limitation was $500 million for DOE contractors.) For DOE contractors, payment would be made from government funds.

In all cases, if the aggregate liability of persons indemnified exceeds the statutory limit of approximately $7 billion, Congress would thoroughly review the particular incident and take whatever action is determined necessary to provide full and prompt compensation to the public. The President would be required to submit a compensation plan to Congress not later than 90 days after a determination by a court that the liability limit may be exceeded. This plan must "provide for full and prompt compensation for all valid claims." Appendix C provides more detail regarding the Price-Anderson Act. Also see the response to comment 3.1-5.

The PAAA requires that the President establish, within 90 days of enactment, a commission to study appropriate means of fully compensating victims of a catastrophic nuclear accident that exceeds the limitation of liability.

The PAAA provides indemnity coverage for all reasonable additional costs incurred by a State or local government in the course of responding to a nuclear incident or a precautionary evacuation. Coverage of a precautionary evacuation is new under the PAAA. It applies to an evacuation that results from an event that is not a nuclear incident but poses an imminent danger of injury or damage from the radiological properties of TRU radioactive waste and that is initiated by an authorized State or local official to protect the public health and safety.

In the event the DOE or the NRC, as appropriate, determines that a nuclear incident is an extraordinary nuclear occurrence (ENO) (a substantial off-site dispersal of radioactive material causing substantial damage or injury), the claimant may take advantage of several procedural shortcuts and a substantially reduced burden of proving liability under the waiver of defenses provision. Under prior law, the waiver did not apply to an accident at a waste facility. The PAAA broadens the scope of this provision so that it applies to any ENO, including an ENO at a waste facility.

Under prior law, a suit for an ENO had to be brought within 20 years of the nuclear incident (unless State law provided a statute of limitations more favorable to the claimant). The PAAA deletes the 20-year requirement and provides only that suit for an ENO must be brought within 3 years of discovering the injury (unless State law provides a statute of limitations more favorable to the claimant).

The DOE feels that it is bearing the costs associated with presenting emergency preparedness courses (described in Appendix C). Wages paid to course participants from the States are covered by the specific State.

In the event of a radioactive material release, cleanup and decontamination are the shipper's responsibility, not the State's.

The contract carrier is required to maintain $5 million liability coverage that would apply to conventional, non-radioactive incidents.

7.12.9-7 <u>Comment</u>

A large number of comments were received, including those from elected and appointed officials and agencies from New Mexico, Colorado, Idaho, Nevada, Washington, Oregon, Georgia, Texas, the Sac and Fox Nations, the Zuni Pueblo, the cities of Denver and Carlsbad, the Jefferson County Commissioners, the Western Interstate Energy Board, and the Hanford Advisory Committee, regarding the DOE's role and capability in responding to TRU waste emergencies. Commenters inquired into the DOE's effective response time to tend an emergency, particularly in remote areas, its involvement, and how it was going to convey pertinent information to first responders before specialists could arrive. Some commenters said they did not feel it should be the responsibility of local volunteers to jeopardize their safety as first responders in accidents potentially involving radiation exposure. Others questioned if the technology even exists to effectively cleanup an accident site involving radioactive contamination. Some commenters requested that radiological emergency-response teams be strategically located along the transportation corridor. One individual commented that just such a team should be a part of each convoy of trucks transporting WIPP waste.

7.12.9-7 **Response**

On November 8, 1985, the Federal Emergency Management Agency, with the concurrence of 11 other Federal agencies, issued the Federal Radiological Emergency Plan (50 FR 46542), also known as the Federal Plan (FEMA, 1985). The Federal Plan applies to the following peacetime emergency scenarios:

- Fixed nuclear facility, (i.e., commercial reactor)
- Transportation
- Nuclear weapons
- Other incidents, (e.g., nuclear-powered satellite re-entry).

The Federal Plan makes two basic assumptions about the Federal government's role in responding to radiological emergencies. Those assumptions are:

- State and local governments are responsible for protecting the health and safety of their citizens.
- The Federal government will respond only if requested by the State, except in situations where those Federal agencies have statutory or other authority. The availability of Federal resources is subject to prior statutory commitments to fulfill other operational requirements.

The Federal Plan is concerned primarily with Federal support to State and local governments beyond the immediate site of the emergency, (i.e., "off the site"). For activities authorized or regulated by a Federal agency, the "on-site" Federal support is the responsibility of that Federal agency. That lead Federal agency is referred to as the Cognizant Federal Agency (CFA). In most transportation accidents, except those involving nuclear weapons, the State or local government will define an area "on-site" at the time of the accident and manage all actions within that area. In such accidents Federal agencies have no independent authority for defining the "on-site" area.

During a transportation emergency in which the DOE has been designated the CFA, the DOE would have the following responsibilities:

- Notify appropriate Federal, State, and local agencies
- Manage on-scene Federal response actions, including radiological monitoring
- Assist State and local governments with protective action measures

- Serve as the Federal source of technical information.

Embodied within the Federal Plan is the Federal Radiological Monitoring and Assessment Plan (FRMAP). The FRMAP assigns the DOE as the lead Federal agency for radiological monitoring and assessment. Even though the Federal Plan recognizes that a "transportation accident . . . may represent much less of a radiological hazard or serious threat to the public, [and that] in most cases, State resources or a limited Federal response will suffice," the full complement of DOE resources is available.

Some examples follow of the types of resources the DOE might typically call upon to respond to a transportation emergency.

The DOE maintains round-the-clock notification points for the purpose of receiving requests for assistance. These resources reside in each of eight Regional Coordinating Offices (RCO) located across the United States. Within ready access of each RCO are specially trained radiological response personnel and state-of-the-art equipment that can be quickly dispatched to the scene of a transportation emergency. Each team available to be dispatched and all eight RCOs have written procedures describing their operations.

Highway travel is the most practical means for transporting the resources of the RCO. Many RCOs have also made arrangements with local charter air services to fly to the location of the emergency. At any rate, the arrival of the DOE's first responders depends on the time and day the request is received, weather conditions, and proximity of the DOE team to the site of emergency.

If additional resources are needed to supplement the DOE's initial response, several unique capabilities are available to support specific needs. For example:

- Several mobile laboratories are available with highly sensitive measurement devices to evaluate air, foodstuff, water, and vegetation samples to assure there has been no release of radioactive material to the environment.

- An Aerial Measurement Service (AMS) maintains helicopters and fixed-wing aircraft with sensitive radiation detectors mounted on board. These can be used to monitor large areas for the purpose of verifying that no radioactive material has been released and dispersed from the shipping package.

- Finally, to help the AMS focus on a smaller area to monitor, a computer modeling capability is available. Referred to as Atmospheric Release Advisory Capability, emergency responders can input data about terrain and meteorology in order to identify the area most likely to be contaminated if a release is suspected.

The technology to clean up radioactive spills has been developed over a 40 year period of operational activities at DOE facilities. Absorbing materials or materials that bind with spilled solids are used to clean up loose contamination. During the cleanup, personnel would wear the appropriate protective equipment. Modifications to Appendix C have been made as a result of this concern.

7.12.9-8 **Comment**

A comment was made by an agency of the State of Nevada that the "Command and Control Centers" course would more appropriately be titled "Incident Command For TRU Waste Accidents."

7.12.9-8 **Response**

The title of the course has been changed to "Command and Control Course." Appendix C has been revised to include topical descriptions of classes taught by the States Training and Education Program.

7.12.9-9 **Comment**

Several commenters raised questions regarding nonradiological emergency training for accident responders.

7.12.9-9 **Response**

Although the States Training and Education Program courses focus on responding to the radiological component of WIPP shipment emergencies, the curriculum has recently been revised to include a discussion on the hazardous chemical compounds of mixed waste. Like the radiological contaminants, the amount of hazardous chemicals in each drum is very small. An exception is when a drum contains lead as discarded shielding bricks, impregnated gloves, impregnated aprons, or similar discrete, solid items. Emergency-response procedures and protective clothing for hazardous chemical components would be the same as for the radiological components. The only exception would be in respiratory protection. For those responders not using self-contained breathing apparatuses (SCBA), organic filters are required (for solvents) in addition to particulate filters.

For a complete explanation of each States Training and Education Program course, see Appendix C.

7.12.9-10 **Comment**

Comments were received from the States of New Mexico, Colorado, Washington, and Nevada, the EEG, the Western Interstate Energy Board, and others regarding the adequacy of the transportation accident scenarios postulated in the draft SEIS. Several commenters had reservations concerning the severity of the DOE's worst-case transportation scenario. The State of Colorado specifically requested that the scenario be clarified as if it is an actual worst case, or a maximum credible accident. One commenter stated that if a TRUPACT-II container fell off a mountain side, it would indeed be more severe than what was considered as a "worst-case scenario" by the DOE. One commenter reported that the procedures for retrieving casks involved in accidents in remote areas have not yet been addressed. Several commenters requested that a host of accident scenarios be considered by the DOE and that detailed emergency-response plans be developed to maximize the effectiveness of a response team during an accident. Some recommended that the DOE stage mock accidents of the more likely accident scenarios so that local emergency-response teams could practice and be critiqued. The State of Washington requested that the DOE consider scenarios involving mixed mode transport (rail and truck), because this would have the maximum impact on local response units and capabilities.

7.12.9-10 **Response**

The extensive variability of the factors involved in an actual accident makes it extremely unlikely that any real accident would resemble the events chosen for examples in emergency-response training. Therefore, there is a high degree of engineering judgment inherent in the selection of accident scenarios. The accident scenarios used by the DOE were chosen 1) to approximate actual accident conditions such as highway speeds, vehicle weights, points of impact, and the like and 2) to highlight specific situations and responses that the instructors wish to emphasize. The training scenarios concentrate on responder protection, lifesaving, firefighting, and site isolation. While it is recognized that no scenario is so severe that a worse one could not be devised, once a scenario involves driver injury, fire, and spill, it involves the necessary concerns for training purposes.

The severity of an accident could affect the radiological extent of the accident. The DOE has evaluated this aspect by analyzing a nonmechanistic "bounding case" accident. For purposes of this analysis, how the accident proceeded is not specified. It simply is assumed that certain levels of radioactivity in certain forms are released. The dose consequences of that release are determined. However, as stated in the analysis, an accident sufficiently severe to produce the assumed release is not expected to occur over the life of the WIPP project.

If a TRUPACT-II needed to be retrieved in a remote area, tow trucks and cranes would be used to upright an overturned cask. A crane would then be used to place the TRUPACT-II on the trailer.

The DOE States Training and Education Program has taught more than 4,700 students in 11 States. With a program of this magnitude, full-scale mock accident training for even the majority of the students would require prohibitive time and money. Conversely, the number of students who could participate in a realistic drill schedule would be negligible. Therefore, the States Training and Education Program has not incorporated these drills in its program.

A mixed-mode scenario (rail and truck) for accidents is not addressed in the SEIS. The mode of transport is less important than the consequences of a TRUPACT-II breach, and a mixed-mode accident would require two highly unlikely events to occur at the same time.

7.12.9-11 **Comment**

Numerous commenters, including elected and appointed officials and agencies from the States of Colorado, Utah, Idaho, Oregon, Nevada, and Texas, the Confederated Tribes of the Umatilla Indians, the Pueblo of Acoma, the cities of Denver, Albuquerque and Carlsbad, and the Western Interstate Energy Board, criticized the draft SEIS for not containing an analysis of the TRU waste transportation costs, especially the cost for emergency-response training, equipment, and implementation and the impacts of these costs on State and local governments. These commenters were concerned that the DOE should provide emergency-response training or funding for emergency-response costs and that emergency-response costs could burden already limited State and local government budgets.

The State of Idaho specifically requested an analysis of "the costs of emergency responder training and equipment, as well as the costs associated with decontamination in the event that an accident with a release occurs" because "State and local governments will have to allocate funds for these purposes, which will take away from other governmental priorities and have an impact on citizens' environments." The State of Nevada recommended a "State-by-State incremental economic impact statement related to ensuring adequate emergency preparedness," and the State of Texas supported an analysis of the effects on "community services and facilities (i.e., the additional burdens on hospitals and other health care providers to be ready in the event of an accident; other emergency-response costs)." The State of Nevada also requested the requirements for an adequate emergency preparedness plan (assuming that States are responsible for implementing such plans) and asked how the adequacy of a plan would be determined.

7.12.9-11 **Response**

On the subject of transportation hazards, the Panel on WIPP of the National Academy of Sciences stated in a report issued in July 1989; "The system proposed for transportation of TRU waste to WIPP is safer than that employed for any other hazardous material in the United States and will reduce risk to very low levels."

Costs for emergency responder training courses will be borne by the DOE, and equipment costs will be distributed by Cooperative Agreements. In view of this position, the States need to allocate only funds to cover wages for personnel of the State to attend courses.

Nevertheless, the U.S. Congress has provided funding for WIPP highway safety measures to seven western States. From this, the western States requesting further funding have increased in number to 10, and the remaining 13 southern and eastern corridor States have urged that equitable sums be provided to them.

7.12.9-12 **Comment**

One commenter inquired about what kind of spill would do what kind of damage. The commenter also asked whether there is a sweeping-up crew for the WIPP.

7.12.9-12 **Response**

The restrictions placed by the NRC Certificate of Compliance on the TRUPACT-II packages (see Appendix L, Annex 1) will minimize the effects should an accidental spill occur during transportation. These restrictions forbid the inclusion of explosives, pryophorics, excessive free liquids, or significant quantities of small particles. Thus, in the event of a spill, the material that could be released would be miscellaneous contaminated solids. When the solids are picked up, the majority of the plutonium would accompany them. Only some surface contamination would remain. Since the radiation emitted by plutonium will not penetrate the outer skin layer, and it is only hazardous when ingested or inhaled, the necessary surface decontamination can safely be accomplished by workers using respiratory protection as a precaution.

Subsection 5.2.2.1 of this SEIS analyzes a "bounding case" accident scenario that assumes the release of respirable particulates carrying plutonium. Such a severe accident is never expected to occur over the life of the WIPP project. Nevertheless, the analyses indicate that no major health effects would occur in the exposed individuals.

If a transportation spill occurred, emergency-response personnel would establish an exclusion zone around the area. The DOE then would be responsible for decontaminating the area to a level of cleanliness acceptable to State officials.

7.12.10 **MONITORING PROGRAMS**

7.12.10-1 **Comment**

Several commenters suggested that the population near the WIPP site and along related transportation routes should be studied with regard to baseline health levels, so that the effects of the WIPP operations on this population may be determined. It was further stated that the DOE committed to these studies in agreements with the State of New Mexico.

7.12.10-1 **Response**

There is no recognized need to perform baseline health studies in the vicinity of the WIPP site since the local population is extremely small and widely dispersed. Therefore, such a study would not represent a scientifically valid assessment of the health effects due to the WIPP or other environmental factors. As agreed to in the Supplemental Stipulated Agreement with the State of New Mexico (page 28) (DOE and New Mexico, 1982), the DOE will fund "short-term and long-term health studies through an independent agency or contractor agreed to in advance by the State and the DOE, if, in the opinion of the State, a significant level of radiation has been released by a WIPP-related activity on or off the WIPP site or if WIPP-related radiation induced health effects are detected in New Mexico communities surrounding WIPP".

Analyses of the risks associated with the transportation of waste to the WIPP show that any exposures will be extremely low and will not present a significant hazard.

To document existing levels of preoperational radioactivity in the environment, the Radiological Baseline Program was developed in agreement with the EEG. This program samples various media such as soils, air, water and biotic tissues in the vicinity of the WIPP, so that these levels may be characterized prior to receipt of waste. The EEG is performing a similar, independent program for comparison and verification purposes. Since these studies have been ongoing since 1985, a significant amount of information has been collected. The data will become the database against which samples collected during the WIPP Operational Environmental Monitoring Program (OEMP) will be compared. The ongoing radiological monitoring programs represent a much more sensitive tool for the identification and control of potential releases than that of any health studies referred to in the comment.

7.12.10-2 **Comment**

Several commenters, including officials from the States of New Mexico and Colorado, the EPA, the EEG, the State of Colorado, and a County Commissioner from Santa Fe, expressed concern about the adequacy of the DOE's transportation and site-related radiation monitoring programs, as well as baseline radiation levels. Some commenters expressed concern that routine releases of radiation at the WIPP site will raise the baseline level or radiation. Others requested that the DOE's monitoring systems for transport vehicles and for the WIPP site be described in more detail. Commenters wanted to know where high- and low-volume air sampling stations would be located, and asked about other planned monitoring techniques. Some suggested that monitoring activities should be reviewed by an independent oversight group to ensure the safety of the workers, the public, and the environment. Others questioned the adequacy the Health Physics Program and the experience of the Program's personnel.

7.12.10-2 **Response**

The DOE has established an extensive environmental monitoring program at the WIPP facility. This program is described in WTSD-TME-057, "Radiological Baseline Program for the Waste Isolation Pilot Plant," April 1985 (Reith and Daer, 1985). Results of the DOE programs have been documented annually in formal reports to the DOE and have in turn been made available to the public DOE, 1986c; DOE, 1987d; Fischer et al., 1988; DOE, 1989d.

The Radiological Baseline Program is being incorporated into the Operational Environmental Monitoring Program, which is described in the Operational Environmental Monitoring Plan (Mercer et al., 1989). Air sampling stations are described in this document to show coverage of the area around the WIPP site. This plan describes the sampling program during the operational lifetime of the WIPP, and how the results from collected samples will be compared to the data accumulated during the preoperational phase. In comparison to the preoperational program, the operational program places additional emphasis on the monitoring of potential exhaust and effluent releases of radioactive materials from the WIPP site. Potential release points include the exhaust ventilation for the waste handling building and the underground ventilation exhaust. Areas of site drainage and sediment accumulation are also sampled. Data obtained from these programs, specifically the air exhaust samples, will be used in conjunction with site meteorological data and the computer code AIRDOS-EPA in order to model any releases from the site.

The design and operation of the environmental monitoring programs have been reviewed by the EEG, which provides independent oversight of WIPP activities. The EEG also runs a similar, but independent, environmental sampling program in the vicinity of the site. The DOE program actively samples soils, waters, vegetation, and biotic tissues, which are collected and divided between the EEG and the DOE program, under stringently controlled conditions. Sample filters containing airborne particulates are also collected for comparison purposes by an independent set of air samplers operated by the EEG. Furthermore, an independent series of samplers will be available to the EEG to allow the sampling of ventilation exhaust streams, which could potentially be contaminated by radioactive materials. These varied samples serve as an independent verification or cross-check in order to determine how well the WIPP facility is operating and how well the environmental programs are performing. Data collected from the DOE monitoring program will continue to be made publicly available through the annual site environmental reports.

Vehicles transporting waste to the WIPP will conform to the regulations established by the Department of Transportation (DOT). The DOT regulations specify external contamination and radiation limits with which the waste transporters must comply. One exception is found in the Waste Acceptance Criteria, which require lower limits with regard to acceptable surface contamination levels than those specified by the DOT. While the DOT limits surface contamination levels, the internal contents of these vehicles are limited by the Certificate of Compliance issued by the Nuclear Regulatory Commission (NRC) (see Appendix L, Annex 1). In addition to NRC requirements, transuranic waste will also be limited by the WIPP Waste Acceptance Criteria (DOE, 1989e). By agreement with the State of New Mexico, all shipments may be reviewed by the State for compliance.

Vehicles will be monitored to determine their location at all times using a computerized tracking system called TRANSCOM. Via a computer linkage, States can track all shipments.

The radiation safety functions have been consolidated into one organization to promote a well-coordinated and interactive program. The Radiation Safety Section includes the functional areas of Operational Health Physics, Technical Health Physics, and Dosimetry. An experienced senior health physicist having 30 years of health physics and management experience (including several years of plutonium work) has been assigned as the Director of Radiation Safety.

A new manager of Operational Health Physics (OHP) has recently been hired who has a B.S. degree in engineering and 15 years experience, which include recent management experience and 7 years experience in plutonium facilities. Recently, job offers have been accepted by three individuals, one of whom has 26 years experience, including 10 years of experience in plutonium facilities. Interviews are currently being scheduled in order to fill the remaining two openings for OHP technicians.

An eminently qualified and experienced Ph.D. has been hired to manage the dosimetry section. Three experienced health physicists are currently employed in the Technical Health Physics Section. Two more well-qualified engineers are being sought to support this group. Job offers are out to two more qualified individuals.

If Radiation Safety personnel do not have actual hands-on experience, they are sent to other facilities to gain this training. A detailed plan to send radiation safety personnel off the site, in order provide them with firsthand knowledge and experience at facilities that handle plutonium, has been institutionalized by including criteria on the Health Physics checklist and each professional's Performance Measurement System form.

A detailed job task analysis and description and related training requirements have been developed. Radiation Safety personnel are currently being trained and checked out through this formal training system. In addition, frequent drills of various operational scenarios are being conducted, and the skills of personnel are being improved. Thus, the WIPP will be operated in a safe manner insofar as its employees and neighbors are concerned.

7.12.10-3 Comment

Commenters expressed concern about the Radiological Baseline Program. The commenters noted that the DOE's policy of routine releases of radionuclides at all of its facilities raise the levels of so-called "background radiation." The commenters also stated that the draft SEIS should have acknowledged this fact.

7.12.10-3 **Response**

The purpose of the preoperational Radiological Baseline Program is to quantify existing levels of both naturally occurring and man-made radionuclides in the environment. Since this program has begun, before the facility has become operational, the measured values represent pre-existing levels of radionuclides. Measurements of radionuclide levels during operation will be compared to preoperational levels and to levels in samples from "background" locations (those located so as to be unaffected by WIPP activities) to determine any trends or increases. See the response to comment 7.12.10-2 for further discussion.

Estimates of routine releases and their associated risks are provided in Section 5. These estimated releases are all within regulatory guidelines.

7.12.11 **DECOMMISSIONING**

7.12.11-1 **Comment**

Concerns were raised by several commenters that "permanent" markers are really not permanent. The commenters suggested that guards may be necessary, because institutional knowledge will not be sufficient to prevent human intrusion. Commenters also stated that radionuclide releases during the decommissioning process have not been discussed.

7.12.11-1 **Response**

EPA requirements govern the types of markers to be used at the WIPP after decommissioning. As stated in 40 CFR Part 191.14(c), "Disposal sites shall be designated by the most permanent markers, records, and other passive institutional controls practicable to indicate the dangers of the waste and their location."

The intent of the EPA, in this regard, is to provide comprehensive actions that will ensure that knowledge and information about the disposal site and its contents is passed on to future generations. The EPA does not assume that passive controls will prevent all possibility of intrusion; but such controls will deter any systematic development of a site.

A document entitled "A Plan for the Implementation of Assurance Requirements in Compliance with 40 CFR 191.14 at the Waste Isolation Pilot Plant" was prepared in December of 1987. This document established an approach for determining appropriate passive institutional controls. In addition to markers and monuments, records, land use restrictions, legal documentation, and Federal control of the site, other methods of preserving knowledge will be evaluated. The use of passive control measures that effectively warn future generations of the buried radioactive materials would not require that the site be "guarded" by future generations.

Releases of significant amounts of radioactive materials during decommissioning are not anticipated. The sealing of the repository would include backfilling tunnels and shafts and removing surface facilities. Handling or movement of transuranic waste would not be involved during decommissioning.

7.12.11-2 **Comment**

A concern was raised about the ability to seal and plug shafts following closure of the WIPP.

7.12.11-2 **Response**

As stated in Subsection 6.3.2.3 of this SEIS, shaft-seal systems would be emplaced in each of the four WIPP shafts to limit the possibility of shafts becoming conduits for the release of emplaced material from the shafts to the Culebra aquifer or to the ground surface. Further studies of plug and seal design would be conducted during the proposed Test Phase. The primary, long-term shaft seal consists of a section of crushed salt or salt blocks in the lower part of the shaft. To protect the primary seal material from seepage coming from above, composite materials would be emplaced midway to the top of the Salado Formation and at the Salado-Rustler interface. In addition, salt-bentonite layers would be laid where the shaft intersects the anhydride beds. In the Rustler, a complex set of concrete and salt-bentonite sections is being considered to block off numerous water bearing beds. All other intervals would be filled with salt.

Shaft seal systems would be emplaced after the underground facility is sealed and backfilled. Emplacements would begin at the bottom of the shaft and continue upward to the surface, with the shaft liner being removed as work progresses upward.

Subsection 5.4.2 of this SEIS evaluates a scenario (Case IC) in which shaft seals fail and become a conduit for radionuclide migration. This scenario does not result in releases greater than the remanded standard (40 CFR 191, Subpart B).

7.12.11-3 **Comment**

Several commenters and the EEG expressed concern regarding the DOE's plan to "clean up" the WIPP site if the Test Phase indicates that EPA standards cannot be met. They wanted to know the costs associated with such a clean up.

7.12.11-3 **Response**

As stated in Subsection 1.4 of this SEIS, several plans are being evaluated by the DOE. The retrieval option would be used if it were determined that ultimately the standard could not be met. The destination for retrieved waste, and the facilities designated to store such waste, would be covered in future NEPA documentation, if necessary. Current generator facilities, including the facility in Idaho, would probably be considered as alternatives in such NEPA documentation.

After waste was removed from the WIPP, surface facilities would be either decontaminated and dismantled, or dismantled and disposed of at one of several DOE waste management facilities, if no beneficial uses other than that of waste disposal, could be made of the WIPP facilities. Most of the WIPP facilities are support facilities such as office buildings, warehouses, and the like, and they are not expected to become contaminated and would be salvaged. Upon removal of surface facilities, the land surface would be recontoured and revegetated. A decision has not been made as to whether excavated underground areas would be backfilled or left as is.

Costs associated with restoring the WIPP site to preconstruction conditions have not been estimated. It is expected that if underground areas are backfilled and sealed, considerable manpower and resources would be required.

7.12.11-4 **Comment**

Officials of the State of New Mexico, the County Commissioners of Santa Fe, members of the EEG, and others raised several questions about the eventual decommissioning of the WIPP site at the end of its operational period. Commenters suggested that the draft SEIS inadequately addresses the decommissioning process and associated radiation exposure levels to workers, the public, and the environment. Commenters wanted to know what the plans are for the surface facility after decommissioning, and how surface facilities would be decontaminated at the end of the operational period. Commenters also wanted to know what the plans are in the event that an accident involving a serious radioactive release forces the site to be decommissioned prematurely. Controlling Officials of the State of New Mexico were concerned about the DOE's plans for managing and controlling the 10,240-acre WIPP land withdrawal area after the facility is decommissioned, and they requested that the State be active in the development of these plans.

7.12.11-4 **Response**

Worker exposures to radiation during decommissioning after completion of the disposal phase are expected to be minimal, since the steps involved in decommissioning (see Subsection 5.4.1 of this SEIS) do not involve handling or moving the previously emplaced waste. The waste handling building and the ventilation exhaust system would be dismantled in a step-by-step fashion that would be described in more detail in future NEPA documentation.

Facility accidents and waste handling accidents are carefully evaluated in the draft Final Safety Analysis Report (FSAR) (DOE, 1989a) for the WIPP. Since TRUPACT-IIs are not opened until they are in the waste handling building, a waste handling accident would have to occur in confined areas with HEPA-filtered exhaust air. If any measurable activity above background levels would escape from a breach in the facility, contaminated soil and vegetation would be removed and disposed of as site-generated waste.

The WIPP facility is a radiologically "clean" facility and would be operated as such. Contamination surveys would be conducted with routine frequency. If contamination is detected above the limits set in DOE Order 5480.11 (DOE, 1988i), the facility would be decontaminated before further operations are allowed. Should an incident cause widespread contamination at the WIPP, the area would be decontaminated to levels as low as reasonably achievable. Then a thorough readiness review to operate would be conducted prior to restarting of operations.

Subsection 2.6 provides information on the facility decontamination and decommissioning. The final decontamination of the facility will satisfy the applicable standards that are in place at that time.

The DOE's plans for the management of the 10,240-acre WIPP site after decommissioning have not been finalized.

7.12.11-5 Comment

Concerns were raised that the plans for closing the WIPP, and the steps that the DOE would take to deny exploration for resources, have not been adequately discussed in the draft SEIS.

7.12.11-5 Response

Closure and post-closure plans required by the RCRA are discussed in Subsection 2.6 of this SEIS. These plans are being developed to satisfy the requirements of 40 CFR 265, Subpart G. This SEIS discusses the actions the DOE will take during the closure and post-closure periods, including funding arrangements and detailed engineering plans. Since these plans have not been completed, it would be premature to project the steps to be taken during the closure and post-closure periods. Permanent markers, as required by 40 CFR 191.14 (c), are meant to warn potential intruders that hazardous materials are buried 2,150 feet underground.

Exploration for resources during the post-closure period will not be allowed as long as the DOE or the Federal government maintains institutional control over the 10,240-acre WIPP site. Such active institutional control is required by 40 CFR 191.15 (a) for "as long a period of time as is practicable after disposal." However, performance assessment calculations cannot take credit for active institutional controls beyond 100 years after the repository is closed.

Currently, a "Memorandum of Understanding" between the DOE and the New Mexico State Office of the Bureau of Land Management is in place to limit such exploration activities near the WIPP site. It has not been revised since June 29, 1983, because it is intended to provide controls until a legislative land withdrawal is completed. It is not felt that such a short-term instrument warrants inclusion in this SEIS, particularly since it covers the period prior to emplacement of waste at the WIPP. It is expected that administrative or legislative land withdrawal agreements will place restrictions on resource explorations at the WIPP site.

7.13 RADIOLOGICAL AND HAZARDOUS CHEMICAL CONSEQUENCES OF WIPP OPERATIONS

7.13-1 Comment

Reviewers commented that it is unreasonable that the minimum and maximum values for the estimated daily intake and, therefore, the risks associated with exposure to hazardous chemicals are equal in many of the scenarios in the SEIS. They questioned the validity of such estimates and requested some clarification of the reported values.

7.13-1 **Response**

This SEIS reports only the maximum estimated intakes and potential risks. The results of the analysis indicating the minimum and maximum estimated intakes for routine operations are a result of conservative scenarios. These scenarios place hypothetically exposed individuals at points of maximum concentrations and assume they are exposed to a continuous source of release. For example, the underground worker is placed in a room with 6,000 drum-equivalents, 8 hours per day, 240 days per year for the operational life of the WIPP. The emission rate of chemicals from the drums is also conservatively assumed to be constant until the entire total concentration of the chemical is depleted. The minimum and maximum values were consistently reported in the draft SEIS tables even though they were often equal; this was an attempt to differentiate those chemicals and scenarios that resulted in a potential range of intakes. Subsection 5.2.4 and Appendix G provide an explanation of those scenarios in which exposures are the same.

7.13-2 **Comment**

A reviewer asked if the fact that there is no Immediate Danger to Life and Health (IDLH) standard for lead indicates that lead poses no immediate danger.

7.13-2 **Response**

The lack of an established standard by one agency does not indicate that no potential for immediate danger may exist. An IDLH occupational health standard has not been developed for lead by the National Institute for Occupational Safety and Health (NIOSH). Standards for all chemicals have not been established by any one agency, and in some cases, agencies have different standards.

The risk assessment in the SEIS uses a Threshold Limit Value (TLV)-based allowable intake and the TLV-based hazard index for evaluating the potential noncarcinogenic risks from lead exposure. The use of the TLV-based reference level for a short-term exposure is more protective of human health than the IDLH. The longer the exposure the lower the allowable intake concentration. As exposure periods lengthen, applicable toxicologic criteria become lower or more stringent. For example, for methylene chloride, the IDLH (based on a 30-minute exposure) is 1,800 milligrams per cubic meter, where the TLV (based on an 8-hour standard exposure) is 30 milligrams per cubic meter. The TLV is the more stringent standard against which to compare intake levels, thereby affording a more conservative approach.

7.13-3 **Comment**

A commenter asked how the location of the maximum concentration point from aboveground operations (i.e., 500 meters south and 200 meters west of the ventilation exhaust for the waste handling building) was determined in Subsection 5.2.4.2 of the draft SEIS.

7.13-3 **Response**

The point of maximum concentration was determined using the long-term version of the Industrial Source Complex (ISC) model. This model is EPA approved and appropriate for predicting air concentrations from continuous, long-term releases of chemicals. A further discussion of the model and the input parameters is provided in Appendix G.8.

7.13-4 **Comment**

A number of reviewers expressed a general doubt and concern about the safety of the transport and disposal of TRU waste destined for the WIPP.

7.13-4 **Response**

This SEIS discusses the consequences to human health and the environment from routine and reasonably foreseeable accidental releases of hazardous chemicals and radioactivity during the transport and disposal of TRU waste destined for the WIPP. The DOE is committed to fully complying with all applicable environmental and health and safety requirements. Additional information is provided in the response to comment 7.3.4-1.

7.13-5 **Comment**

One commenter felt the WIPP is the safest facility that could be built with current technology. Another person felt that no occurrence at the WIPP during a 5-year test period would be of any consequence. One person noted that the radiological and chemical risk assessments for routine and accident scenarios in the SEIS indicate that all exposures to the public and workers are well below health protective reference levels.

7.13-5 **Response**

The DOE has assessed the impacts associated with routine and reasonably foreseeable accident conditions during transport of TRU waste to the WIPP as well as from waste handling activities. It has also considered public comments on the draft SEIS in the publication of this final SEIS. The risks associated with the operations planned during the Test Phase and the Disposal Phase are analyzed using conservative assumptions and indicate that levels of risk are low.

7.13-6 **Comment**

One commenter stated that studies conducted at the Idaho National Engineering Laboratory (Clements and Kudera, 1985) to measure gas generation rates prove that gas generation tests can be performed at facilities other than the WIPP. This, therefore, disproves the DOE's need to perform gas generation tests during the Test Phase at the WIPP as stated in the Proposed Action in the draft SEIS.

7.13-6 **Response**

The gas generation studies conducted at the Idaho National Engineering Laboratory address short-term gas generation rates from radiolysis and have been used by DOE to address transportation requirements. The gas generation studies proposed during the Test Phase at the WIPP are designed to answer questions about gas generation from long-term processes such as biodegradation, the corrosion of metal, and waste interactions with brine. The data collected by Clements and Kudera (1985) does not provide sufficient data on gas generation for the purposes of reducing uncertainties in assessing long-term performance to determine compliance with 40 CFR Part 191. The objectives of the bin- and alcove-scale tests are presented in Subsection 3.1.1.4; Appendix O provides a summary of the Test Phase.

7.13-7 **Comment**

The EEG commented that the assumption of an air velocity of 3 meters per second is non-conservative by a factor of at least 2. The assumption requires a flow rate of 120 cubic meters per second in either one storage room or in the panel exit drift. They stated that the total flow rate for a panel is about 58 cubic meters per second and for an individual room would be only a fraction of this. They stated that this discrepancy was pointed out in their draft FSAR (DOE, 1989a) comments and acknowledged by the DOE. They noted that the values in Tables 5.31 and 5.32 of the draft SEIS check for the assumptions used.

7.13-7 **Response**

The air velocity of 3 meters per second is for the drift and not in a room. The DOE has reanalyzed the scenario in this final SEIS using an estimated air velocity in a room of 0.4 meter per second (see Subsection 5.2.4.3).

During operations, room air would move at different velocities depending on the number of drums, the height to which the drums are stacked in a room at a given time, and the opening of air control louvers. As the cross-sectional area of the space decreases, the velocity would increase. The results of the analysis using 0.4 meter per second are still well below health protective levels. It should be noted that the scenario includes a very conservative assumption that a worker is present in the room with 6,000 drum-equivalents for 8 hours per day, 240 days per year for the entire 20-year operational period. In reality, WIPP operating procedures require that workers remain upstream in the ventilation system whenever possible. Workers would spend minimal time in the waste rooms during routine waste handling operations.

7.13-8 **Comment**

The EEG made the following points regarding the assumption that particulate releases of heavy metals during routine operations are assumed to be insignificant:

- The statement that Waste Acceptance Criteria (WAC) (DOE, 1989e) certification assures no radioactive contamination exists on the surface of containers is incorrect. A limited amount of radioactive contamination is allowed (50 picocuries per 100 square centimeter for alpha emitters and 450 picocuries per 100 square centimeters for beta-gamma emitters).

- The HEPA filtration system will not normally be operating to filter underground exhaust and, thus, cannot be categorized as routinely filtering exhaust air.

7.13-8 **Response**

This final SEIS has been modified to reflect these comments (see Subsection 5.2.4). The limits for radioactive contamination have been included; however, the basis for the assumption is still valid. For example, assuming an average inventory of radionuclides, the maximum mass concentration of surface contaminants on CH TRU drums is equal to 1.3×10^{-10} gram per 100 square centimeters. This concentration is orders of magnitude below detectable levels for RCRA-regulated metals. The statement on the HEPA filtration system has been deleted because the filter system would not be used routinely. Because of the physical form of the metals in the waste, there is no reason to require continuous HEPA filtration.

7.13-9 **Comment**

The EEG noted that footnote "a" is missing from Table 5.36 on page 5-82 of the draft SEIS.

7.13-9 **Response**

The footnote has been added to Table 5.36 (now Table 5.43), which explains the calculation of the incremental lifetime cancer risk.

7.13-10 **Comment**

The EEG noted that the units of $\mu g/m^3$ are missing from page 5-78, Table 5.34.

7.13-10 **Response**

The table (now Table 5.41) has been corrected to include the units $\mu g/m^3$ (micrograms per cubic meter).

7.13-11 **Comment**

The EEG stated that it agrees with the inclusion of trichloroethylene in the waste inventory because it was commonly used prior to and during the 1970s. It noted that this point was made some months ago by Dr. William Lappenbusch, the EEG's consultant.

7.13-11 **Response**

Trichloroethylene was detected in the headspace gas of drums sampled at the Idaho National Engineering Laboratory (Clements and Kudera, 1985). This chemical was substituted with 1,1,1-trichloroethane in approximately 1975; therefore, in the risk assessment it is considered to have the same total concentration as the 1,1,1-trichloroethane reported by the Rocky Flats Plant (Rockwell, 1988).

7.13-12 **Comment**

The EEG commented that they believe the assumptions listed on page 5-68 of the draft SEIS are all reasonable and slightly conservative. Other commenters felt that the assumptions used in the risk assessment were not conservative and required further justification. Their questions concerned the quantity of waste used in the assumptions that above- and below-ground workers would be exposed to during routine operation (e.g., potential backlogs of waste in the waste handling building and the backfilling and sealing of rooms as they are filled).

7.13-12 **Response**

The DOE has used very conservative assumptions in the chemical risk assessment in this SEIS and believes that the risk estimates provide an upper bound of the consequences that potentially may occur. For example, for the purposes of calculations it was assumed that 22,000 drums during the Test Phase or 6,000 drums during the Disposal Phase are present and not backfilled at all times. It is not possible that this volume of waste could arrive and be emplaced in the underground in one day (i.e., a very conservative assumption). Also, no credit is taken for the carbon composite filter that has been demonstrated to limit the release of volatile organic compounds from the drums (DOE, 1989f). During routine operations, waste received at the WIPP would be emplaced in the underground according to waste handling policies and procedures. Consistent with the DOE's policy of ALARA (as low as reasonably achievable), the waste would be moved underground as quickly as possible to minimize any potential radiation exposure. It is also conservatively assumed that above- and below-ground workers remain continuously at the point of maximum concentration of chemicals in air. For example, below-ground workers are postulated to remain in a room containing 6,000 drums 8 hours per day for 25 years.

7.13-13 **Comment**

The EEG commented that the emission rate reported for 1,1,1-trichloroethane in Table 5.28, page 5-67 was inconsistent with the other values that were calculated using the square root of the molecular weight ratios. It was noted that the values in Table 5.31 were calculated using a value of 1.7×10^{-7} as was reported in the 1988 draft FSAR (DOE, 1988b).

7.13-13 **Response**

The value for the emission rate for 1,1,1-trichloroethane in Table 5.28 of the draft SEIS (now Table 5.35) is a typographical error and has been corrected. As noted, the correct value of 1.7×10^{-7} grams per second was actually used to calculate the air concentrations in Table 5.31 (now Table 5.38).

7.13-14 **Comment**

The EEG commented that the basis for excluding noncarcinogens if they are present in amounts less than 1 percent by weight is not clear. They state that since the reference cited is not readily available (Rockwell, 1985), a summary or explanation of its contents should be included in the SEIS. Also, in equation G-4, the term "Ri" and "RLi" appear to reference the same variable. They asked what the correct usage is for this variable. They stated that if Li is a variable, then it should be defined.

7.13-14 **Response**

The reference cited on page G-24 of the draft SEIS is Rockwell, 1988. The information in this report is included in the SEIS in Table B.3.2 of Appendix B.3, which discusses the hazardous chemical constituents in TRU mixed waste. This report was provided to the EEG and its consultant, Dr. William Lappenbusch. It is also provided at DOE reading rooms for public review. All TRU mixed waste reported by the DOE generators that may eventually transport waste to the WIPP was evaluated in the risk assessment. It was determined from the "TRU Mixed Waste Characterization Data Base" chapter in (WEC, 1989a) that the Rocky Flats Plant reported the largest volumes and types of RCRA-regulated hazardous waste. Based on the estimated maximum concentrations of chemicals in the Rocky Flats Plant TRU mixed waste (Rockwell, 1988), those chemicals in quantities greater than 1 percent were determined to provide a realistic estimate of the risks. Based on the concentrations, toxicities, and potential pathways of exposure, the chemicals chosen for the risk assessment are considered appropriate.

The "Ri" in the definition of variables in equation G-4 should be "RLi," which is defined as the reference level for the ith chemical (milligrams per kilograms per day). The error is corrected in this final SEIS.

7.13-15 **Comment**

The following comments were submitted on Appendix G of the draft SEIS:

1) The formula for methylene chloride is incorrect.

2) A reference was requested on the biodegradation of dichloromethane occurring both aerobically and anaerobically.

3) Clarification was requested on the health effects of 1,1,1-trichloroethane specific to the LC_{50} response.

7.13-15 **Response**

1) The formula in Subsection G.3 contained a typographical error and has been corrected in the text to read CH_2Cl_2.

2) A reference has been added as follows: Environmental Protection Agency (EPA) 1985, [EPA, 1985a]; Criteria Document on Dichloromethane. Final Draft. Environmental Protection Agency, Office of Drinking Water (cited in ATSDR, 1987).

3) The statement for LC_{50} in rates of approximately 14,000 milligrams per kilogram for a 7 hour exposure is a correct statement since this is for an inhalation exposure. This is a lethal air concentration to 50 percent of the population. It is not an oral LD_{50}. The statement in Appendix G in the draft SEIS is correct.

7.13-16 **Comment**

The EEG commented on the statement (page 5-70 of the draft SEIS) that "The EPA Industrial Source Complex (ISC) Dispersion Model predicts off-site concentrations of volatile organic gaseous releases from the WHB and underground storage areas." They asked if it is assumed in these analyses that hazardous waste is not adsorbed onto particulates in the exhaust. They stated that if the adsorption of particulates is not assumed, then documentation for this assumption is required in the SEIS for proper justification; otherwise, it should be considered in the assessment.

7.13-16 **Response**

The risk assessment for the exposure to releases of volatile organic compounds (VOCs) considers the intake of the gaseous releases of VOCs that represents the predominant form of these compounds and potentially the most direct and significant form of exposure to an individual.

During routine operations at the WIPP, the risk assessment evaluates the release of VOCs through the carbon composite filters on the containers. It is conservatively assumed that the VOCs are emitted from the drums at the constant rate (grams per second) that is reported in Table 5.35 for each VOC. These emission rates are approximately five orders of magnitude higher than actual measured values reported in the TRUPACT-II Safety Analysis Report for Packaging (DOE, 1989f). Also, no credit is taken for the adsorption of the VOCs on the carbon composite filter.

During accident scenarios in which containers are breached, it is assumed that the concentrations of VOCs in the void volume of the drum(s) are instantaneously released. The quantity of a VOC released is calculated by multiplying the headspace gas concentration by the void volume of the drum. For example, in accident C2 in the SEIS, one drum is assumed to release 1.9×10^{-3} gram per liter which for 147 liters = 2.7×10^{-1} grams of carbon tetrachloride (see Subsection 5.2.4.3 and Table 5.4.2). This calculation assumes that VOCs from within all the inner bags in the drum are instantaneously released during the accident. The gaseous form of these compounds is most directly absorbed by the body and therefore poses the greatest potential risk.

Because of the complex waste matrices, it is difficult to predict the additional quantities of VOCs that might be adsorbed on the particulates released during the accident scenarios. Because of the conservative gaseous release fraction, the contribution of particulates is assumed to be negligible. To verify this assumption, the air concentration was recalculated assuming that the 10 micron particulates released were composed of 100 percent activated carbon which has a maximum adsorption capacity for VOCs. A maximum specific surface area of 1.8 kilometers square surface area per kilogram of particulate was assumed. In scenario C2, the results of the calculation indicate that the concentration of carbon tetrachloride in air at the receptor would increase from 5.8×10^{-1} milligram per cubic meter to 6.5×10^{-1} milligram per cubic meter. The assumption of VOCs adsorbed on particulates, even on an extreme and unrealistic particulate matrix, does not significantly increase the maximum exposure to an individual. Based on these calculations, the gaseous release of VOCs is considered a reasonable assumption, and the adsorption of additional VOCs on particulates is not included in the scenarios in this final SEIS.

7.13-17 <u>Comment</u>

The EEG commented on the information on page 5-71 concerning the potential exposures to VOCs from opening the TRUPACT-II at the WIPP. Using the assumption that VOCs will be emitted from drums inside the TRUPACT-II at the rates listed in Table 5.28 of the draft SEIS, they calculated that in 100 hours the predicted concentration would be 1.6 times the TWA-TLV for carbon tetrachloride in an average load. In a maximum load, they calculated the concentration as 15 times the TWA-TLV for carbon tetrachloride and 1.8 times for 1,1,1-trichloroethane. They stated that it is apparent that sampling must be done before opening the TRUPACT-II units at the WIPP, and that precautions may have to be taken to insure safety of those most involved in waste handling with the TRUPACT-II.

7.13-17 <u>Response</u>

Using the emission rates listed in Table 5.28 of the draft SEIS, the EEG's calculations are correct; however these rates are approximately five orders of magnitude higher than actual rates measured for inclusion in the TRUPACT-II Safety Analysis Report for Packaging (DOE, 1989f). Although concentrations of VOCs inside the TRUPACT-II are not expected to be a problem, part of the procedures for handling CH TRU waste at the WIPP include the sampling of gases prior to opening the TRUPACT-II. The samples are taken to gather data on the concentrations of VOCs and other gases inside the TRUPACT-II and to ensure that the gases are at safe levels prior to its opening. A discussion of this procedure has been added to the final SEIS for clarification. The analysis in Subsection 5.2.4.2 provides a bounding case analysis and therefore has not been reanalyzed using the lower, more realistic diffusion rates.

7.13-18 **Comment**

The EPA and other commenters stated that because of the high degree of uncertainty with the risk assessment for the hazardous chemical component of the waste destined for the WIPP, perhaps an upper and lower limit should be used instead of an average concentration. A number of commenters questioned the use of weighted average total concentrations of hazardous chemicals in TRU mixed waste.

The EEG commented that the statement on page 5-64, line 4 of the draft SEIS, which says that the use of average concentrations represents a bounding case, is misleading. They stated that in any scenario involving only a few drums (e.g., when unloading a TRUPACT-II), a conservative assumption would be at least as great as the average concentration for the maximum class of waste. They stated that this is especially pertinent because the original TRUPACT-II certification is not expected to permit mixing of waste types. As an example, they said that Waste Category 2 (cemented and uncemented organic sludges) comprises 10.5 percent of all waste and has a concentration of carbon tetrachloride of 50,000 milligrams per kilogram which is 9.3 times the average.

7.13-18 **Response**

The total concentrations of VOCs reported by the Rocky Flats Plant (Table 5.31 of the SEIS) are used in the risk assessment to identify those chemicals that are representative of the waste, but do not represent the quantities of chemicals potentially available for release to the environment. The potential exposure to VOCs during routine operations is through the carbon composite filter on the containers. The weighted average concentrations of VOCs in the headspace of containers (Table 5.33 of final SEIS) are used to calculate the diffusion rates of each chemical through these filters. Experiments conducted on diffusion rates of VOCs through these filters used saturated concentrations of VOCs inside the container (WEC, 1988b). The results indicated that the diffusion rates are actually about five orders of magnitude slower than those used in the SEIS. The maximum concentrations (Table 5.31) are utilized in the risk assessment to estimate an emission period for VOCs through the container filters for routine operation scenarios (Table 5.36). During operations such as the unloading of a TRUPACT-II, potential exposures are limited by the rate of diffusion of VOCs through the filters and do not relate to the total amount of VOCs in the waste. Because the release of VOCs is limited by their diffusion rates through the filter, the potential exposures are not dependent on the total quantity of the chemicals originally present in the waste.

The total weighted average concentrations (Table 5.31) and the average emission periods (Table 5.36) are not used in the analysis but were provided for information. The minimum and maximum values for exposures and risks were reported in the assessment to provide a range of potential risks associated with the various scenarios. Because of comments from the EEG and others concerning the weighted average values, they have been deleted in the final SEIS. This does not change any of the analyses in the risk assessment because they were not used to calculate exposures. The weighted average concentrations of VOCs in the headspace of containers (Table 5.33) are used to estimate potential exposures to VOCs.

The statement on page 5-64 of the draft SEIS refers to the average concentrations of VOCs in the headspace of the drums (now Table 5.33). Based on analytical data from Clements and Kudera (1985), the use of these average concentrations for accident scenarios is considered to provide a representative basis for the analysis. In addition to the fact that a large percentage of the drums containing TRU mixed waste have below detectable quantities of VOCs (Table 5.34), it is assumed that all drums contain mixed waste instead of the 60 percent of the total inventory that is actually reported (WEC, 1989a). Using the maximum reported headspace gas concentrations (Clements and Kudera, 1985) to calculate risks associated with postulated accident scenarios does not change the conclusions of the analysis because the results indicate that exposures are still orders of magnitude below health-based levels.

7.13-19 **Comment**

One commenter asked if underground experiments at the WIPP would pose a greater risk to the public than conducting the experiments in a laboratory setting.

7.13-19 **Response**

As shown in Section 5, the potential risks to the public from exposure to radioactivity and hazardous chemicals are expected to be very small for the Proposed Action and for the Alternative Action. Final plans and procedures for implementing any experiments would include compliance with all applicable health and safety requirements and environmental regulations. Also see responses to comments 7.11-1, 7.11-4, and 7.11-10.

The Proposed Action includes conducting the Test Phase with bin-and/or alcove-scale tests underground at the WIPP. Bin-scale experiments would involve a very small percentage of the TRU waste inventory and could be conducted at an aboveground facility. The Alternative Action discussed in the SEIS is to conduct the bin-scale tests at an aboveground facility. The alcove-scale tests could not be conducted at a location other than underground at the WIPP; therefore, these experiments would be eliminated in the Alternative Action. A description of the types of experiments in the Proposed Action and Alternative Action is provided in Subsection 3.1.1.4 and Appendix O of the final SEIS.

7.13-20 **Comment**

A reviewer criticized the fact that the DOE uses assumptions in the hazardous chemical risk assessment to predict potential consequences from routine operations and accident scenarios at the WIPP. It was stated that the uncertainty analysis in Subsection 5.2.4.1 was evidence that the DOE has not been conservative in estimating risks associated with operating the WIPP.

7.13-20 **Response**

An uncertainty analysis is an integral part of any risk assessment. Uncertainties are addressed throughout the risk assessment by making conservative assumptions where appropriate. Subsection 5.2.4.1 includes a detailed discussion of the assumptions used to compensate for uncertainty. The estimated future risk to human health may occur only if all the conservative assumptions are realized. The DOE believes the risks associated with the potential exposures to hazardous chemicals from routine and postulated accident scenarios are conservatively estimated and provide an upper bound of the impacts. Further details on the methodology used in the hazardous chemical risk assessment are provided in Appendix G.

7.13-21 **Comment**

A commenter stated that the DOE did not provide enough explanation in Subsection 5.2.4.2 of the draft SEIS on the potential exposures to the public from releases of hazardous chemicals. It was felt that the draft SEIS does not instill public confidence in DOE activities.

7.13-21 **Response**

Subsection 5.2.4.3 (was Subsection 5.2.4.2 in the draft) presents the results of estimated routine releases of hazardous chemicals and subsequent potential exposures for both workers and the public. A more detailed discussion of the assumptions made to evaluate any potential risks is provided in Subsection 5.2.4.2. To evaluate risks to the public from routine operations at the WIPP, a hypothetical resident is placed at the WIPP site boundary. The estimated daily intakes of each chemical are provided in Table 5.40. The DOE has conservatively estimated the potential risks to the public. All potential exposures to hazardous chemicals are orders of magnitude below health-based levels.

7.13-22 **Comment**

The EEG asked what the phrases "to the only occupational population" and "residential exposure" meant on page G-24 of the draft SEIS. They asked how the assumption of filtration validates that there will be no exposure to the public, if the filtration system also "filters" out VOCs, and how dilution excludes people from exposure.

7.13-22 **Response**

The EEG makes a valid point that the last paragraph on page G-24 of the draft SEIS was unclear. Subsection G.10 has been rewritten in the final SEIS for clarification. The accident scenarios are assumed to involve potential exposures only to the occupational population because all hypothetical accidents occur either in the waste handling building or underground. Because the risks to workers associated with the release of hazardous chemicals from accident scenarios at the WIPP are well below health based levels, risks to the public are not estimated. Short-term exposures to individual members of the public from releases of hazardous chemicals during postulated accidents would be less than those to individual workers because of the restricted access to the facility, operational protocols for accident control and cleanup, and the decreased concentrations of chemicals from dilution and diffusion in the air.

The filtration system does not filter out VOCs. No credit is taken for HEPA filtration in accident scenario C10 in estimating an exposure to workers from releases of lead particulates. The statement on filtration is deleted from the text.

7.13-23 **Comment**

The EEG commented that the concentrations of VOCs the aboveground worker would be exposed to during the 5-year Test Phase are too low by a factor of about 3. Using the assumptions stated on page 5-68, they noted that the aboveground worker should be exposed to the emissions from an average of 66,000 drums during the first 5 years, and 6,000 drums thereafter. They stated that the estimated daily intakes in Table 5.32 of the draft SEIS reflect this 11 to 1 ratio. They also noted that the concentration for an aboveground worker in the 20-year period is consistent.

They stated that the effective X/Q value for the 20-year concentration is about 1.5×10^{-6}. They noted that this is about a factor of 10 low compared to table H-49 of the FEIS, but without knowing stack height assumptions they said they could not comment on its validity.

7.13-23 **Response**

It is correctly pointed out that in the draft SEIS the aboveground worker is exposed to an average of 66,000 drums during the first 5 years, and 6,000 drums yearly thereafter. The factor used to adjust for the increase in the number of drums over 5 years (i.e., to calculate an average emission period) was applied in the intake calculations in the draft SEIS. The calculation of intake and risk is correctly calculated in the draft SEIS; however, the air concentration should reflect the emission of the average number of drums in the scenario. In response to another comment by the EEG and others on drum-equivalents, the exposures are recalculated in the final SEIS using 17,600 drums per year in the first 5 years. The emission of the average number of drums during the first 5 years is correctly indicated in the air concentration at the aboveground receptor location in the final SEIS.

It is difficult to compare the air concentrations in the FEIS with those in the SEIS because different models are used and different circumstances are being modelled. The values reported in the FEIS in Table H-49 are predicted using the MESODIF model, which is an integrated puff model. The release is treated in this model as a string of puffs released every hour into the wind field. The long-term Industrial Source Complex model is used in the SEIS to predict concentrations of chemicals released during routine operations. This is an EPA-approved model for predicting concentrations from long-term, continuous sources. The point of maximum aboveground concentration from releases of chemicals during underground operations is 300 meters south and 100 meters west of the exhaust shaft. This equates to a distance of 1,037 feet from the underground exhaust shaft. The stack height and other parameters are provided in Appendix F of the SEIS.

7.13-24 <u>Comment</u>

Commenters questioned the validity of the postulated accident scenarios at the WIPP. The following comments were made concerning the accident scenarios:

1. A fire scenario involving an entire room or facility should be considered instead of just one drum underground.

2. Chronic (long-term) exposures are not considered for undetected leaks and mechanical malfunctions.

3. The release fractions in accidents are not conservative.

4. The duration of exposures are not justified.

5. No credit should be taken for HEPA filters during an accident.

6. The information provided in Table 5.35 of the draft SEIS was not clear enough for the public to understand.

7.13-24 <u>Response</u>

1. Engineering modifications involving fuel tanks and lines, speed limiting governors, and the presence of fire extinguishers on underground vehicles have greatly reduced the likelihood of an underground diesel fire involving waste and the underground diesel fire, as evaluated in the FEIS, is no longer considered as a reasonably foreseeable event.

   Past operational experience indicates that during approximately 1.8 million container years of operations (approximately 180,000 containers in storage over 10 years of operation) with TRU-type waste similar to that to be handled at the WIPP, there has been only one recorded instance of a container fire. Circumstances contributing to this fire included the drum being painted black, exposure to direct sunlight, and improper packaging of a material. At the WIPP, the containers would not be exposed to direct sunlight, would be vented, and would be certified to WAC (DOE, 1989e) requirements. Because of these reasons--the low historic probability of a spontaneous ignition and the limited time that waste would spend aboveground--an accident involving a fire in the waste handling building is not considered a reasonably foreseeable event.

Spontaneous ignition within a drum is postulated to occur following emplacement in the disposal area. Because the waste would be in the underground disposal rooms the majority of the time and sprinkler systems do not exist underground, an underground fire is evaluated in the SEIS. Based on past history of waste stored at DOE facilities and the study documented in DOE/WIPP 87-005 (WEC, 1987a), if a fire occurs within a drum in an array, it is not expected to propagate to adjacent waste containers. Based on fault-tree analyses of the probabilities of conditions necessary to propagate a fire in a drum of TRU waste, it was concluded that it is extremely unlikely that sufficient oxygen exists within a waste container to sustain a fire for a period of time necessary to heat adjacent containers to ignition temperatures. Because of WIPP WAC limits on pyrophorics and container specifications, and waste handling equipment and techniques at the WIPP, the probability of a container breach at the same time as a fire was also considered to be unlikely and therefore external oxygen sources would likely not be available in the event of spontaneous ignition in a drum of waste.

2. Short-term (acute) exposures are distinguished in the risk assessment from continuous, routine exposures. Accidents are evaluated as short-term (acute) exposures. Accidents involving mechanical malfunctions are considered as nonroutine, short-term events.

   The waste and containers received at the WIPP are certified according to the WAC. Upon receipt at the WIPP the containers are again inspected to insure their integrity. Chronic continuous exposures from the routine handling of waste at the facility are also included in the risk assessment.

3. Assumptions used in assessing the risks associated with accident scenarios at the WIPP are conservative and expected to bound potential exposures. Based on the form of hazardous chemicals in the waste, it is assumed that the quantity of VOCs in the void volume of a drum is released when a drum opens. This scenario conservatively assumes that not only is the drum opened but that all the inner bags are breached. Particulate releases of lead are assumed from vaporization during a fire underground. The removal rate of particulates is based on deposition in the underground drifts as the particulates cool (Appendix F).

4. The duration of the exposures in accidents C2 through C6 are based on the air flow in the waste handling building or underground, and the time it takes the contaminant cloud to pass the location of the hypothetically exposed individual. In the accident scenarios, above ground workers in the waste handling building are exposed to chemicals for one minute while underground workers in a drift are exposed to chemicals for 15 seconds. For accident C10, it is conservatively assumed that the individual is exposed for 30 minutes to the maximum predicted air concentration from the Industrial Source Complex short-term model.

5. No credit is taken for HEPA filtration during the accident scenarios at the WIPP (Subsection 5.2.3.4). The statement concerning HEPA filtration on page 5-61 of the draft SEIS is removed in the final SEIS.

6. The footnotes on Tables 5.42 and 5.45 reporting the grams of material released, the estimated intakes, and hazard indices are revised for clarity. A more detailed discussion of the calculations of intake and risk is provided in Appendices G.9 and G.10.

7.13-25 **Comment**

A commenter asked where the scientific evidence is to support an assumption that gases flow at a constant rate through the carbon composite filter. It was stated that Appendix F does not justify such an assumption.

7.13-25 **Response**

The assumption that volatile organic compounds (VOCs) flow at a constant rate through the carbon composite filters on the containers of TRU waste is used in the chemical risk assessment to evaluate potential exposures during the routine operations at the WIPP. This is a very conservative assumption. In reality, the rate of flow of gas through the filters will decrease as the concentration of chemicals decreases over time. Actual measurement of the diffusion of VOCs through these filters indicate that the rate is approximately five orders of magnitude slower than those calculated in the SEIS (DOE, 1989f). This means that the potential exposures to VOCs during routine operations is probably much less than the already low concentrations indicated in the SEIS. A discussion of this assumption is provided in Subsection 5.2.4. Appendix F provides a description of the postulated accident scenarios at the WIPP. During these scenarios it is assumed that the total quantity of VOCs in the void volume of breached containers is released. Because the containers are breached, no credit is taken for the filter during accident scenarios.

7.13-26 **Comment**

The State of Idaho commented that the statement on page 5-9 of the draft SEIS that measurable exposure to the public or adverse effects on the environment would not be expected during routine operations at the Radioactive Waste Management Complex (RWMC) should be supported by a risk assessment. The risk assessment provided only addresses radiological exposure, not hazardous chemical exposure.

7.13-26 **Response**

By definition, risk is a quantitative or qualitative expression of possible harm that considers both the probability that harm would occur and the consequences of that event. For routine operations at the RWMC, radiation dose rates to the public are negligible and beyond the measuring capabilities of current state-of-the-art instrumentation. Occupational radiation exposure is generally very low and is consistent with the "as low as reasonably achievable" philosophy. Using radiation risk assessment methods endorsed by the National Academy of Sciences and International Commission on Radiation Protection, risks at such low doses rates would be very small.

Because of high-integrity packaging and small quantities of hazardous constituents in the waste, exposures to hazardous chemicals associated with routine operations would be very low. Breached containers and subsequent chemical and/or radiological releases are analyzed in the Radioactive Waste Management Complex Safety Analysis Report (Passmore, 1986).

7.13-27 **Comment**

The State of Idaho commented that adequate measures need to be taken to ensure that water quality is protected from TRU waste, mixed waste, organics, and metals at the RWMC. Contamination may result from long-term storage, retrieval, packaging, and transportation.

7.13-27 **Response**

Proper containment of radioactive waste, including mixed waste, is a primary method for assuring protection of human health and the environment. As indicated in Subsection 5.2.1.1 and Appendix P, only solid TRU waste containing only residual quantities of liquid is received for storage at the RWMC. The WAC are used to control the type of waste received, identify restrictions, and establish packaging requirements. DOT specification containers are used as the external container. The waste material is contained in multiple layers of plastic packaging. The waste is stored in a weather-protected manner. Controlling the type of waste received and the method of packaging, and providing weather-protected storage ensures that negligible impacts would occur during operations at the RWMC.

7.13-28 **Comment**

The State of Idaho commented that a distinction between routine releases (which are not expected to occur) and normal releases appears to have been made in the draft SEIS. They stated that this information, along with the fact that liquids are routinely encountered during WIPP processing (page 5-13), raises concern about "routine" and "normal" operations.

7.13-28 **Response**

There is no intention to distinguish between "routine" releases and "normal" releases. For consistency, the word "normal" has been changed to "routine" throughout Subsection 5.2.1. It should also be noted that any unintended release of container contents, whether they be radionuclides, hazardous chemicals, or both, are not considered normal releases. These incidents are considered abnormal events and are analyzed in the Radioactive Waste Management Complex Safety Analysis Report (Passmore, 1986).

The WIPP Waste Acceptance Criteria specify that waste containers may contain only residual quantities of liquid. Residual liquids are double contained, as determined by radiographic examination. This containment may be provided by the waste container, 90-mil rigid liner, plastic bags, bottles, etc. A limited volume of the stored TRU waste previously examined exceeded the residual liquid limit. This waste is segregated and stored for future processing. Due to the container integrity and small volumes of liquids encountered, liquids do not pose a problem during storage and routine operations.

7.13-29 **Comment**

The EEG commented that the emission rate reported for 1,1,1-trichloroethane in Table 5.28, Page 5-67 was inconsistent with the other values that were calculated using the square root of the molecular weight ratios. It was noted that the values in Table 5.31 were calculated using a value of 1.7×10^{-7} as was reported in the 1988 draft FSAR (DOE, 1988b).

7.13-29 **Response**

The value for the emission rate for 1,1,1-trichloroethane in Table 5.28 (now Table 5.35) is a typographical error and has been corrected. As noted, the correct value of 1.7×10^{-7} gram per second was actually used to calculate the air concentrations in Table 5.31 (now Table 5.38).

7.13.1 RISK ASSESSMENT METHODOLOGY

7.13.1-1 **Comment**

Reviewers stated that the draft SEIS underestimates the potential exposures to radionuclides and hazardous chemicals. It was stated that the assumptions used in the draft SEIS are not conservative.

7.13.1-1 **Response**

The assumptions used in the risk assessment for releases of hazardous chemicals and radionuclides during routine operations, accident scenarios, and long-term performance are conservative and the DOE expects them to bound any risks associated with activities of transport, handling, and long-term disposal of TRU waste at the WIPP. A discussion of the conservative assumptions used in the risk assessment are provided in Subsections 5.2.2, 5.2.3, and 5.2.4. Subsection 7.3, responses to comments, provides additional information on the risk assessment of transportation of TRU waste.

7.13.1-2 **Comment**

Reviewers commented that low levels of chemical exposures should not be considered as not harmful to human health. It was also commented that if an "acceptable level" is set at the no detection level (i.e., not necessarily zero) there is no mechanism to readjust this standard with newer, more sensitive analytical techniques in the future.

7.13.1-2 **Response**

The SEIS uses various reference levels to aid the public and decisionmakers in judging the likelihood and significance of effects from exposures to potentially harmful substances.

A threshold level (i.e., a level below which there are no adverse affects) is well documented within toxicology and is widely accepted in the scientific community. The EPA and other health protection organizations estimate the threshold level for noncarcinogens from scientific literature and apply safety factors appropriate to various applications. For carcinogens they extrapolate the dose-response for experimental studies at relatively high exposures to estimate the generally small risk associated with a small exposure. Using that methodology, risk managers can then determine the exposure limits necessary to implement "acceptable risk levels" of one in a hundred, one in ten thousand, one in a million, or one in ten million.

The point is valid concerning standards that are set at technology based levels (i.e., no detection limits); however, if "acceptable levels" are determined based on potential risk, then this point is not valid. Any level determination, whether it is technology or risk based, needs to be updated on a periodic basis as new and more extensive information becomes available.

7.13.1-3 **Comment**

One reviewer of the draft SEIS asked why the DOE used outdated data when considering the health and safety issues of managing radioactive waste at the WIPP.

7.13.1-3 **Response**

The DOE uses the best available information, on the types and volumes of TRU waste, in the risk assessments for potential exposures to radioactive and chemical components of the waste. The analyses in the SEIS adequately describe the foreseeable impacts associated with the transport and management of TRU waste destined for the WIPP.

7.13.1-4 **Comment**

The EPA commented that the expression of calculations, to two significant figures, throughout the draft SEIS indicates a degree of confidence that may not be accurate, considering the uncertainty associated with exposure and risk estimates. Officials of the State of Washington also commented that the number of significant figures in Table

3.1 regarding estimated waste volumes, gives a false sense of certainty. They stated that this uncertainty should be clearly addressed in the SEIS. They also stated that the more current estimated volumes, as reported in the 1988 Integrated Data Base, should be reported in the final SEIS.

7.13.1-4 **Response**

Exposure and risk estimates are reported to two significant figures in order to show any difference between evaluated scenarios and individual constituents. Two significant figures are not intended to indicate the degree of certainty in the analyses. The text provides a discussion of the uncertainties associated with the risk assessments. Because of the difficulties in projecting future TRU waste generation rates over 25 years and the potential need for processing of older waste, the DOE acknowledges that there is uncertainty in the estimated volume of TRU waste to be sent to the WIPP.

The volumes of waste used for the transportation and operational risk assessments are scaled upward, so that the total volume is equal to the capacity of the WIPP (e.g., 6.2 million cubic feet of CH TRU waste and 250,000 cubic feet of RH TRU waste), in order to provide a bounding case analysis. The volumes in Table 3.1 are reported as they are presented in the 1987 Integrated Data Base and are not intended to indicate a degree of certainty in the volumes of waste. Using the 1987 Integrated Data Base (DOE, 1987b) is considered conservative, since the total volume estimates have decreased in later versions of the database (DOE, 1988g). Because the volumes, for each facility reported in the 1987 Integrated Data Base are proportionally increased to the total capacity of the WIPP, the DOE does not believe it is necessary to rerun the analyses based on the 1988 Integrated Data Base.

7.13.1-5 **Comment**

Officials of the EPA commented that on page 5-63 of the draft SEIS, it states that the average void volume of 172 drums sampled from the Idaho National Engineering Laboratory was reported to be greater than 50 percent. They asked how the DOE justifies a 20 percent void volume, in earlier calculations, in the number of shipments of waste. They asked what the significance of this discrepancy is, relative to gas generation modeling and related studies.

7.13.1-5 **Response**

In the draft SEIS, 6.2 million cubic feet (i.e., the design capacity for CH TRU waste at the WIPP) was assumed to be volume of waste, and an additional fullness factor of a 20 percent was included for conservatism. The result was to overestimate the total number of shipments from each facility. Because of comments received from the EEG and others, the 20 percent fullness factor has been taken out of the final SEIS. The 20 percent used in the draft SEIS was related to the total volume of waste and did not refer to the void volume (airspace) in the drums.

The actual void volume in the drums varies, depending on the waste form, with sludges having less void volume than combustible waste. Gas generation is dependent on the waste type, because the processes that influence the amount of gas generation include radiolysis, corrosion of metal, and biodegradation. The importance of these various processes have been proposed for study in experiments to be conducted during the Test Phase.

7.13.1-6 **Comment**

A commenter stated that the failure to consider different pH levels is disturbing, given the widely known fact that lead increases its solubility in a low pH environment. It was stated that a similar flaw in the radiation pathway analysis would result in significantly underestimating radiation exposure.

7.13.1-6 **Response**

The pH used in the SEIS is based on actual measurements of pH valves in the Culebra Aquifer (Randall et al., 1988) that range from approximately 7 to 8. The Culebra groundwater is a carbonate system that has a high buffering capacity (i.e., is not readily subject to change in pH levels). The use of a pH between 7 and 8 to estimate the solubility of contaminants in the Culebra is considered reasonable.

7.13.1-7 **Comment**

A commenter questioned the DOE radiation protection standards used in the draft SEIS which assume a linear relationship between radiation doses and risk. The commenter asserted that this assumption is unreasonably optimistic by a factor of 1,000. According to the commenter, the relationship between doses and risks is superlinear at low doses, meaning that radiation causes proportionately more damage at low doses and dose rates, than at high doses and dose rates. The commenter said that this failure to include this low dose/dose rate effect in the preparation of past radiation protection standards invalidates the health assessments performed in the draft SEIS.

The commenter further stated that the explanation for this phenomenon was discovered by Dr. Abram Petkau, who found that free radicals produced by radiation are extremely effective in attacking cell membranes. Dr. Petkau's work suggests that this attack is more effective at low dose rates because radicals are less likely to recombine before doing damage to cells, and that radiation-induced radicals can damage cell membranes, particularly those of the immune system, and cause an increased incidence of all diseases, not just cancer.

Finally, the commenter added that radiation protection standards are currently under review, including the consideration of the low dose/dose rate effect, and that because this review will not be completed before the WIPP becomes operational, the DOE should postpone accepting waste at the WIPP until this issue is resolved.

7.13.1-7 **Response**

The commenter's hypothesis regarding the relationship between low doses of radiation and health effects was reviewed in Appendix B to Chapter V of the BEIR-III report (NAS, 1980). This review did not support the commenter's conclusions, but indicated that more research was needed in the area of radiation-induced radical interaction with cell membranes.

Much of Dr. Petkau's research was conducted on artificial membrane systems. Since the BEIR-III report was issued, research has concentrated on investigating the behavior of radiation-induced radicals in living organisms. This research indicates that cells have mechanisms to counteract the effect of free radicals (i.e., chemicals such as Vitamin E), which prevent the radicals from damaging membranes. These mechanisms are present in cells which have the capability to repair themselves, so the effects of radiation on these cells are due to causes other than membrane damage.

However, there are some cells, including some immune system cells, which do not have the ability to repair themselves. Since the immune system plays such a vital role in the body, the United Nations Scientific Committee on the Effects of Atomic Radiation studied the effects of radiation on the immune response in 1972 (UNSCEAR, 1972). The study concluded that "the immune system has large built-in safety factors that allow it to withstand and recover from substantial injury by radiation." The committee reviewed its conclusions in 1988 and found that they were still valid (UNSCEAR, 1988).

As discussed by the commenter, protective mechanisms evolved in living cells to protect them from the effects of naturally occurring radiation. Exposure to radiation or radioactivity as a result of WIPP operations would be extremely small in comparison with naturally-occurring radiation, and well within its normal variation. Immune system protective measures which can counteract the effects of background radiation should be equally effective in mitigating the negligible increase caused by WIPP operations.

In December, 1989, the National Research Council's Committee on the Biological Effects of Ionizing Radiation, published a report (BEIR V) on the health effects of exposure to low levels of ionizing radiation (BEIR, 1989), as discussed in Appendix N. This report states for all forms of cancer except leukemia there is not any departure from linearity for the dose response below 400 rem. For leukemia, the dose response is linear-quadratic; however, the report goes on to say that the quadratic contribution vanishes at low doses, leaving only the linear term. The report also states that its risk estimates become more uncertain when applied to very low doses and that the risk estimate could increase or decrease. The report recommends continued research on the effect of very low doses for both low and high LET radiation. The linear dose response assumption used in the SEIS is consistent with the information and approach in the current report of the National Research Council.

Radiation protection standards are always under review because the state of knowledge is continually evolving. However, the DOE believes the SEIS provides an adequate basis for choosing among the analyzed alternatives.

See also the response to comment 7.14-10.

7.13.1-8 **Comment**

A commenter wanted to know the human health and environmental risks associated with exposure to plutonium.

7.13.1-8 **Response**

The waste which the WIPP will receive is described in Appendix B. Considerable data concerning the risks associated with plutonium have been added to Section 5 and Appendices F and N. The reader is also referred to the UNSCEAR, BEIR III, and BEIR IV reports identified in those sections of the SEIS. Also see responses to comments 7.3.5.2-2 and 7.14-10.

7.13.1-9 **Comment**

The EEG and the EPA requested clarification of certain detailed assumptions regarding the radiological modeling for routine emissions and postulated accident scenarios including stack effluent modeling, dispersion modeling, terrestrial modeling, dose modeling, and meteorological data.

7.13.1-9 **Response**

Additional information has been provided in Appendix F.1 to clarify certain assumptions used in the radiological assessment. Assumptions regarding pathways to people other than the inhalation pathway were not modified in response to these comments. In general, the calculated dose consequences are insensitive to assumptions that affect the ingestion pathway. For example, precipitation, which has been based upon average yearly rainfall for the purpose of accounting for wet scavaging, can be increased or reduced by a factor of 10 without affecting the total calculated dose from all pathways combined (at least to three significant figures). Similarly, the buildup time for radionuclides in the environment, which was based on 12.5 years, can be varied from 1 to 50 years with no discernible effect on total dose to people. These examples confirm the dominance of the inhalation pathway in dose assessments for the radionuclides present in TRU waste.

This final SEIS has modified the stack effluent modeling section of Appendix F to more accurately account for effective stack height by only using the vertical component of Rupp's equation. The dispersion calculations presented in Appendix F use this updated information. Table F.5 documents the stack related input information. Since the effective stack height is not an input parameter, the values for the waste handling building and the storage exhaust filter building have not been added to the table. For information purposes, the effective stack heights have been back-calculated. They are about

- 32 m for the waste handling building

- 24 m for the storage exhaust filter building.

7.13.1-10 **Comment**

Several commenters said that the DOE's figures underestimate the risk of low-level radiation exposure by a factor of 1,000 or more. Dr. J.M. Gould (Gould, 1986) has determined, based on studies of fallout from the Chernobyl accident, that deleterious effects from radiation exposure can be detected at low levels. These effects occur immediately upon exposure and cannot be explained by chance alone. The commenters suggested that these effects should be used in setting the radiation protection standards rather than extrapolations of effects at much higher doses. Furthermore, the commenters said that since the EPA is in the process of reviewing radiation protection standards, the WIPP should not be allowed to operate until this review is completed.

7.13.1-10 **Response**

Radiation health effects have received considerable study. Reviews on this subject are periodically issued by a number of scientific organizations, including the following:

- The International Commission on Radiological Protection (ICRP)

- The National Academy of Science's Committee on the Biological Effects of Ionizing Radiation (BEIR)

- The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR).

These reviews have reported a number of specific health effects caused by radiation such as genetic damage, fetal and neonatal injury, and cancer incidence.

Other health effects have also been investigated. For example, experiments with animals have found that radiation has a life-shortening effect. On that subject, the 1988 UNSCEAR report stated:

> A very large body of evidence in experimental animals allowed the Report to conclude that at low to intermediate doses and dose rates, life shortening is essentially due to the induction of malignancies at a rate above the natural rate for the species investigated. This conclusion applies to experimental animals and, as far as could be judged from the limited human experience, also to man.

The same report reviewed the effects of radiation on immune system response. It affirmed an earlier conclusion that "the immune system has large built-in safety factors that allow it to withstand and recover from substantial injury from radiation." To calculate the potential effects of routine operations and postulated accidents, this SEIS has used values for radiation risk which are consistent with the reviews discussed above. These values provide a quantitative estimate of the effects of WIPP operations.

This conclusion is also supported by the data published in the December, 1986, Council on Economic Priorities Newsletter. In this newsletter Dr. Gould presents a case for excess mortality due to low-level radiation (Gould, 1986). In Table 6 of this article, infant, fetal, and cancer mortality rates are shown for counties which contain commercial nuclear power plants. The table compares the reported mortality rates in these counties against expected mortality rates, which are calculated using counties which do not have such facilities. DOE has concluded that data published in the table show that the difference between the two sets of mortality rates is not statistically significant.

Also see response to comment 7.13.1-7.

7.13.1-11 **Comment**

The EEG and the EPA identified several errors and discrepancies in Subsection 5.2.3.

7.13.1-11 **Response**

Discrepancies between text and tables and errors in the text itself have been resolved. The most significant of these required a recalculation of the routine releases from the WIPP resulting in a reduction of the radiological impacts from routine WIPP operations. This was a result of the decoupling of the source term for routine operations from the radioactivity available for release in the original analysis.

7.13.1-12 **Comment**

A commenter asked what are the differences in the level of characterization of the hazardous chemical and radiological source terms that require the use of different risk assessment methodologies.

7.13.1-12 **Response**

Because of differences in the nature of the exposure pathways and the dose-effect relationships between chemicals versus radionuclides, different methodologies are used to evaluate the potential exposures and risks. For example, as explained in Subsection 5.2.2 of this SEIS, radiation exposure rates at the surface of containers are used to estimate radiation dose equivalents to a population during routine transport. No such exposure mechanism exists for hazardous chemicals.

7.13.2 **ROUTINE EXPOSURES**

7.13.2-1 **Comment**

Several commenters stated that the final SEIS should assess the effects of failure of the WIPP waste handling building filtration system to operate at an efficiency rate of 99.9999 percent during routine operations and following postulated accidents.

7.13.2-1 **Response**

The high efficiency particulate air (HEPA) filter systems in the WIPP's waste handling building ventilation exhaust have a key role in confining the spread of radioactivity. Each system is made up of three filters: a roughing filter to capture the bulk of airborne particulates, and two HEPA filters in series. Each HEPA filter is designed to remove a minimum of 99.97 percent of the incoming particulates, and tested against a 99.95 percent efficiency standard. In keeping with practice at other DOE facilities, each HEPA filter is assumed to remove 99.9 percent of the particulates entering the filter, for a combined system efficiency of 99.9999 percent. No credit is given to the efficiency of the roughing filter.

To ensure that the systems are operating properly, a number of redundant and diverse methods are used to monitor the system's performance continuously:

1. The differential pressure across all three filters would be monitored to test for either plugging or filter breach.

2. The radioactivity in the exhaust flow downstream of the filters would be monitored for any increase in the amount of radioactivity being released. These monitors are designed in accordance with American National Standards Institute (ANSI) Standard N42.18-1980, "Specification and Performance of Onsite Instrumentation for Continuous Monitoring of Radioactivity in Effluents" (formerly ANSI N13.10-1974).

3. The status of the fan serving the system would be monitored to ensure that it is operating properly.

4. The static pressure in the rooms served by the systems would be monitored to ensure that the systems are maintaining a slight vacuum in comparison to atmospheric pressure.

The output of these monitoring systems would be continuously transmitted to a central monitoring room. In the event that the filter systems are not performing to specification, alarms would sound at both the filter system location and the central monitoring room.

In addition to continuous monitoring, the filters themselves would be tested for performance using two other ANSI standards:

ANSI 101.1-1978 "Efficiency Testing of Air Cleaning Systems Containing Devices for Removal of Particulates"

ANSI N510-1975 "Standard for Testing of Nuclear Air Cleaning Systems."

These tests would be performed at least annually and immediately following any maintenance or filter changes to demonstrate at least 99.95 percent removal efficiency per filter. As with the alarms discussed above, failure of these tests would result in filter replacement.

The combination of properly designed filters, continuous monitoring of their performance, and periodic in-place testing is the basis for the assumption that these filters will reduce routine emissions and that they will mitigate the impact of any accident. This assumption is also supported by the WIPP Safety Analysis Report (DOE, 1988b) Failure Modes and Effects Analysis, which confirms that the design is adequate. No accidents that could cause a failure of a waste container and a simultaneous failure of the HEPA filtration system have been identified.

Another major filtering system at the WIPP is the subsurface facilities ventilation system. However, in contrast to the waste handling building filter systems, this system is normally in a standby mode. If working area monitors or effluent monitors serving the WIPP's underground operations detect higher-than-normal levels of radioactivity, or if activated by an operator, the subsurface facilities ventilation system would be placed into service. Since it must rely on proper functioning of the effluent monitors or operator intervention, the subsurface facilities ventilation system can not be assumed to be as reliable as the on-line systems serving the waste handling building. For these reasons and to be conservative, routine operational and accident analyses which evaluate releases from the WIPP's underground facilities do not take credit for the storage exhaust filters.

Also see the response to comment 7.12.2-3.

7.13.2-2 <u>Comment</u>

Several commenters asked what EPA regulations establish the dose limits to the public and, specifically, the doses to persons of the (James) Mills Ranch. The EEG offered a suggestion regarding the location of the "maximum individual," a term used to describe a theoretical situation in which a fictional individual is given the maximum dose of hazardous air pollutants. The EEG suggested that the maximum individual be located as close to the WIPP site as any real person could live.

7.13.2-2 <u>Response</u>

The regulation referred to in Subsection 5.2.3.3 of the draft SEIS is EPA's national emission standards for radionuclide emissions from DOE facilities (40 CFR, Part 61). The final SEIS assesses routine operational doses to a hypothetical individual living at the site boundary at the point of maximum concentration, based on an assessment of annual average meteorological data, instead of at Mills Ranch.

7.13.3 **ACCIDENTAL RELEASES**

7.13.3-1 **Comment**

Many commenters asserted that the draft SEIS did not consider human error as a contributing factor to accidents, or associated risks of exposure, during waste-handling operations at the WIPP.

7.13.3-1 **Response**

Human error has been considered in the accident analysis of WIPP operations, and it is the primary initiator of the accident scenarios postulated to occur during waste handling at the facility.

Once the waste reaches the WIPP, handling operations will generally involve 1) inspecting the shipping packages; 2) offloading and moving the shipping packages to their proper handling locations; 3) unloading, inspecting, and surveying the waste containers; 4) assembling waste containers for transport to the underground storage area; and 5) emplacing the waste containers in their selected underground storage location. In analyzing these operations, a total of 17 potential accident scenarios were postulated, 11 of which could be initiated by either human error or mechanical failure. The worker-initiated accident scenarios, described in Appendix F.3, include various collisions of forklift equipment with CH waste drums and boxes resulting in punctures and spills, accidental dropping of containers during handling operations, and for RH waste, crane operator errors resulting in waste canisters being dropped. These scenarios, along with those associated with equipment failure, spontaneous fire, and adverse natural phenomena, were considered in establishing the human factors and safety-related design requirements for the WIPP.

Where design features could not be incorporated to preclude an accident, mitigative measures such as high-efficiency particulate air (HEPA) filters on the WIPP ventilation exhaust were introduced to reduce the effects on the environment. Such equipment would be continuously monitored to ensure that it is operating properly. With these design features, the predicted doses resulting from these accident scenarios were analyzed. The results show that the risks to off-site populations are not significant. For more information on the predicted consequences, see Subsections 5.2.3.4 and 5.2.3.5.

Administrative controls, operational contingency plans, and worker training are also being used to minimize the potential for and consequences of accidents caused by human error. Worker training measures will teach workers how to mitigate the consequences of an accident, should one occur. However, in all accident scenarios, workers are assumed to do nothing to mitigate the consequences of accidents and are assumed to remain at their work stations indefinitely. As discussed in Section 6.0, additional mitigative measures have been identified which would reduce the potential risk to workers in the event of an accident.

7.13.3-2 **Comment**

Many commenters, including the EPA and the EEG, commented that the WIPP operational accident scenarios are not conservative in terms of the number of drums affected, release fractions, or assumed drum radioactivity content. The EPA also asked if resuspension was considered for the underground scenarios.

7.13.3-2 **Response**

The descriptions of the drum handling accident scenarios presented in Appendix F.3 have been clarified to more accurately portray the equipment to be used at the WIPP, and how it might contribute to an accident. A range of accident scenarios has been assessed to encompass relatively more likely, lower impact events, as well as less likely, higher impact events. Release fractions under these accident scenarios reflect the physical form of the waste allowed under the WIPP Waste Acceptance Criteria, the packaging of waste in containers designed to meet DOT requirements, and the drum failure mode. The release fraction and depletion fraction used in the analyses were obtained from Mishima (1973). No revision to these release fractions is warranted.

Underground accident scenarios were modeled similar to those postulated to occur within the waste handling building. One area of difference is the treatment of depletion within the underground. Particulates were assumed to be depleted from the initial source by agglomeration with salt particles and impact with the rough surfaces of the mined areas. Eighty percent of these particles were assumed to be resuspended and released to the environment. This 20 percent depletion fraction is considered to be conservative and is discussed in Appendix F.3.1.

In response to numerous comments regarding the selection of a drum's average radioactivity content for most accident scenarios, additional analyses have been conducted in order to consider the impacts of a drum containing the maximum allowable radioactive content. The results are documented in Appendix F.3 and in Subsection 5.2.3. Since the limiting credible accident for off-site exposure was previously based upon the maximum radioactive content of a drum, no increase in the maximum off-site impact is predicted. Dose impacts to workers are similar to those previously reported for the postulated accident scenarios. The mandatory use of worker respiratory protection, under certain operating conditions, would result in reducing worker exposure to low levels, even for extremely low probability accident scenarios.

7.13.3-3 **Comment**

A commenter stated that consideration should be given to accidents caused by natural phenomena, or to damage of the WIPP as a result of enemy attack. The commenter felt that the WIPP could be a target of enemy attack because, as asserted, the WIPP is a facility for the storage of nuclear bombs.

7.13.3-3 **Response**

All WIPP facilities essential for the safe handling of radioactive waste are designed to withstand the effects of natural phenomena as discussed in the FEIS, Subsection 9.5.3. These previous discussions remain valid and are not altered by modifications addressed in this SEIS.

The WIPP is intended to serve as a research and development facility to demonstrate the safe disposal of post-1970 defense TRU waste only. The WIPP is neither authorized nor intended for the disposal or storage of nuclear weapons.

7.13.3-4 **Comment**

Several commenters expressed confusion between the draft SEIS statement that "most accidents during WIPP's operating lifetime would not result in releases of radioactive material" and the draft SEIS presentation of routine releases of radioactivity during normal operations. Other commenters suggested that routine exposures exceeded those under accident conditions.

7.13.3-4 **Response**

The apparent confusion is a result of the assessment of both routine- and accident-related emissions from the WIPP. As presented in Subsection 5.2.3 of the final SEIS, airborne releases of radioactive particulates are anticipated during routine waste-handling operations. These are expected to be associated with the release of the surface contamination present on waste packages, as allowed under the WIPP Waste Acceptance Criteria and DOT regulations. The routine emissions also include a contribution from the contents of waste packages assumed to arrive at the WIPP in a damaged condition. The SEIS also considers the possibility of accidents during waste-handling operations at the WIPP. The accident analysis postulates a range of accident scenarios, the most likely of which are not sufficiently severe to result in an accident-related release of radioactive material.

Additional confusion about the risk to workers from routine operations and postulated accident conditions resulted from misinterpretation of the analysis results. Routine exposures to population groups are collective results and should not be directly compared to individual exposures that may result from postulated accidents.

7.13.3-5 **Comment**

The EEG requested an assessment of the consequences of a catastrophic failure of the WIPP waste hoist.

7.13.3-5 **Response**

The DOE maintains the position that a scenario involving the catastrophic failure of the waste hoist vehicle and subsequent significant release of radioactive materials is not a reasonably foreseeable event. Furthermore, this scenario is a noncredible event, based upon the guidelines in DOE Order 6430.1A (DOE, 1988h) which provide that events with an annual probability of less than one in one million be excluded from the design basis of a facility. Therefore, the design and operational plans for the WIPP do not consider the implications of this accident scenario. In response to the EEG's request that such an event be assessed, this hoist vehicle accident is evaluated in Appendix F and Subsection 5.2.3.

A second accident involving a single RH TRU waste canister under a similar scenario was also considered but not evaluated. Operational constraints limit the payload of the hoist to a single RH TRU canister. The steel canister is also contained within a thick-walled facility cask while on the hoist. As such, both the total transuranic activity and the likely release fraction from a hoist drop scenario involving RH TRU waste are less than that evaluated for CH TRU waste.

These accidents have an exceedingly low probability of occurrence. Based upon an assessment of statistical data, the probability of a catastrophic hoist failure is estimated to be 1.7×10^{-8} per year, or about one event in every 60 million years of operation. However, the likelihood that the hoist accident would have significant consequences is even smaller. This is because the estimated consequences of an accident are also dependent upon the complete scenario or sequence of events which fully describe the accident. For the hoist drop accident, assumptions must be made concerning at least the following details:

- whether the hoist has waste on the conveyance at the time of the accident
- the size of the radioactive payload
- the fraction of the radioactive material which is respirable
- the percent of the radioactivity released in the accident
- the percent of the radioactivity which plates out or deposits on surfaces of the mine and shaft during its passage to the atmosphere
- whether the HEPA filtration system is activated
- the meteorological conditions including wind speed, direction, and atmospheric stability class (relates to dispersion and mixing of materials in the air), and
- the location of the individual receiving the exposure.

The specific assumptions used in the analyses are critical in estimating the severity of the accident consequences. The complete scenario can use assumptions ranging from very conservative to "normal". In general, the more conservative the assumptions, the more severe the estimated consequences and the less likely the scenario is to occur.

As shown in Appendix F.3, the estimate of dose to the hypothetical maximally exposed individual in the extreme of a hoist drop could range from 190 rem using very conservative assumptions to less than 7 millirem using more likely or "normal" assumptions. The likelihood of these scenarios is estimated to range from an annual probability of about 4×10^{-17} for the 190 rem to about 7×10^{-10} for the 7 millirem exposure.

7.13.4 <u>HUMAN HEALTH AND ENVIRONMENTAL IMPACTS</u>

7.13.4-1 <u>Comment</u>

One reviewer commented that the DOE needs to put the estimated impacts into a perspective which can be appreciated by the general public. It was stated that the risks to the public and workers, even under postulated accident conditions, are small, and that this point needs to be emphasized. At the same time, reviewers questioned the estimates of excess cancer risk from exposure to hazardous chemicals.

7.13.4-1 <u>Response</u>

The estimated levels of incremental risk associated with the WIPP can be placed into perspective by considering the background levels of cancer present in our society. For known or potential carcinogens, risks are estimated as probabilities. Cancer, in all its forms, is a prevalent disease; approximately 28 percent of the population is affected by some form of cancer during their lifetimes. Approximately 64 percent of these cases result in death directly attributable to the disease within 5 years of diagnosis (American Cancer Society, 1988). Thus, in a population of one million persons, roughly 280,000 persons are likely to contract cancer. Excess cancer risk is expressed in terms of additional cancers that might be anticipated as a result of specific exposure to a carcinogen in drinking water, food, or air. Therefore, a 1×10^{-6} incremental cancer risk implies that an additional person in one millon is likely to contract some form of cancer. In real terms, it means that 280,001 per million may be affected by cancer, compared to 280,000 per million.

Readers may compare WIPP related risk estimates in Section 5 of the SEIS to these statistics.

7.13.4-2 <u>Comment</u>

Commenters asked why the draft WIPP SEIS did not discuss routine radiation exposure to workers, or adequately assess worker exposure in the event of an accident. Also, officials of the EPA asked if the DOE complies with Federal radiation guidelines on occupational exposure and suggested that doses be expressed as committed effective dose equivalents.

7.13.4-2 **Response**

The occupational exposures are discussed in Subsection 5.2.3.3 for routine operations. Cumulative doses are shown in Table 5.24. The doses include those received during the Test Phase. The maximum individual dose to a worker is expected to be no more than 1 rem per year.

Accidental releases are discussed in Subsection 5.2.3.4. These releases are based on the accident scenarios discussed in Appendix F. The resultant dose equivalents to workers are shown in Table 5.28. The assumption previously made that workers would respond as trained and immediately evacuate the scene of the accident, has been modified. The final SEIS now calculates worker doses based on the assumption that they would remain at the scene indefinitely. Credit is taken for the mandatory use of respiratory protection by workers when handling waste containers having greater than 100 PE-Ci.

The WIPP would be operated in strict conformance with DOE Order 5480.11 (DOE, 1988i), "Radiation Protection for Occupational Workers." This Order complies with the latest guidance on what constitutes an acceptable radiation protection program. Included in the Order are provisions for worker training, limits on radiation exposure, monitoring of the workplace and the worker (internal and external dosimetry), and control of contamination. The WIPP radiation protection program, designed to meet the requirements of the Order, is described in report WP 12-5, "WIPP Radiation Safety Manual" (WEC, 1988a).

All radiological analyses conducted for this SEIS are based upon the latest guidance of the International Commission on Radiological Protection (ICRP), including expressing doses as committed effective dose equivalents. Analytical results reproduced from other reports and presented in this final SEIS were quoted verbatim. These analyses were based upon the guidance available at the time of their preparation and thus, may not reflect the latest available ICRP guidance.

7.14 LONG-TERM REPOSITORY PERFORMANCE

7.14-1 **Comment**

A number of individuals commented that brine inflow from the Salado Formation into the waste disposal rooms could affect repository integrity. Especially troubling to them was that "independent scientists have revealed that water is seeping into the WIPP." They commented that brine coming in contact with waste and waste containers will corrode them and could act as a transport medium for the waste.

7.14-1 **Response**

The "independent scientists" are the Scientists Review Panel who, in 1988, using information from the DOE, commented on a higher rate of brine inflow than had been expected in the 1980 FEIS.

At the time of the FEIS, it was assumed that the Salado Formation was hydraulically unsaturated, with the result that brine intrusion into the facility (other than very small amounts from thermally-induced migration of fluid inclusions) could occur only as a result of human intrusion, which was assumed not to occur less than 1,000 years after decommissioning. Recent experience indicates that the Salado is brine-saturated under natural conditions, although extremely low in permeability (10^{-22} to 10^{-20} square meters).

Therefore in the SEIS the DOE has assumed that:

1. Even in the absence of human intrusion, saturation of the WIPP repository occurs about 2,000 years after decommissioning (in the Case I calculations); or that

2. In response to human intrusion involving a Castile brine reservoir, saturation of the WIPP repository could occur as soon as 100 years following decommissioning (in the Case II calculations), that time being when institutional control of the WIPP site is assumed to be lost.

Both the assumption of natural saturation of the WIPP after decommissioning and the assumption of human intrusion only 100 years after decommissioning are conservative with respect to the assumptions made at the time of the FEIS (i.e., they result in earlier potential release of radionuclides into the accessible environment). Research is actively examining both the mechanism and the potential timing of repository saturation in the absence of human intrusion. Saturation under undisturbed conditions may take well over 2,000 years.

7.14-2 **Comment**

Many commenters said that the release calculations, including long-term calculations, did not take into account the possibility of human error. One person also talked about the possibility of corruption within the DOE. These assertions were made in the belief that catastrophe is imminent.

7.14-2 **Response**

Human factors are the most uncertain aspect of any scenario development and analysis. In the performance analysis needed to demonstrate compliance with the proposed EPA standards for disposal of TRU waste (40 CFR 191, Subpart B) described in Appendix I.1.5, a sensitivity and uncertainty analysis will indicate those input parameters that the final integrated release calculations are most sensitive to, and the possibility of human error will be addressed by using a broad range of values for those inputs. An example of the kind of human error that could be allowed for in this way is a shaft seal that leaks because it is not installed in accordance with design.

In addition, some human factors are already implicitly included. For example, the Case II calculations assume that: 1) institutional control is completely lost at the WIPP site in only 100 years and passive markers are lost or ignored; 2) in spite of penetrating the repository, drilling continues; 3) no radioactive monitoring is used during drilling or logging the hole; and 4) no special measures are taken at any time in treating or plugging the bore hole.

7.14-3 **Comment**

Numerous commenters suggested that other scenarios be discussed. These included

Solution criticality if waste is exposed to brine
Water leakage into the site or major flooding
Mining or drill holes intercepting the site,
connecting the Bell Canyon with the repository
or creating other release pathways
Solution mining
Earthquakes
Steam or hydrogen explosion
Land subsidence
Radioactive slurry
Other accidental release

Additional comments were that the DOE has not used its imagination enough to consider real disasters.

7.14-3 **Response**

Scenarios other than those examined in the SEIS are of course possible. A Performance Assessment will be used to determine whether the WIPP would be in compliance with the EPA standards for the disposal of TRU waste (40 CFR 191, Part B). An analysis of possible scenarios has been started. So far the list consists of numerous scenarios arising from perturbations in groundwater flow, climatic changes, repository seal failure, and human intrusion. Eventually this list will be reduced to the 10 or so most severe ones. The Case II scenario was chosen to be analyzed in Subsection 5.4.2.6 because it is among the more severe scenarios possible.

Solution criticality refers to the concentration of dissolved fissile materials into a critical mass. Criticality is discussed in the FEIS on page 9-164. Fissile materials are only present in trace amounts in the waste to be sent to the WIPP. The consensus is that there is no feasible means of accumulating a critical mass in the WIPP; however, more calculations are planned.

The DOE recognizes that water is seeping into the repository. However, as discussed in Subsection 5.4.2.4, Brine Inflow, the quantity foreseeable is far short of that required to flood the repository.

There are no perennial or ephemeral streams to flood the WIPP site, and the site is several hundred feet above the Pecos River, 15 miles away.

In the long term, releases from an underground repository will likely be from geologic processes and events, e.g., transport by groundwater. The only likely actions of man that could disturb the waste buried in the WIPP would be mining or drilling into the waste. The WIPP disposal areas are 2150 feet deep, too deep for ordinary digging to reach the waste stored there. Over the long-term, drill holes into the waste are quite probable (Appendix I.1.5) and will be analyzed in the Performance Assessment. Case II treats the consequences of the case of a single hole drilled through the repository into an underlying pressurized brine reservoir.

The McNutt potash zone is 150 meters (500 feet) above the repository. Water from solution mining would have to penetrate across the salt bedding planes to reach the stored waste. The shafts will be sealed between the potash zone and the repository level to prevent a by-pass past these beds.

The WIPP site is in a area of low seismicity (FEIS Section 7.3.6).

As to the steam hypothesis, neither CH nor RH TRU waste has enough heat output to flash water into steam. The average CH drum, CH box, and RH waste container all have heat outputs of less than 1 watt each. Brine plus waste does not constitute an explosive mixture.

The response to comment 7.15-5 shows that during the Disposal Phase, the buildup of corrosion-generated hydrogen in a disposal room is precluded by the absorption of incoming brine by the bentonite in the backfill. The generation of hydrogen by radiolysis and the generation of methane by bacterial action will continue; however, these gases do not build up to their flammable or detonable concentrations.

After the panel seals are installed, the facility could become saturated with brine. Hydrogen and methane would build up as the oxygen in these disposal areas is depleted. (The bacteria that reduce carbohydrates to methane are anaerobic bacteria.) No way of igniting these mixtures of gases is evident. However, even if these gases were to ignite and/or detonate, the panel seals are so massive that the detonation wave would not accelerate them to velocities larger than 0.1 ft/s (0.03 m/s). The energy of this motion would be quickly dissipated within the concrete of the end plugs and by friction with the tunnel walls and the seal would remain intact.

Subsidence was discussed in the FEIS (Section 9.7.2.2) with the conclusion that the ground surface would only subside about a foot.

The formation of a radioactive slurry requires an ample supply of water and a gross comminution of the waste and its containers. Neither is credible at the WIPP. The discussion of this matter in Subsection 5.4.2.4 has been re-written to indicate more clearly why the DOE believes that the formation of a radioactive slurry is not of concern.

Human behavior is the most uncertain aspect of scenario development and analysis, but the EPA provides guidance on the types of human behavior that should be examined in the eventual performance assessment (see 40 CFR 191, Appendix B). A sensitivity and uncertainty analysis will indicate those input parameters that the final release predictions are most sensitive to, and the effects of human behavior will be allowed for by using a broad distribution of values for these inputs. In any case, the consequences of extreme accidents must be considered in conjunction with their low probability. (See also the response to comment 7.14-2.)

7.14-4 **Comment**

Commenters say that there is not enough evidence presented to support the contention that radioactive waste will be prevented from entering the environment within the next 10,000 years. They say that the assumptions and analysis are without basis in fact and insupportable by the evidence given, that many questions remain unresolved, and that dangerous and unwarranted assumptions have been made.

7.14-4 **Response**

This SEIS estimates radionuclide releases to the environment under a variety of scenarios (Subsection 5.4.2.3). If the WIPP remains undisturbed, there would be no release to the environment within the 10,000-year time frame called for by the EPA standards (40 CFR 191), even if the seals have nearly completely failed (Case IC), but eventually (in about 200,000 years) some water-borne radioactivity will escape the WIPP site. If the WIPP is disturbed, the release to the environment under expected conditions for the disturbed repository scenario (Case IIA(rev)) is almost a million times lower than the limit specified by the EPA standard. The deterministic analysis for extremely degraded conditions (Case IIC(rev)) in the final SEIS indicates that the EPA standard appears to be violated. These conditions have a low probability of occurring. If the analysis should show a significant indication of noncompliance, a number of options would be considered (e.g., waste treatment, engineering modifications) for bringing the WIPP into compliance and the required NEPA documentation for those options would be prepared before a decision to proceed was made. At the conclusion of the Test Phase, another supplement to the EIS would be prepared. At that time it would be determined whether the WIPP would comply with the radiation protection standards issued by the EPA for the disposal of TRU waste (40 CFR Part 191, Subpart B); compliance with the RCRA Land Disposal Restrictions (40 CFR 268), and other regulatory requirements would be confirmed. If there were a determination of compliance with the EPA standards and other regulatory requirements, and a favorable Record of Decision on the new SEIS, the WIPP would move into the Disposal Phase.

The performance assessment required is a probabilistic analysis (see Appendix I.1.5). Each calculated release will be accompanied by a probability assigned as a result of experiments or expert judgment, so that their impacts can be assessed and compared with the EPA standards.

The DOE does not accept the assertion that the assumptions made and the analytical methods used are without basis in fact and unsupportable by the evidence given. Material properties assumed, such as Culebra dolomite transmissivities, are based on measurements made with standard techniques, and are within the range of those measurements. Where data are scarce or wide-ranging, best scientific judgments have been used to interpret those measurements. Analyses are made with standard methods, such as the use of Darcy flow for brine inflow from the Salado Formation, or, when analytical methods have had to be developed, with due appreciation for the physics and chemistry of the real world. Finally, as indicated in the response to comment 7.14-42, the "assumptions" made are not unsupportable ideas, but simplifications made to let the analytical model represent the real world well, but still leave the model calculable.

7.14-5 Comment

Several commenters questioned the period of 10,000 years for which predictions are made, both because this is such a long time and because it is nevertheless short compared to the half-life of plutonium. They commented on the uncertainties in those predictions and even questioned whether such predictions are possible at all. They doubted whether the public could be confident about the safety of the WIPP without standards maintained by active control long after the initial waste emplacement.

7.14-5 Response

Ten thousand years is a long time, roughly twice recorded history. The EPA chose this time "because that appears to be long enough to distinguish geologic repositories with relatively good capabilities to isolate wastes from those with relatively poor capabilities. On the other hand, this period is short enough so that major geologic changes are unlikely and repository performance might be reasonably projected." (50 FR 38070, Sept 19, 1985) "There was no intention to indicate that times beyond 10,000 years were unimportant but the [EPA] felt that a containment system capable of meeting the proposed containment requirements for 10,000 years would continue to protect people and the environment well beyond 10,000 years" (50 FR 38076). Finally, the EPA recognized that there is no possibility of complete assurance that the standards will be met; it recognized that there would inevitably be substantial uncertainty in projecting disposal system performance. Proof of the future performance is not to be had in the ordinary sense of that word; instead, what is required is a "reasonable expectation" that compliance will be achieved. Although these calculations are not directed at compliance with any standard, the DOE chose times similar to those used by EPA in many of their regulations.

Future performance cannot be ensured by promising perpetual maintenance and control, both because we today cannot be sure what later generations will do or permit to be done and, more prosaically, because the EPA standards specifically rule out any consideration of active controls over a geologic repository beyond 100 years. The EPA standards require, however, that active institutional controls over disposal sites be maintained for as long a period as is practical. The need for confidence in the long-term integrity of the WIPP is basic among the reasons for the DOE plans to make the necessary studies during the WIPP Test Phase so that there will be a reasonable expectation of acceptable future performance.

7.14-6 **Comment**

Commenters expressed concern that the models used to project site behavior for 10,000 years were over simplified and included too many assumptions and uncertain data.

7.14-6 **Response**

The models used to make long-term predictions are state-of-the-art models generally accepted in the scientific community. There will always be some uncertainty in the data base for any geologic repository, just as numerical modeling will always involve some use of simplifications and assumptions. Realistically, these limitations must be accepted. (See also the responses to comments 7.14-5 and 7.14-42.)

The WIPP site and its surroundings have been studied by means of boreholes from the surface since 1977 and by direct access underground since 1983. The data and process rates used in the analyses are based on in situ measurements or extrapolation of such measurements. The "assumptions" are better than that word implies, but even so, many of the assumptions are to be studied further in the proposed Test Phase.

The emphases in the Test Phase are on gas generation and brine inflow, although studies of salt creep, tunnel closure, and seal behavior would also continue. Additional understanding of the Culebra aquifer and Castile brine reservoir would also be gained as study of the WIPP continues.

7.14-7 **Comment**

The EEG commented that it was imprudent to call the concentrations of volatile organic chemicals (VOCs) "limited" or "minor" on page 5-110 of the draft SEIS, because in some waste forms concentrations average as high as 150,000 mg/kg (Table B.3.2 of the draft SEIS).

7.14-7 **Response**

The concentrations of VOCs in TRU waste given in Table B.3.2 do not represent actual or possible quantities that may be present in the waste; the text on page B-24 of the draft SEIS that mistakenly says otherwise has been corrected. These "concentrations" are instead supplied to indicate the kinds of hydrous chemicals that may be present, not their quantities, and to show the relative importance of different forms of TRU mixed waste.

The "concentrations" of VOCs in Rocky Flats Plant waste were estimated from knowledge of the inputs of chemicals into the processes generating the waste, without regard to chemical reactions, volatilization, or quantities of chemicals that may be segregated in low level waste. Information from Clements and Kudera (1985) indicates that the actual amount of VOCs in the waste is limited. Further information on the source term for VOCs used in the operations risk assessment is provided in Subsection 5.2.4.2.

7.14-8 **Comment**

Several commenters said that the discussion of integrated releases in the draft SEIS shows that the WIPP does not meet EPA standards and fails to discuss why this is acceptable.

7.14-8 **Response**

The calculations presented in the SEIS are not intended to demonstrate compliance with EPA disposal standards. Rather, they were performed with the intent of providing an indication of the facility's environmental impacts over the long-term, and the feasibility of complying with the standards. Taken altogether, they show that compliance is probable.

Much more rigorous calculations must be conducted to evaluate compliance with EPA standards. These will use results from a proposed Test Phase and will include the probability of an intrusion into the repository.

A new Subsection I.1.5 has been prepared to explain how the final assessment of compliance will be made. As indicated therein, about 10 release scenarios will be chosen that are of high enough probability and consequence to affect that assessment, and about 100 calculations will be made for each scenario. Thus about 1,000 probabilistic calculations of integrated releases will be made for the final regulatory compliance assessment, not just the nine deterministic analyses reported in this SEIS.

7.14-9 **Comment**

Many commenters expressed concern over the possible contamination of groundwater used for drinking and agriculture. The Pecos River is of particular concern. One commenter noted that peyote, important to rituals of the Native American Church, grows along the Rio Grande, where it will be contaminated by radioactivity from the WIPP.

7.14-9 **Response**

The principal and closest groundwater overlying the proposed WIPP storage area is in the Culebra Member of the Rustler Formation, about 1400 feet above the storage area. The groundwater in the Rustler Formation at the WIPP site is already saline. It contains total dissolved solids (TDS) at levels of 30,000 mg/L and up. It is not potable water. This groundwater leaves the WIPP site flowing to the south. It very probably eventually turns west, ending up in the Pecos River. Immediately south of Carlsbad, the Pecos receives saline inflows (from sources other than the WIPP) that already render it unusable for drinking water or for agriculture. Further south in Texas, however, enough fresh water enters from side-streams to dilute the salt-laden water to usable levels.

The WIPP will not become a permanent waste disposal facility unless compliance with the EPA standards is demonstrated by means of a performance assessment. No waste will be permanently disposed of at the WIPP unless compliance with that standard is demonstrated. Any radionuclides released will eventually reach the Pecos River, but in much lower concentrations than near the WIPP site because of decay and dilution. The Rio Grande is even more distant, approximately 30 to 40 kilometers (18.6 to 24.8 miles) or (19 to 25 miles)along the flow path, and concentrations there will be even lower.

Peyote (Lophophora williamsii) does indeed grow along the flood plain of the Rio Grande and may be present along the lower reaches of the Pecos River as well. However, the most recent compilation of North American cacti (Benson, 1982) indicates that peyote is only present from Presidio, Texas, southward, far removed from the site.

7.14-10 **Comment**

Many commenters expressed concern about even low levels of radiation. The EPA standards are at fault, they say, because they speak of permissible levels of radiation, when there is no safe level of radiation. Reference was made repeatedly to the Petkau effect, by which the commenters meant damage to the immune system from radiation, and more from low levels of radiation than from brief but high dose-rate exposures.

Studies were cited on health effects resulting from the Chernobyl accident, atomic bomb testing, and Hiroshima-Nagasaki as evidence of health risks associated with exposure to low levels of radiation.

Some commenters thought that the 10,000-year containment period specified by EPA standards is too short.

7.14-10 **Response**

All WIPP activities will be conducted in accordance with regulatory requirements and recognized radiation protection standards.

The standards for radiation protection are based on data from the wartime experience at Hiroshima and Nagasaki, from medical experience with radiation treatments (these two sources gave information only on doses much higher than any discussed in this SEIS), from data relating to occupational radiation exposures, and from extensive laboratory experiments with animals and lower forms of life. These data have been extensively analyzed by international and national organizations, particularly the International Commission on Radiological Protection (ICRP), the United Nations Council on the Effects of Atomic Radiation (UNSCEAR), the National Council on Radiation Protection and Measurements (NCRP), and the National Academy of Sciences (NAS). The conclusions of these scientific groups reflect the best judgment of experts in the field.

Comments about the Petkau effect referred to mid-1970s work by Dr. A. Petkau of Canada, which concern the potential significance of membrane-mediated damage in biologic systems. The commenters asserted that this work implies that low-level irradiation is more effective than higher dose rate exposure in causing cell damage, and therefore discredits the BEIR III report (Biological Effects of Ionizing Radiations; NAS, 1980). On the contrary, with Dr. Petkau's cooperation, the BEIR III committee evaluated the significance of this work and, although admitting a need for additional studies in this field, concluded that "the available data relative to the effects of low-dose or low-dose-rate exposures on carcinogenesis in humans and experimental animals do not, in general, support the hypothesis of an increased probability of induction at low dose rates" (NAS, 1980, pp 463-469). Also see the response to comment 7.13.1-7.

The data cited by the commenters on the health effects of ionizing radiation tend to be anecdotal or in some respects not applicable. The Hiroshima-Nagasaki data, for instance, are all at dose levels much higher than background. The data from atomic testing and from the Japanese experience were known to and used by the experts who prepared the BEIR III report. (The subsequent BEIR V report [NAS, 1989] reconsiders the Japanese data based on a reanalysis of the radiation doses to which these people were exposed.)

The EPA explains the 10,000 year period specified in 10 CFR 191.13 as "long enough to distinguish geologic repositories with relatively good capabilities to isolate wastes from those with relatively poor capabilities. On the other hand, this period is short enough so that major geologic changes are unlikely and repository performance might be reasonably projected." They go on to say, "a disposal system capable of meeting the proposed containment requirements for 10,000 years would continue to protect the people and the environment well beyond 10,000 years" (50 FR 38070-1, 38076).

See also the response to comment 7.13.1-7.

7.14-11 **Comment**

Commenters raised concerns that "permanent" markers are really not permanent and that institutional knowledge will not be sufficient to prevent human intrusion.

7.14-11 **Response**

EPA requirements (40 CFR Part 191.14c) call for the DOE to erect monuments at the WIPP site and to leave records in various archives indicating its nature and presence. The EPA does not assume that passive controls will prevent all possibility of intrusion; but such controls are intended to deter any systematic development of a site. However, the EPA formally requires that it be assumed that there is some probability of human intrusion beyond 100 years after decommissioning, i.e., that institutional control is lost and that passive markers are not 100 percent effective (40 CFR 191.14a).

A document entitled "A Plan for the Implementation of Assurance Requirements in Compliance with 40 CFR 191.14 at the Waste Isolation Pilot Plant" was prepared in December of 1987 (WEC, 1987b). This document established an approach for determining appropriate passive institutional controls. In addition to markers and monuments, the use of records, land use restrictions, legal documentation, Federal control of the site, and other methods of preserving knowledge will be evaluated. The use of passive control measures that effectively warn future generations of the buried radioactive materials would not require the site to be "guarded" by the future generations.

However, in spite of the longevity of such long-term monuments as Egyptian and Roman buildings and pyramids, there can be no assurance that such records will indeed last for thousands of years. For this reason, human intrusion scenarios are evaluated in this SEIS and probabilistic analyses of these scenarios will be made during performance analyses using the results of the proposed Test Phase.

7.14-12 **Comment**

Commenters indicated 1) that the TRU waste to be emplaced in WIPP will generate large amounts of heat, and 2) that the DOE has assumed that no problems will occur as a result of this heat, rather than demonstrating by calculations that no problems will occur. The problems that may result from this large amount of waste heat include increased brine inflow, salt fracturing, and salt creep rates.

7.14-12 **Response**

The radioactive waste in the WIPP will produce a little heat, but the resultant rise in temperature of the surrounding rock is too small to change its properties significantly.

From Appendix Table B.2.13, it can be inferred that if the WIPP is completely filled, initially there will be 360 kilowatts of heat produced by the CH TRU waste stored there, decaying to 125 kilowatts in 100 years. (The amount of heat generated by the RH TRU waste is small by comparison, 4 kilowatts decaying in 100 years to 2.4 kilowatts.).

Even if the initial heat loading of the WIPP were 600 kilowatts, as one commenter estimates, the commenter has neglected the spatial distribution of the heat and the fact that the heat generated is continuously decreasing. In fact, 600 kilowatts would be spread out over an area of roughly 100,000 square meters, for a thermal density of about 6 watts per square meter. This is roughly equivalent to one night-light every square yard, except that the "light bulbs" get weaker as the stored radioactivity decays.

Intragranular brine inclusions have been shown to migrate toward (or in some cases away from) a heat source. The FEIS reported studies of the migration of this fluid toward high-level waste canisters (FEIS Section 9.7.3.2). High-level waste is no longer to be taken to the WIPP, even for experiments. The drums and canisters containing CH TRU and RH TRU waste in the WIPP will cause much less brine inflow. A much more copious source of brine is intergranular brine (SEIS Subsection 5.4.2.4). This migrates toward the storage rooms because of the lower pressure there. The net brine inflow should not be changed appreciably by heat from the waste.

The other effects of raising the temperature of the waste and the surrounding salt are an expansion of the rock (a decrease of its density), a decrease in its viscosity, and changes in its elastic moduli. The expansion of the rock tends to close fractures. Otherwise, the effects of these changes would be expected to be increased buoyancy (from the decreased density) and movement upward (if the resistance to flow is decreased enough).

The DOE has made numerous calculations on the effects of heat on the surrounding rock. For example, the FEIS (pp. 9-149 through 9-151) reports the results of calculations of temperature rise and temperature-induced buoyancy as a result of TRU waste emplacement at the rate of 2.8 kilowatts/acre (0.69 watts per square meter). The maximum calculated temperature rise was 2° Celsius, and the maximum heat-induced movement of the rock was 1 centimeter. Even if the thermal density were as high as 6 watts per square meter, the heat rise would only be in the order of 17° Celsius, and no significant movement of rock would be expected.

7.14-13 **Comment**

Several commenters said that the geologic hydrologic regime, climate, land-use patterns, and population will change around the WIPP site over the next 10,000 years, making the long-term performance of the repository unpredictable.

7.14-13 **Response**

Climate, population, and land-use patterns may indeed change over the next 10,000 years. Population and land-use patterns are inherently unpredictable, and partly for this reason the EPA has chosen a period of only 1,000 years for its individual protection standards (50 FR 38073, Sept. 19, 1985). However, in this SEIS these calculations are extended to 10,000 years. On the other hand, the EPA says that a 10,000-year period is ". . . short enough so that major geologic changes are unlikely and repository performance might be reasonably projected" (50 FR 38071, Sept. 19, 1985).

Nevertheless, the EPA requires that the DOE consider the long-term performance of repositories such as the WIPP. The only method known for predicting the release rate of radionuclides and their rate of transport to the biosphere for periods of time this long is through computer modelling of the various processes that might lead to that release. The ways by which these unavoidable uncertainties are taken into account are described in Appendix I.1.5.

7.14-14 **Comment**

Several commenters noted that risk assessments are "risky business." One needs to be careful with them, not trust them too implicitly, and put them into perspective.

7.14-14 **Response**

Risk assessments are called for by the EPA and used by the DOE because there is no empirical way to assess long-term performance. The extent to which one accepts their results depends on the credibility of the methods and input data used. The results of the risk assessments made in this SEIS have been reviewed by several groups external to the DOE, including the National Academy of Sciences WIPP panel, the EPA, and the EEG.

7.14-15 **Comment**

A few commenters said that the WIPP will release airborne particulates that will constitute a long-term, widespread hazard. One said, "The chief contaminant of the WIPP waste is plutonium which can be spread and resuspended in the air and produce lung cancers for 240,000 years."

7.14-15 **Response**

Even during the Disposal Phase, no reasonably foreseeable accident at the WIPP site could cause widespread airborne releases of radioactivity, let alone during the millennia following closure of the WIPP. (The catastrophic hoist drop discussed in Appendix F.3 has a probability of only 1.7×10^{-8} of occurring, and hence is not reasonably foreseeable.) The only way that radioactive material might be released directly to the surface is by an intruding borehole (Subsection 5.4.2.6). There is no way of getting any appreciable amount of radioactive particles into the air after the site is closed and decommissioned. Except for radon, the transuranic radionuclides are heavy (PuO_2 is about as dense as lead), and do not remain airborne. In Subsection 5.4.2.6 the amount of radon gas released during human intrusion is shown to be small.

7.14-16 **Comment**

Some commenters questioned the ability of the containers to stand up against salt corrosion.

7.14-16 **Response**

The various types of containers would indeed corrode when inflowing brine comes in contact with them, as discussed in Subsection 5.4.2.4. Even if corrosion were not a factor, the CH waste drums and boxes would would be crushed by surrounding salt as the tunnels close. However, the long-term integrity of the WIPP does not depend on the ability of the waste containers to remain intact. The primary barriers to waste release are the properties of the surrounding geologic media (see Section 4.0 and Subsection 5.4.2).

7.14-17 **Comment**

A number of commenters said the site is not suitable for a repository. Factors cited included the pressurized brine reservoir, slurry, gas generation, karst, salt dissolution and creep, cracks in the walls of the tunnels, brine inflow, temperatures, and general "site problems."

7.14-17 **Response**

These are all issues to which a great deal of attention has been given in the continuing geological, geochemical, and structural studies of the WIPP site, and studies of some of them will continue in the proposed Test Phase.

Some of these issues have been dismissed as of no further concern. These include karst, slurry, and waste heat. Karst in the sense of large solution cavities does not exist at the site, although fractures in the Culebra aquifer do (see the response to comment 7.7-3), and these are accounted for in the dual-porosity radionuclide-transport model used in the SWIFT II code. The interaction of brine inflow with waste to form a slurry will not occur because there is not enough brine inflow and the waste is not in the form of small particles. (The discussion on slurry in Subsection 5.4.2.4 has been rewritten.) (See also the response to comment 7.8.5-1.) Temperature effects do not arise because the heat output of the waste is very low (see the response to comment 7.14-12.) Even at installation, an average canister produces only 0.9 watts per canister; by 100 years most of the fission products will have decayed away, and the heat level will have been reduced to 0.5 watt per canister.

The present status of knowledge about the remaining factors (the brine reservoir, gas generation, salt dissolution and creep, cracks in the walls of tunnels, and brine inflow) are addressed in separate responses to comments in Subsections 7.7 and 7.8.

7.14-18 **Comment**

The EEG asked if there is a significance to the difference between value of 49.21 liters per day for Qw reported in Table I.1.4.5 on Page I-32 and the value of 49 liters per day previously reported in that table.

7.14-18 **Response**

The value (Qw) is the daily water intake of beef cattle. The value of 49.21 liters per day was an error and the calculation has been corrected using 49 liters per day (Table I.1.21). The different number does not significantly affect the result.

7.14-19 **Comment**

The EEG commented that it was not clear why lead is selected as a representative toxic metal in lieu of others, such as cadmium, which may be more toxic, other than that it is present in highest concentration. It was also suggested that a further explanation of other wastes, including organics, should be included in the SEIS to document the assumption that releases of lead will bound any potential risk due to chemical exposures in the long-term.

7.14-19 **Response**

The estimated concentration of soluble metals in the Culebra in the human intrusion scenario (Appendix I.1.4) is based on aqueous speciation/solubility calculations using the EQ3NR code (Wolery, 1983). Input data for the model were obtained from information obtained from the Culebra water quality sampling program (Randall et al., 1988). Thermodynamic data and information on stable solid phase equilibrium chemistry for RCRA-regulated metals other than lead in a brine environment are not available, and therefore cannot be evaluated by this methodology. The maximum predicted solubility for lead is used as the source term in the scenario. This is considered a conservative assumption because soluble lead is not expected to be limited by its initial concentration in the waste (WEC, 1989). Also, the rapid dissolution of lead is assumed. Based on the estimated concentrations of other metals in TRU mixed waste (WEC, 1989), other metals may be under saturated because of the smaller initial inventory.

Information is lacking in the scientific literature on the types and rates of reactions in the salt environment of the repository that would influence the organic chemical source term over a 10,000 year period. It is known that processes that will tend to degrade organic compounds (e.g., biodegration and radiolysis) will occur in the waste over the long term. However, the rates of degradation in this specific environment are not known. Based on the current available information, the use of lead as the indicator chemical for evaluating the long-term risks associated with the hazardous chemical source term is considered appropriate, because there is information available to estimate a concentration over the long term. The DOE has no information to justify assumptions to estimate a source term for the organic chemicals in brine over the long term. This discussion has been included in Subsection 5.4.2.2.

7.14-20 **Comment**

The EEG commented that the variable RV (daily respiratory volume) in Table I.1.4.4) is given in units milligrams per cubic meter per day ($mg/m^3/day$) and cubic meter per day (m^3/day). Dimensional analysis indicates that the latter set of units is applicable. Also, they felt the conversion factor should probably be in milligrams per gram (mg/g) rather than micrograms per milligram ($\mu g/mg$) for the same reason. Finally, they stated that the equation incorporating these variables should be:

$$I_r = (C_{ai})*(RV)*(T_{ai})*(A)/W_a$$

To obtain the correct units for I_r:

$$(g/m^3)\ (m^3/day)\ (mg/g)\ (1/kg) = mg/kg/day$$

The EEG stated that the reported equation has the variable (A) incorrectly in the denominator. They asked if the calculations in the draft SEIS are made with the reported equation.

7.14-20 **Response**

The EEG is correct that the units for RV are cuoic meters per day (m^3/day). This is a typographical error and is corrected in the final SEIS. The concentration of lead in air (C_{ai}) is reported in micrograms per cubic meter ($\mu g/m^3$) and not grams per cubic meter (g/m^3); therefore, the conversion factor of μg/mg is correct. It is also correctly reported in the denominator. The equation correctly reads as follows:

$$I_r = (C_{ai})\ (RV)\ (T_{ai}) /\ (A)\ (W_a)$$

To obtain the correct units for I_r(mg/kg-day) :

$$(\mu g/m^3)\ (m^3/day)\ /\ (\mu g/mg)\ (kg)$$

The equation is correctly used to calculate the lead intake via inhalation for humans; however the incorrect units were typed in the table. Table I.1.4.4 (now the second half of Table I.1.20) has been rewritten and clarified and the correct units are indicated.

7.14-21 **Comment**

The EEG asked why the possibility of chelation of metallic ions by organic compounds has not been considered in the calculations on draft SEIS page I-23, Modeling Assumptions For Calculating Lead Solubility in Culebra groundwater. It was mentioned that some of the compounds used for decontamination purposes are chelates.

7.14-21 **Response**

The chelation of metals by organic ligands is not considered to contribute significantly to the concentration of metals solubilized in brine for the following reasons:

- the concentrations of organic ligands in brines is expected to be quite low (Lappin et. al., 1989).

- magnesium, which is present in the brine in high concentrations, competes very effectively with the metals for any binding sites on organic ligands that may be present in the brine or the waste (Lappin et. al., 1989).

However, the possible presence of ligands was a factor considered in selecting the sorption coefficients used for lead in the long-term performance calculations.

7.14-22 **Comment**

The EEG commented on page I-29, Table I.1.4.5, Calculation of the Ambient Lead Concentration at Receptor Site. They noted that the equation used for these calculations shows 2π rather than the square root of 2π as required (see equation I-37, page I-14 of the draft SEIS). The actual estimate does use the square root value in arriving at the average concentration estimate. They stated that this equation should be corrected.

7.14-22 **Response**

The equation has been corrected in Table I.1.20.

7.14-23 **Comment**

The EEG said that "The calculations of human exposure from the stock water well to beef pathway are incorrect. The correct dose to an individual would be over two orders of magnitude [the actual number cited is 200] greater than reported. The corrected doses (15.7 rem committed effective dose equivalent in the Case IIC scenario) are very significant and will most likely violate the EPA standards when probabilities are assigned."

7.14-23 **Response**

The comment as quoted actually refers to three such claimed errors. In the first two, the DOE estimates are correct; in the third case the DOE estimate was wrong.

In the first two instances, standard transfer factors were used to relate the concentration of radionuclides in foliage or in drinking water to their concentrations in beef. If these had been ratios of radionuclide accumulation in beef to the rate of ingestion of foliage or water, as the EEG thought, the DOE should have included a factor of 200 for the average numbers of days a steer is kept on the range before it is slaughtered for beef. In fact, however, these are equilibrium transfer factors, numbers that describe the level to which radionuclides build up in the animal after a long period of ingesting those radionuclides. The multiplicative factor of 200 is therefore not warranted.

In subsequent conversations, the EEG has said that a telephone call with Baes, whose report (Baes et al., 1984) is the source of the transfer factors used, has revealed that the transfer factor referred to is indeed an equilibrium transfer factor, and that therefore the EEG now agrees that the factor of 200 was not warranted. However, Baes also told the EEG that he believes that the transfer factors reported may be low. How low they might be cannot be answered easily; studies and conversations between the EEG and Sandia National Laboratories staff continue to attempt to resolve this matter.

Since, however, the cattle are not left on the range long enough to come into equilibrium with the forage or the stock well water, a non-equilibrium factor of the form $1 - \exp(-\lambda t)$ is in order, where λ is $\ln(2)/T_{1/2}$ and $T_{1/2}$ is the biological half-life of the radionuclides. This factor would decrease the predicted radiation exposures and thus tends to balance out the possible need to increase this transfer factor.

In the third case, the DOE was in error. A soil depletion factor of 1.1×10^{-4} was left out in the calculation of exposure of the hypothetical ranch family. The results tabulated in Table I.1.3.4 (now Table I.1.7) should have been 9091 times higher, and in this final SEIS they have been corrected. As the EEG indicates, however, a 10,000-fold higher exposure from ingested radionuclides is still much less than the exposure from inhaled radionuclides.

7.14-24 **Comment category was intentionally left blank**.

7.14-25 **Comment**

The EEG found a number of instances in which the draft SEIS overstated a position or appeared to be wrong.

In the first of these, the SEIS says on page 7-4 that the TRU wastes "would not be expected to release any radioactivity or hazardous chemical constituents; therefore, there would be no long-term radiological or chemical impacts."

In the second, on page 5-114, Case II is said to be unlikely, given monuments marking the site.

In the third, on page 5-129, possible leaks through seals are mentioned, without mentioning also possible leaks around these seals.

In the fourth, on page 5-137, it is said that 12 liters of brine released up an intruding borehole in the time taken to drill down from the Castile to the Bell Canyon formations would carry up with it the equivalent of 1/100 drum of radionuclides. The EEG finds this number too small.

7.14-25 **Response**

The first draft SEIS statement was clearly incorrect. It should have said that, if the WIPP becomes a permanent repository, it must comply with the EPA standards, and there would not be any release of radioactivity or hazardous chemical constituents above regulatory limits; therefore, there would be no unacceptable radiological or chemical impacts. The SEIS has been revised accordingly (Subsectional 7.3).

The second draft SEIS statement is also wrong. Using EPA's probabilities for drilling into sedimentary basins (40 CFR 191, Appendix B), the probability of Case II occurring is around 1 in 4 (see SEIS Appendix I.1.5), even with a permanent monument on the site and with records in appropriate archives.

The third statement has been changed in Subsection 5.4.2.5 to recognize that leaks through tunnel and access-way seals would probably be accompanied by leaks through the surrounding rock.

The fourth sentence referred to has been changed in Subsection 5.4.2.6 to read: "Eighty hours of Salado Formation brine inflow at 1.3 m^3/yr is 12 liters and, for a radionuclide solubility of about 10^{-4} molar, (Cases IIB and IIC), this Salado brine will carry with it the equivalent of about 1/30 drum of radionuclides." The calculations that give this result are shown below.

Radioelement	Amount in drum	Amount dissolved	Percent of drum
Thorium	6.0 g	0.278 g	4.6%
Uranium	12.1 g	0.286 g	2.4%
Neptunium	0.03 g	0.284 g	>100%
Plutonium	15.5 g	0.287 g	1.9%
Americium	0.49 g	0.289 g	59%
Curium	4.2×10^{-4} g	0.293 g	>100%
Californium	1×10^{-5} g	0.302 g	>100%
OVERALL	34.4 g	1.17 g*	3.4%

* Sum of amounts dissolved or amount present, whichever is smaller.

This calculation assumes that each element is independently soluble at the level of 10^{-4} molar. In actuality, the interactions between solutes will reduce the overall solubility of these radionuclides.

7.14-26 **Comment**

The EEG noted that although the assumption used in the FEIS that TRU waste in the repository dissolves at the same rate as salt is called unrealistic, it led, because of other assumptions, to a concentration that was less than 4×10^{-6} molar. The SEIS uses solubilities of 10^{-6} and 10^{-4} molar.

7.14-26 **Response**

In the FEIS, TRU waste was assumed to dissolve at the same rate as salt. At that time, the DOE thought this assumption was unrealistically conservative. The DOE has not tried to verify the EEG's finding.

7.14-27 **Comment**

The EEG noted that the draft SEIS implies there is a definite plan and commitment to using backfill containing bentonite, and that it is unaware of any such commitment, and the text should not take credit for it.

7.14-27 **Response**

The working assumption within the WIPP project is that the backfill will contain bentonite, and currently most analyses are based on that assumption. However, no credit is taken in the SEIS calculations for radionuclide retardation or permeability reduction resulting from the addition of bentonite to the backfill, except in the discussion of the accumulation of flammable gas in Appendix F.3.3 and in the response to comment 7.15-5.

Future analyses or research may reveal that bentonite is not an appropriate backfill for some reason not now known; therefore the DOE has not made a final decision on the nature of the backfill. This is an element that will continue to be evaluated.

For a discussion of the function of backfill, see the response to comment 7.15-4.

7.14-28 **Comment**

The EEG indicated that it has been "assured in the past that there was not enough brine in the Salado to fill a room before closure. We believe the current hypothesis is more reasonable."

7.14-28 **Response**

The past assurances should not have been that there was not enough brine in the Salado, but that its rate of inflow was too small to fill a room before closure. The DOE agrees with the EEG that all open spaces will eventually be filled with brine, assuming that gases generated by waste and backfill are eventually dissipated. If, however, 1) gas-generation rates within the repository are significant, and 2) the effective far-field gas permeability is near zero, then the repository will remain unsaturated even for time periods of 10,000 years and more.

7.14-29 **Comment**

The EEG noted that it has long maintained that a well scenario with humans drinking treated water directly from the well is reasonable to consider, and the technology to reduce high solids in water is available today (with reverse osmosis being perhaps the most practical method). The EEG stated that "the well water in Case IIC, if treated to remove 90 percent of the solids, and, incidentally, remove 90 percent of the radionuclides, would result in a dose of about 33 rem/year (CEDE). Even if 99 percent of the radionuclides were [removed], the CEDE would still be 3.5 rem/year."

7.14-29 **Response**

The DOE's calculations for 90 percent desalination agree in their essentials with the Environmental Evaluation Group's. The calculations for Case IIC(rev) are given in Table 2; the result is a committed dose of about 20 rem per year of exposure. (For Case IIA(rev), which describes the expected performance of the WIPP if disturbed, the net committed dose per year of exposure is only 10^{-4} millirem). However, there is little likelihood that the highly saline Culebra water will be used for household uses in the near future when much better water is available. In the long run, it may become necessary to use this water, poor though it is. In that case, a water quality analysis at the time would be needed to dictate the levels of desalination to be used. Present State and Federal regulations limit the radium and gross alpha content of drinking water; future regulations can be expected to be no less strict.

7.14-30 **Comment**

The EEG said that "In many cases involving dose calculations, some of the assumed parameters are either not present in the SEIS, or must be searched for in an unspecified location in the two volumes."

7.14-30 **Response**

An attempt has been made to remedy the situation in this final SEIS.

7.14-31 **Comment**

The EEG stated that "arrival times at points of interest for Cases IA and IB 'were determined by the times at which the discharge rates rose to 10^{-18} Ci/day.' This extremely low activity represents material discharged per day having an activity of only about one disintegration per year! This represents the extreme leading edge of a distributed nuclide and effective arrival times are longer than stated."

7.14-31 **Response**

In this final SEIS, this indicator level has been raised to 10^{-10} curies per day (Ci/day) in Subsection 5.4.2.5. This number derives from the fact that the ALIs (Annual Limits of Intake; these are listed in ICRP 30) for transuranic radionuclides are all in the order of 10^5 Bq/yr, or about 3μCi/yr, which is 7.4×10^{-9} Ci/day. The level of 10^{-10} Ci/day is comfortably below that. Increasing this indicator level has not changed the results appreciably, indicating that there is a steep wave front.

Table 2 Human Exposure from drinking desalinated stock well water, Case IIC(rev), t = 10,000 years

Nuclide	A Concentration in well kg (nuclide)/ kg (brine)	B Specific activity (Ci/g)	C Ingestion rate (Ci/d)	D CEDE factor (rem/μCi)	E Committed dose (rem/yr)
			Case IIC(rev)		
Np-237	2.01×10^{-10}	7.05×10^{-4}	2.83×10^{-10}	3.9×10^{0}	4.03×10^{-1}
Pb-210	7.80×10^{-15}	7.3×10^{1}	1.19×10^{-9}	5.1×10^{0}	2.22×10^{0}
Pu-239	6.54×10^{-11}	6.22×10^{-2}	8.14×10^{-9}	4.3×10^{0}	1.28×10^{1}
Pu-240	2.34×10^{-12}	2.28×10^{-1}	1.07×10^{-9}	4.3×10^{0}	1.67×10^{0}
Ra-226	6.12×10^{-13}	1.0×10^{0}	1.22×10^{-9}	1.1×10^{0}	4.91×10^{-1}
Th-229	1.33×10^{-12}	2.13×10^{-1}	5.67×10^{-10}	3.5×10^{0}	7.24×10^{-1}
Th-230	4.37×10^{-13}	2.02×10^{-2}	1.77×10^{-11}	5.3×10^{-1}	3.42×10^{-3}
U-233	6.29×10^{-10}	9.68×10^{-3}	1.22×10^{-8}	2.7×10^{-1}	1.20×10^{0}
U-234	2.05×10^{-10}	6.25×10^{-3}	2.56×10^{-9}	2.6×10^{-1}	2.43×10^{-1}
U-236	3.47×10^{-10}	6.47×10^{-5}	4.49×10^{-11}	2.5×10^{-1}	4.10×10^{-3}
Total					1.97×10^{1}

Column C = A x B x 2 x 1000
Column E = C x D x 365 x 1,000,000

7.14-32 <u>Comment</u>

The EEG noted that "The FEIS reports a pit area of 66.9 m^2 [720 square feet] for resuspension of radionuclides and 46.45 m^2 [500 square feet] is reported for resuspension of Pb from the same pit in the SEIS, a factor of 1.4 difference for these estimates." The EEG asked why the areas vary, and which one was used in obtaining the reported values.

7.14-32 <u>Response</u>

The mud pit area used in the SEIS differs from that used in the FEIS. The mud pit area used in the SEIS calculation was 46.45 square meters, rounded to 46 square meters in the text. This value comes from <u>Groundwater and Wells</u> (Driscoll, 1986), and is believed to be more representative than the 66.9 square meters used in the FEIS.

7.14-33 <u>Comment</u>

The EEG asserted that, because soil concentrations were underestimated by a factor of 8,975, and beef concentrations were underestimated by a factor of 200, the net exposures of the ranch family by the soil-plant-beef pathway were underestimated by a factor of as much as 1.8×10^6. The EEG went on to say, "throughout this analysis it has been assumed that a 20 cm plow layer has been used for beef cattle grazing such as on winter wheat. If cattle are grazing on open range, then the thickness of the radionuclides deposit is closer to 2 cm or the Pu-239 concentration is a factor of ten higher than the corrected value or 4.64E-13 Ci/Kg." The soil that cattle would ingest, both per se and on plant surfaces, would contain greater amounts of radionuclides than assumed. This would, the EEG said, increase the exposure by still another factor of ten, and that, "these values are admittedly small when compared to doses resulting from inhalation, but are not as small as that reported."

7.14-33 **Response**

As indicated in the response to comment 7.14-23, the suggested factor of 200 is incorrect, but that of 8,975 (now 9,091) is correct. Table I.1.3.7 (now Table I.1.11) has been corrected.

The final suggested factor of ten is based on the fact that range cattle ingest a considerable amount of soil a day, both directly and on vegetation. The ingestion of radionuclides this way is more efficient than via deposition on the ground and absorption through plant roots. This factor would apply only to beef eaten and milk drunk by the ranch family; it would not apply to garden vegetables and root crops, which are washed before being eaten. The EEG's point is well taken, but as it says, the increase in exposure from ingested radionuclides does not affect the net conclusions on human exposure, because the principal human uptake of radionuclides is by inhalation.

7.14-34 **Comment**

The EEG said that it "has been told that blowout preventers do not activate unless pressures are quite high and might not be activated by a brine reservoir. Also, since the WIPP-12 brine reservoir unavoidably permitted 27,000 barrels of brine to flow to the surface before it could be shut in for pressure testing (see Page H-9 of TME 3153), how can the claim be made that little or no brine would reach the surface?"

7.14-34 **Response**

Contrary to what is said in the draft SEIS (p 5-114), blowout preventers are not activated by an increase of pressure at the well head; they are activated when unusual conditions are observed. The driller closes the blowout preventer either manually or hydraulically. In oil or gas drilling, it is most desirable to confine formation fluids to their respective sources. This is true not only for safety reasons but also for economic reasons. In the rotary system of drilling, the circulating fluid column accomplishes this effectively so long as fluid density and column height are sufficient to develop a hydrostatic pressure greater than the formation pressures exposed in a well bore. An adequate fluid column then becomes the primary element affecting well control. Blowout preventer equipment actually becomes the second line of defense, and its primary function is to preserve the fluid column or to confine well fluids to the bore hole until an effective fluid column can be restored.

Formation pressure open to the well that is greater than the hydrostatic pressure of the fluid column in the hole will give advance evidence of its presence to the drilling crew. Sometimes this evidence is very obvious; for example, fluid may flow rapidly from the well. Other times it will not be as obvious. Other preliminary signs of potential blowouts include drilling breaks, flow of drilling mud from the well, pit gain, or presence of gas, such as H_2S.

When a well "kicks," several operations <u>must be performed</u> to kill the threatened flow. First, the drilling crew must establish control, i.e., stop the entry of salt water or gas into the hole. The first operation involves the using of emergency equipment-blowout preventers to close the top of the hole, thus "bottling up the well" to prevent further entry of formation fluids. All drilling instruction manuals stress the single most important step to stopping unanticipated flow to the borehole: <u>CLOSE THE BLOWOUT PREVENTER</u>. If the preventer is not closed, there will be no way of learning the pressure involved, no means of stopping further entry of formation fluid, and no way to get heavier mud into the hole. As most drilling manuals emphasize, it is not only important to close in the well, but it should be done immediately to minimize the amount of formation fluids that enter the well.

If a brine flow (or blowout) is encountered, the drilling fluid (drilling mud) in the hole and the pits will have to be replaced, because it will be contaminated with brine and/or hydrogen sulfide gas and will have to be disposed of in an approved disposal area. This will be an economic disadvantage; therefore, as stated in Case II of this SEIS, the drillers will allow only a minimal volume of brine to flow from the well.

As to the statement that 27,000 barrels of brine were allowed to flow in the WIPP-12 incident, flow was initially stopped after only 51 barrels had been produced by closing the pipe rams on the blowout preventer. At that time, heavier mud could have been prepared and circulated to stop the flow of brine. However, research interests dictated that the flow not be completely stopped until after testing could be performed. Thus, the drilling mud was kept relatively light and the well was allowed to produce: 1) 20,543 barrels while the hole was deepened from 3,016 to 3,047 feet (31 additional feet), and 2) 6,538 more barrels while the hole was geophysically logged, for a total of 27,081 barrels. Following hydrologic testing, heavier mud was used, which reduced the brine flow, resulting in an additional 22,143 barrels while the hole was deepened to its final depth of 3,925 feet (878 additional feet). The flow could have been stopped completely before deepening by setting casing through the brine reservoir, but that would have precluded additional testing after hole deepening. Thus, while the total flow to the surface at WIPP-12 was approximately 49,275 barrels (not 27,000), all but 51 barrels of this total resulted from conscious decision rather than from limitations in the behavior of the blowout preventer.

7.14-35 **Comment**

The EEG asked what assurance there is that standard borehole plugs would be installed, and who would inspect them.

7.14-35 **Response**

The New Mexico Oil Conservation Division's Rule 201 requires that "before any well is abandoned it shall be plugged in a manner which will permanently confine all oil, gas, and water in the separate strata originally containing them. This operation shall be accomplished by the use of mud-laden fluid, cement and plugs, used singly or in combination as may be approved by the Division." The rule requires notice to the Division before plugging operations are started. After plugging is completed, the operator must file a report with the Division detailing how the well was completed. The well owner must also contact the District Office of the Division to arrange for one of its representatives to inspect the plugged well and the location. In the case of plugging a hole in the WIPP area, the State Engineer Office must also be informed because of its concern for the protection of aquifers. The Office will usually send an inspector to observe the operations. The DOE reasonably assumes that future practices will be as strict.

7.14-36 **Comment**

The EEG agreed with the plutonium and americium solubilities used in the draft SEIS, 10^{-6} molar for average conditions and 10^{-4} for degraded conditions, but said that an order of magnitude increase in the solubility for uranium might be more appropriate.

7.14-36 **Response**

The DOE disagrees. Admitted, there is a large component of expert judgement in assigning solubilities to these radionuclides in the absence of satisfactory laboratory measurements. Laboratory measurements are underway to obtain good values for actinide solubilities in strong brines. This program is described in the "Draft Final Plan for the Waste Isolation Pilot Plant Test Phase: Performance Assessment" (DOE, 1989b) as Activity S.1.2.6.

The range of solubilities of 10^{-3} to 10^{-9} molar mentioned in Subsection 5.4.2.4 is intended to be the range of solubilities to be considered in the sensitivity studies that are a part of the Test Phase plans. In any case, however, the real value (or range of values) of uranium solubility in brine will be used in the compliance analyses to be performed near the end of the Test Phase.

7.14-37 **Comment**

The EEG did not believe that gas generation by radiolysis is negligible. It stated: "A G factor of 1.0 [atoms of gas per 100 electron volts of absorbed alpha energy] would yield 0.64 moles/year/drum. Even though G factors are usually assumed to decrease, in a poorly defined manner, with time it does not seem conservative to ignore radiolysis. Besides, the only reason to use real waste for experiments is [to evaluate] the contribution of radiolysis. Neither bacterial decay nor chemical reactions require waste."

7.14-37 **Response**

The paragraph in question in Subsection 5.4.2.4 does not say that gas generation by radiolysis is negligible. It merely says that radiolysis and thermal degradation are small contributors to gas generation compared to microbial action and corrosion. The DOE agrees that the effects of radiolysis are not obvious; experiments to be conducted during the proposed Test Phase would examine gas generation by radiolysis.

The DOE notes, however, that both microbial and chemical activity are expected to be dependent on radiolysis in the real world. Two specific examples are: 1) it is possible that the conversion from oxic corrosion (which does not produce gas) to anoxic corrosion (which does produce gas) will be inhibited or prevented by oxidizing materials generated by radiolysis, and 2) it is possible that radiolysis may in fact increase the bioavailability of plastics and rubbers, not now considered in the gas-generation estimates.

7.14-38 **Comment**

The EEG commented that "The large retardation factors [in Case I], for 100% of the wastes, assumed in the Culebra should guarantee that you will have no problems, regardless of other assumptions. Since there are so many complexities to this waste and large quantities of material that are potential chelating materials, we believe that a small percentage (perhaps in the 1 to 10% range) of waste should be assumed to move with no retardation."

7.14-38 **Response**

In this comment the EEG refers to Table 5.52 of the draft SEIS (now Table 5.59) where Culebra retardation factors used in Case I analyses are shown. These factors were as great as 7600 (for Am) and 39 (for U, Np, Pb, and Ra).

The EEG is suggesting that a portion of the waste radionuclides will be taken up into organic complexes and not be as greatly retarded by sorption in the host rock as the bulk of the dissolved radionuclides. This possibility has already been taken into account in the selection of the K_d factors from which retardation factors are derived, especially in Cases IB, IC, IIB, IIC, IIC (rev), and IID, in which Culebra radionuclide transport properties are "degraded."

As indicated in Appendix I.2.2 and Lappin et al. (1989, Subsection D.2.2), the K_d values used in this final SEIS were selected to include the possibility that complexation by inorganic ligands would reduce the sorption by several orders of magnitude below that observed in laboratory experiments with WIPP waters. Rather than do calculations with

K_ds of zero, it is better to evaluate whether chemical disequilibria among radionuclides and chelates and/or material transport of radionuclides by colloids is likely.

At this time the DOE's judgment is that an assignment of $K_d = 0$ to any significant portion of the WIPP inventory is physically unrealistic. The DOE recognizes that, as part of the most recent amendment to Appendix II of the Consultation and Cooperation Agreement between the DOE and the State of New Mexico, the fact that K_d is greater than zero within the Culebra for nuclides of interest must be demonstrated experimentally before final evaluation of compliance with 40 CFR 191. Otherwise a value of zero will have to be assigned to at least a portion of the inventory.

7.14-39 **Comment**

The EEG noted "that taking a cuttings sample from RH TRU wastes could conceivably result in somewhat higher doses [than indicated for CH TRU waste]. For example, if an RH TRU cylinder contained an average of 10 Ci/L of Cs-137 at time of emplacement (this would meet the requirements of the State of New Mexico for a total concentration of less than 23 Ci/L), this would still be 1.0 Ci at 100 years. A 526 cm^3 cutting would have a dose rate at 1 meter of 175 mrem/hr, even if no compaction of the waste were assumed." Other commenters also said that a release scenario involving RH TRU waste should be analyzed in the SEIS.

7.14-39 **Response**

The DOE agrees that a better discussion is needed of why only CH TRU waste was considered in evaluating the long-term performance of a disturbed repository. Such an improved discussion has been supplied in this final SEIS (Subsection 5.4.2.2). As part of this discussion, it was thought that the exception to the general rule of RH TRU waste being of small consequence relative to CH TRU waste might be the exposure of the drilling crew and the hypothetical down-wind ranch family to an RH TRU waste sample brought directly to the surface by a drillhole.

Such calculations have been added to Subsection 5.4.2.6. The results are a considerably higher exposure of a drill crew member for a hole drilled early in the 10,000-year period of concern, but no higher exposure of the hypothetical down-wind ranch family (see Tables 5.61, 5.62, 5.63, and 5.64).

7.14-40 **Comment**

The EEG noted that the draft SEIS says on page B-15 that "emplacement procedures at WIPP will minimize degradation of RH TRU canisters." It asked how the corrosion of canisters is minimized in light of brine seepage and how the uncertainty of the RH inventory justifies its exclusion in the performance assessment.

7.14-40 **Response**

The statement quoted was made in the context of RH TRU waste not having been included in the long-term performance assessment inventory. It is a misstatement; it is not that degradation of RH TRU waste canisters will be minimized, but that brine circulating in the CH TRU waste rooms will not have access to the RH TRU waste in its separate canisters.

Subsection 5.4.2.2, which deals with the relative importance of CH and RH TRU waste, has been expanded to explain better why only CH TRU waste is considered in the long term performance assessment of Case II. The essence of the reason is that a drillhole that intercepts a waste room allows brine to dissolve radionuclides from a whole room or panel, whereas a drillhole that intercepts an RH TRU waste canister admits the brine only to that canister. Moreover, the fission products that distinguish RH TRU waste from CH TRU waste are short lived and decay away in a few hundred years. The exception to the general unimportance of RH TRU waste relative to CH TRU waste is exposure of members of the drill crew. An analysis of the consequences to the drill crew and to the hypothetical ranch family of drilling through an RH canister has been added in Subsection 5.4.2.6.

7.14-41 **Comment**

The EEG noted: "Not enough information was presented in the SEIS to reproduce the values in Table [I.1.3.2] . . . The use of drum equivalents for TRU activities is nowhere mentioned in this section (we could not find it in the entire SEIS), yet it is not possible to estimate the values without it. . . . Curiously, the density of the mud for plume dispersion is given as 2.0 g/cc which is inconsistent [with that given in Lappin et al., 1989]. The SEIS should settle on one value for both calculations and 'stick' to it."

7.14-41 **Response**

This comment concerns the calculation of exposure of the hypothetical ranch family to radioactive material brought directly to the surface by an intruding drill hole. This final SEIS supplies additional steps and information intended to permit the reader to follow the calculation more easily. For instance, an example of the calculation leading to Table I.1.3.2 (now Table I.1.3) has been added to the text, and the text has been changed to avoid the phrase "drum equivalents."

Although the original FEIS does indeed speak of a density of 2 g/cm^3, a density of 1.4 g/cm^3 was used in this final SEIS except where ambient concentrations of lead are calculated (Table I.1.20). There, its use is conservative: it increases the predicted exposure.

7.14-42 **Comment**

Numerous commenters were concerned whenever the text speaks of assumptions made for a scenario or a calculation. They believe that the long-term release calculations are based on unsubstantiated assumptions, simplistic conceptual models, and estimates of parameters that have large uncertainties.

7.14-42 Response

The scientist often uses common words otherwise than as non-scientists use them. Three such words are "assumptions," "estimate," and "suggest."

No model or calculation exactly mimics nature. For this reason every scientist is careful to point out assumptions necessary to analyze natural phenomenon. The relevant question is, therefore, not why assumptions were made, but whether the assumptions made are reasonable.

Similarly, calculations made using approximations to nature, and assumptions are said to be "estimates." This alerts the reader that the results are uncertain.

Technologists, after describing an ensemble of data on some structure or system, often lead into their interpretation of these data with the phrase, "This suggests that . . ." They may be fairly sure of their interpretations, but they recognize that their peers may differ from them in some respect.

The WIPP site and its surrounds have been studied by means of boreholes from the surface since 1977 and by direct access underground since 1983. The data and process rates used in the analyses are based on in situ measurements or extrapolation of such measurements. The "assumptions" are better than that word implies, but even so, they are to be studied further in the proposed Test Phase.

As indicated elsewhere, the emphasis in the Test Phase is on gas generation and brine inflow. Studies of salt creep, tunnel closure, and seal behavior would also continue. Still, there are specific areas that would not or cannot be qualitatively improved by further study. These include the hydraulic properties of the Culebra aquifer (i.e., fracture, flow, and transport properties) and (after 1990) properties of the pressurized brine reservoir.

The models used to make long-term predictions are state-of-the-art models generally accepted in the scientific community. More detailed descriptions of the data bases and rationale supporting models and assumptions used in the SEIS are given in Lappin (1988) and Lappin et al. (1989).

7.14-43 Comment

A number of commenters noted the numerous changes in the understanding of the WIPP site since the 1980 FEIS (e.g., the factor of 10^{-3} to 10^{-4} reduction in Salado Formation permeability) and interpreted these changes to mean that great uncertainties exist in these inputs, and, hence, unreliable predictions.

7.14-43 **Response**

The DOE has learned a good deal more about the WIPP site since the FEIS and also since the Site and Preliminary Design Validation investigations of the early 1980s. Inevitably, some of the new data change interpretations made earlier. These changes have arisen chiefly because at the time of the FEIS, the only access underground was by means of drillholes from the surface. These changes indicate a clearer understanding of the geologic and hydrologic aspects of the site and lessened uncertainty, not the opposite.

7.14-44 **Comment**

EPA officials said, "The Draft SEIS states, 'Marker Bed 139 will not be healed by closure.' The same assumption could be made for Marker Bed 138 since it is, in areas, within 10 feet of the repository. Does the DOE consider Marker Bed 138 or any other marker beds as potential primary pathways for radionuclide migration?" Another commenter called for an analysis of MB 138.

7.14-44 **Response**

Yes, MB 138 could in principle be a pathway for migration, because its permeability is much like that of MB 139. However, MB 138 is farther above (10 feet) the waste rooms than MB 139 is below (3 feet) them, and is therefore not as important in this respect as MB 139.

The way that the disturbed rock zone grows, and hence the way that the permeabilities of stratigraphic markers near the WIPP horizon (including both MB 138 and MB 139) increase, is a central focus of activities proposed during the WIPP Test Phase.

7.14-45 **Comment**

The EPA stated, "Although the intent of the Draft SEIS is not to show compliance with 40 CFR Part 191, the information for the NEFTRAN modeling is incomplete if compliance were to be shown. The parameters listed for the NEFTRAN modeling, Tables 5.51 and 5.52, omit certain parameters, such as boundary pressures and brine concentrations, which are critical to the modeling and need to be presented."

7.14-45 **Response**

These input parameters, inadvertently left out of the tables in the draft, have been included in this final SEIS (Subsection 5.4.2.5). Boundary pressures are lithostatic: 14.8 MPa in the waste rooms and 1 MPa in the Culebra. The brine was taken to be saturated.

7.14-46 **Comment**

The EPA and others questioned the statement that surface water was not considered as an available mode for transporting radionuclides from the mud pit to the ranch family in Case II, and they questioned the fact that this possibility was not considered in the draft SEIS. This they said, was not sufficient justification for an out-of-hand dismissal of surface water as a potentially important pathway. The EPA said that it "has found in previous analyses not related to WIPP that the population impacts through this pathway may be more severe than that from the resuspension pathway." Lastly, the EPA commented that "the impact analysis for this scenario should include the consequences of the subsequent transport of radionuclides, via surface water onto downstream farmland, either through natural or artificial flow or erosion, or present, a better rationale for not including it."

7.14-46 **Response**

Surface run-off has not been considered in this final SEIS because of the low precipitation in the area, high soil porosity and high plant evapotranspiration. "The mean annual precipitation in the region is about 12 inches, and the mean annual runoff is 0.1 to 0.2 inch. The maximum recorded 24-hour precipitation at Carlsbad was 5.12 inches, in August 1916. . . . More than 90 percent of the mean annual precipitation at the site is lost by evapotranspiration [which] greatly exceeds the available rainfall; however, intense local thunderstorms may produce runoff and percolation. . . . There are no perennial streams or surface-water impoundments at the WIPP site" (FEIS pp 7-79 to 7-82.).

The local slopes are to the southwest and into Nash Draw, where the only surface water is salt lakes. (Significantly, the largest of these is named Laguna Grande de la Sal.) Thus, there is no agriculture downslope. For these reasons surface runoff is not included in the analysis.

7.14-47 **Comment**

The EPA said, "Two of the four scenarios considered for human intrusion (Cases IIB and IIC) indicate a substantial likelihood of not complying with the containment requirements of EPA's disposal standards. At the same time, these four scenarios indicate substantial reductions of long-term releases that may be associated with engineered modifications to the waste and/or backfill. The EPA encourages the DOE to discuss such engineering modifications further in the final SEIS. Furthermore, EPA supports performance of experiments that would better define the potential benefits of these engineered modifications."

7.14-47 **Response**

As discussed in the response to comment 7.14-8 and in Appendix I.1.5, compliance analyses will be based on a probabilistic treatment of an ensemble of integrated release calculations, not on the results of any one calculation alone. The particular calculation reported in the draft SEIS that appears to be over the regulatory limits was the one for Case IIC. This was a scenario using degraded parameters in which no mitigation measures such as waste processing or consolidation or backfill compaction were taken. A DOE task force is studying the feasibility of various alternatives for waste treatment and engineered barriers. The performance of feasible alternatives may be examined in bin-scale tests; these would be incorporated into Phase III of the bin-scale experiments (Appendix O). Also see the response to comment 7.11-1.

The discussion in Subsection 6.3 of engineering measures that might be taken to mitigate integrated releases has been expanded along the lines suggested.

7.14-48 **Comment**

The EEG calculated exposures for the release of lead based on assumptions on pages I-25 to I-33 of the draft SEIS. They stated that the SEIS text is inaccurate because it confuses g/m^3 with μg/m^3 in several locations on page I-27. They asked why, in a parallel exposure scenario to the radiological assessment, only one year of lead deposition was reported. They presented a series of calculations on the uptake of lead for beef cattle assuming lead deposited on soil over 100 years. They included pathway analysis on beef and plant consumption by humans, as well as the inhalation of lead particulates. The EEG concluded that their analysis agrees with the statement in the SEIS that secondary pathways other than direct inhalation contribute an insignificant lead burden to humans.

7.14-48 **Response**

The EEG is correct in noting errors in the draft SEIS text on page I-27, paragraph 3, line 2 and on page I-27, paragraph 5, line 2. In both cases, the air concentration is incorrectly reported. The units should be μg/m^3 and are corrected in this final SEIS. The only pathway evaluated in the SEIS for lead exposure to humans during the first 100 years is direct inhalation. The calculations by the EEG confirm the statement that, based on previous studies, secondary pathways of lead uptake do not significantly contribute to the lead exposure. The results of the pathway analysis for radionuclides show similar results.

The transfer factors for soil to plant and forage to meat relate to a steady-state condition, so that it is not necessary to consider a concentration over 200 days in the secondary pathway analysis. The formula for calculating the inhalation of lead by humans is correct in the SEIS; however, the units for the lead concentration in air (C_{ai}) should be in μg/m^3 and the daily respiratory volume (RV) should be in m^3/day. The units are correct in this final SEIS.

7.14-49 **Comment**

The EEG commented on the health effects associated with stable lead from wind dispersion (see draft SEIS, page I-27). They commented that because cattle consume significant quantities of soil, which are present on plant surfaces as a result of erosion processes (pounds per day), it may not be advisable to ignore lead consumption by animals through this pathway. The EEG asked if any of the models employed incorporate this pathway. They also asked why inhalation of lead contaminants is not taken into consideration in ambient and resuspension pathways for these animals.

7.14-49 **Response**

In considering material brought directly to the surface by a drillhole in Case II, the daily intake of lead by humans is calculated for direct inhalation because this is the most direct and potentially significant exposure pathway. As shown for the radionuclides in Table I.1.3.7 of the draft SEIS (Table I.1.11 of the final SEIS), indirect pathways such as the ingestion of beef and vegetables contribute a much smaller dose than direct inhalation. The same is presumed true for exposure pathways for stable lead.

Cattle may consume lead from contaminated soil deposited on plants; however, this additional pathway will not significantly increase the daily intake of lead by humans. Because the concentration of lead in air at the hypothetically exposed individual's location is orders of magnitude below health-based levels and the concentration of lead deposited on soil is also very small, the secondary pathway of resuspension will not contribute significantly to the inhalation of lead by humans. The secondary pathway of the inhalation of lead by cattle is not estimated for these scenarios.

7.14-50 **Comment**

The EEG commented that the reported concentration of lead in stock well water was obtained from a 10 milligram per liter prediction of SWIFT-II allowing for lateral dispersion of 4.2 which gives an estimate of 2.38 milligram per liter from the ratio of 10/4.2. They commented that the correction for dispersion was not mentioned in connection with radionuclide concentrations, and the SEIS should document that SWIFT-II does not make this correction in its operations.

The EEG also provided calculations to predict the uptake of lead by cattle drinking the contaminated stock well water (EEG, 1989, p. 101). They stated that the reported concentration in the draft SEIS is equal to that estimated using one day of drinking the water. They stated that the concentration of lead in beef after 200 days of drinking the water is 191 times higher than that reported. Consequently, the daily intake of lead by humans is 2.79×10^{-3} milligram per kilogram per day instead of the reported value in the SEIS of 1.46×10^{-5} mg/kg-day. They calculated the hazard index to equal 6.4 which indicates that the reference level is exceeded in this scenario.

7.14-50 **Response**

The factor of 4.2 for lateral dispersion was used for the Case II studies (37 for Case IIA) reported in the draft SEIS for stable lead as well as for radionuclides (See draft SEIS, Table 5.56 and text on the same and next pages.). A two-dimensional modeling of the transport of contaminants has been run in this SEIS as Cases IIA (rev) and IIC (rev). The updated version of the SWIFT-II code described in Subsection 5.4.2.6 of this SEIS calculates the lateral spread of the contaminant plume explicitly. The result is a more realistic treatment of the transport of stable lead and radionuclides in the Culebra.

Using this version of the code, the concentration of lead in the stock water is decreased to 1.5 milligrams per liter in Case IIC (rev).

The concentration of lead in beef in the draft SEIS is calculated correctly because the transfer factor from lead in water to beef is a steady-state value that is independent of the number of days the cattle drink the water. The hazard index is calculated correctly in the draft SEIS and indicates that the levels are below health-based reference levels. The explicit incorporation of lateral dispersion in two-dimensional modeling results in a decreased hazard index from this scenario in the draft SEIS.

7.14-51 **Comment**

Commenters questioned the DOE's performance analysis as follows: "What would the DOE do if the deficiencies in their methodology were drastic? For example, the WIPP site blows up due to the generation of explosive gases as the temperature inside the drums got hotter. Such a scene might actually have happened in the Ural Mountains to the Soviets. Does it not behoove the DOE to take the time, spend the money, do all the testing they need to, get all the independent and unbiased scientific verification that would corroborate the safety of WIPP prior to the emplacement of full-scale operation amounts of waste?"

7.14-51 **Response**

Analytical and calculational performance analyses must be used to determine the long-term performance of the WIPP because it is inherently impossible to determine this performance experimentally. Experiments serve to supply data used to calculate the properties of the materials involved, to indicate the relative importance of various physical phenomena involved, and to verify the applicability of the calculational codes used over the short term.

Because the future cannot be predicted with complete assurance, the EPA has prescribed additional requirements, called Assurance Requirements (40 CFR 191.14) that attempt to ensure safety in ways that are unrelated to the predictions of the performance assessments, and therefore offer a redundant form of safety. For example, 40 CFR 191.14 requires active institutional control of the site for as long as practicable and also requires that the site be monitored after disposal to detect substantial and detrimental deviations from expected performance.

The 1957 incident in the Urals was a chemical explosion in a waste bed. The WIPP Waste Acceptance Criteria (WAC) have been developed to preclude this or similar possibilities at the WIPP. For instance, these criteria prohibit the inclusion of explosive and pyrophoric materials or compressed gases in the waste. (See SEIS Appendix A and Subsection 2.3.1.) The generation of gases such as hydrogen and methane cannot, however, be completely precluded; the WAC can only require that individual waste drums, boxes, and containers be vented. The possible build-up of explosive mixtures of hydrogen (or methane) and oxygen in the disposal rooms and panels is discussed in the responses to comments 7.14-3 and 7.15-5. Even if such mixtures should accumulate in the disposal areas, and even if these gases should be ignited, the seals in the accessways are too massive to be moved. Such an explosion could only occur once because it would exhaust the room or panel of its oxygen.

The site and the proposed repository have been studied a great deal since the 1980 FEIS was published (see SEIS Section 4.0 and Subsection 5.4.2 and Appendices E and I), adding considerably to the basic knowledge and understanding of the site. The proposed Test Phase would further add to this information.

The DOE regularly seeks independent and unbiased review and verification of its studies and analyses. The Groups that have provided independent review for the WIPP project include the EEG, the EPA, the WIPP panel of the National Academy of Sciences, and the WIPP Blue Ribbon Panel. The roles of these groups are discussed in Subsection 10.3.

7.14-52 **Comment**

The EPA asked that the final SEIS contain a "lifetime" for a waste disposal room, saying that this is a critical factor in the interplay of factors such as gas pressure and brine inflow.

7.14-52 **Response**

The times of significance for a waste room are the times needed for closure, for saturation with brine, and for pressurization to lithostatic pressure. The room itself, of course, is there forever.

Closure time is calculated to be in the range of 60 to 200 years. With a final void volume per room of 123 cubic meters (Table I.2.1), and a brine inflow rate of 0.1 cubic meters per year per room, a room would fill with brine in 1230 years, assuming no resistance to inflow by gas pressure.

The rate of gas generation is estimated as up to 0.85 moles per drum per year from bacterial action and 1.70 moles per drum per year from corrosion. In the early history of the closed room, corrosion will be precluded by absorption of the incoming brine in the backfill, and only bacterial action will generate gas. Then, with 7000 drums of waste in a room, the rate of gas generation is no more than 0.85 x 7000 = 5950 moles per year. The number of moles of gas needed to fill the residual room volume to a pressure of 14.8 MPa (148 atmospheres) is, by the gas equation

$$N = PV/RT = (148 \times 1.23\times10^8)/(82 \times 300) = 7.14\times10^5 \text{ moles.}$$

Then, dividing by 5950, the room will take at least 120 years to pressurize to lithostatic pressure.

7.14-53 **Comment**

The Scientists' Review Panel (SRP) believes that 1) inflowing brine will mix with the waste to form a slurry available for transport; 2) gases will be generated; 3) room closure will pressurize the slurry; 4) even without pressurization, borehole intrusion will bring waste to the surface in quantities above EPA standards, or with pressurization additional waste will be driven to the surface; 5) seals will not be able to isolate the slurry within individual rooms; 6) this slurry will rise in the [poorly sealed] shaft to the Rustler aquifer; and 7) solution channel hydrology will allow this now contaminated Rustler water to move very quickly to off-site points.

7.14-53 **Response**

This scenario depends primarily on a large quantity of brine inflow from the Salado and an interaction of the brine with the waste to form a slurry. The basic argument is this: The SRP believes that the permeability of the Salado Formation is 10 times as great as the 10^{-20} square meters (10^{-8} darcy) value used in this SEIS, and that therefore the brine inflow will be correspondingly greater, 380 cubic meters per room in 100 years instead of 43 cubic meters. Such a volume would not be absorbed by even 50 percent bentonite in the backfill. They then assert that this free brine will interact with the waste to form a slurry.

The key issue is, what is the permeability of the Salado Formation? The SRP relies on a short paper by Bredehoeft (1988) that summarizes DOE data, showing "permeability measurements ranging from 10^{-3} to 10^{-10} darcy, with the average near 10^{-7} darcy [10^{-19} square meters]." The SRP uses this 10^{-7} darcy figure in their analysis. Bredehoeft himself, however, concluded, as does the DOE, that a figure of 10^{-8} darcy [10^{-20} square meters] fits the moisture influx data better. He says, "Many of the higher permeability values are believed to be the result of this near field disturbance [i.e., the disturbed rock zone]."

The SRP asserts without further argument that brine will interact with the waste to form a slurry. The DOE finds this unreasonable: a slurry is a mixture of fine particles in a liquid (brine) in which the solid material is carried along as the liquid moves. There is no mechanism for the waste to be so comminuted.

The DOE agrees that gases will be generated as the SRP says, that an intruding borehole will bring waste material to the surface, and that an incompletely healed disturbed rock zone in MB 139 may constitute a pathway around as well as through tunnel and shaft seals, although the latter would simply be a higher-permeability path rather than an open channel.

The SRP says that "hydraulically driven liquid waste will seek escape around engineered barriers and through permeable tunnels and seals . . . allow[ing] water to bypass and enter the shafts" at rates of 1.5 gallons per minute, or about 3000 cubic meters per year. The resultant velocity of flow is too small to carry any but very small particles. A flow of 1.5 gallons per minute is 9.5×10^{-5} cubic meters per second. A 1-foot diameter drillhole would have an area of 0.073 square meters. Then, assuming salt filling this hole, leaving a porosity of 5 percent, the velocity of flow is:

$$9.5 \times 10^{-5} / (0.73 \times 0.05) = 0.026 \text{ m/s}$$

So slow a fluid velocity will only carry along particles of less than 400 μm diameter. These would be equivalent to small sand particles. Flow through any larger flow path, such as through MB 139 past an accessway seal, would be at smaller velocities, which could only carry still smaller particles.

The DOE does not agree that "the Rustler aquifer contains soluble beds [at the WIPP site] that have been involved with near-surface dissolution and [that] these beds have developed a solution-channel hydrology with high transmissivity and a possibility of fast travel time for radionuclides." Karst is present in Nash Draw to the west, but not at the WIPP site itself (see Subsection 4.3.3). Extensive measurements do indicate the presence of a transmissivity flow field downstream of the site that is dominated by fracture porosity. However, this is not "solution-channel hydrology" or karst, and the effect of the fractures has in any case been taken account of by a transport code (SWIFT II) that handles dual-porosity flow explicitly.

7.14-54 **Comment**

The EEG pointed out that Appendix I incorrectly referenced Table 5.7 instead of 5.59 on p. I-18; Figure I.1.2.1 referenced in the text on p. I-7 should have been Figure I.1.1, and the first entry on Table I.1.3.1 should have been Plutonium^{238}.

7.14-54 **Response**

Subsection I.1.3.5, paragraph 1, now refers to Table 5.68 (was 5.7). The section on influence functions in Subsection I.1.2.1 now refers to Figure I.1.1 as it should. The first entry in Table I.1.1 (was I.1.3.1) is now to plutonium-238, not to plutonium-239.

7.14.1 METHODOLOGY AND DATA SELECTION

7.14.1-1 **Comment**

Commenters stated that considering only solubilized and insoluble/adsorbed states for radionuclide transport would be incorrect in light of recent research demonstrating that colloidal transport of suspended precipitates is also an important mechanism.

7.14.1-1 **Response**

The statement that colloidal transport of radionuclides such as plutonium is potentially a significant transport mechanism in both the Salado and Rustler Formations is correct. The SEIS uses preliminary estimates of radionuclide solubility of 10^{-6} molar and 10^{-4} molar. The text indicates that the solubility could range from 10^{-3} molar to 10^{-9} molar, depending on the influence of such factors as adsorption, sorption, and colloidal or other transport by suspended particles. Experiments to evaluate the importance of these factors and others have been proposed for the Test Phase.

7.14.1-2 **Comment**

A commenter noted that throughout Subsection 5.4 (Summary, Decommissioning and Long-Term Performance), in calculating the health risk and exposure levels to humans from possible releases, the SEIS uses tables devised by the International Commission on Radiological Protection. The commenter asked if these tables are a standard accepted by environmentalists and health practitioners?

7.14.1-2 **Response**

Yes, these tables are internationally accepted. They have been adopted by national scientific organizations such as the National Council on Radiation Protection and Measurements and The National Academy of Sciences. They have been incorporated into the regulations of the Nuclear Regulatory Commission, the EPA and various States. They have also been adopted by the DOE for assessing radiological exposures to workers.

7.15 MITIGATION MEASURES

7.15-1 **Comment**

A group of commenters noted that two SEIS scenarios indicate WIPP failure to comply with EPA standards and stated that the document must address the location of treatment facilities and the use of backfill materials and engineered barriers that would be used to attain compliance. The commenters also inquired about the cost of implementing these measures. The EEG questioned why any decision regarding waste processing would be postponed, and why treated wastes are not included in the experiments.

7.15-1 **Response**

Regarding the scenarios that indicate failure to comply with the standards, see the response to comment 7.14-8.

Immobilization, incineration, and compaction are potential waste treatment processes for enhancing the waste form, should that be determined necessary or desirable based upon results of evaluation of engineered alternatives and tests to be conducted during the proposed Test Phase. Since the draft SEIS, the DOE formed an Engineering Alternatives Task Force to evaluate potential waste form treatments, facility design modifications, and regulatory compliance approaches that may be evaluated during the Test Phase. Efforts are being accelerated to allow potential treated waste during the bin tests. Costs and conceptual feasibility would also be evaluated.

Several waste treatment methods exist, such as: incineration, immobilization, grouting, cementation, use of absorbants, polymer solidification, and vitrification. Subsection 6.4 of the final SEIS discusses waste treatments in detail. During the proposed Test Phase, an evaluation would be made of the need for waste treatment, as well as specific method(s) to be utilized. The DOE will issue another SEIS at the conclusion of the Test Phase and prior to a decision to proceed to the Disposal Phase; such a SEIS would analyze the system-wide impacts (including those from retrieval, handling, processing, and transportation) of disposal of post-1970 TRU waste in the WIPP. Such NEPA documentation would analyze the system-wide impact of proposed waste treatments and/or engineering modifications.

Backfill is one type of engineered barrier. Current plans are to use salt backfill; it would probably contain about 30 percent bentonite to absorb brine inflow and might also contain additives (getters) to absorb gases generated in the waste by bacterial action and corrosion. The exact composition of this backfill will be determined using results obtained during the Test Phase. The other type of engineered barrier that is currently proposed is the shaft and tunnel seals used to isolate individual panels of the repository from each other and the environment. The DOE is assessing the need for a third phase of experiments using treated wastes. Future needs for additional test bins and drum-volumes of actual CH TRU waste will be based on: preliminary test results and perceived data needs. Details of Phase III tests will be incorporated into a future, separate Test Plan addendum (Molecke, 1990). Also, see the response to comment 7.11-8.

7.15-2 <u>Comment</u>

The EEG questioned why experiments for gas generation are being proposed when the draft SEIS text (page 6-2, line 3) states that gas getters will solve the problem. It noted that the text states "other experimental results could identify the need for other treatments" and asked what kinds of results could prompt other treatments.

7.15-2 <u>Response</u>

The draft SEIS does not say that getters <u>will</u> solve the problem of gas generation, only that they "could be selected as a mitigation measure." Potential measures such as gas getters would be evaluated during the proposed Test Phase, and feasibility evaluations are currently under way. See the response to comment 7.15-1 for a discussion of the efforts underway by the Engineering Alternatives Task Force which is evaluating actions which could be taken depending on results of Test Phase experiments.

7.15-3 <u>Comment</u>

The EEG asked what other materials, including getters, are being considered for backfill given that the SEIS only refers to a 70:30 crushed salt-bentonite mixture with yet unidentified gas getter(s).

7.15-3 **Response**

A salt-bentonite mixture provides the benefit of being both chemically and physically compatible with the surrounding host rock and being very sorptive of brine. Salt-bentonite is therefore the mixture that is being most seriously considered as a fundamental backfill material. However, the DOE may yet decide, as the result of experiments in the Test Phase, that other materials should be added as getters for absorbing gases or for changing the chemistry of corrosion or bacterial action. Other possible materials are identified in Subsection 6.3.2.2.

7.15-4 **Comment**

The EEG called the draft SEIS statement misleading (page 6-5) in that "The reason for backfilling WIPP disposal rooms and access tunnel systems . . . would be to shorten the estimated 'time for closure' of the disposal room," because this is not the sole reason for using backfilling. It stated that "getters, such as bentonite, are used to retard radionuclide movement after a hydrological breach." It was also noted that the EPA requires engineered barriers and that backfill is the only engineered barrier planned for the WIPP at the present time.

The EEG asked what the mechanism is for more rapid entombment of the waste exclusive of brine sorption and minimized gas production. It stated that it seemed that the authors favor the use of gas getters rather than bulk backfill materials.

7.15-4 **Response**

Backfill is indeed one kind of engineered barrier. It would probably contain bentonite to trap inflowing brine and it may well contain other getters to absorb some of the gases generated by microbial action and corrosion. As mentioned in the FEIS (DOE, 1980) (page 8-22), it would also reduce potential fire hazards. Seals in tunnels and shafts are another kind of engineered barrier being planned.

Brine sorption and minimization of free gases were the mechanisms that the DOE had in mind when the sentence quoted from was written. These two mechanisms should decrease the backpressure during the later stages of room closure.

7.15-5 **Comment**

The EEG stated that the draft SEIS did not discuss worker safety, if, after the first panel is sealed, it becomes pressurized due to gas generation and the bulkhead is blown out prior to closing the mine. (Estimates of potential pressures were requested.)

The EEG also questioned whether drums could contain explosive gas mixtures during retrieval, if retrieval becomes necessary.

7.15-5 **Response**

Realistic gas generation potentials during the Disposal Phase are 0.5 moles per drum per year from bacterial action, 0.05 moles per drum per year from radiolysis, and 1.7 moles per drum per year from corrosion, if water is available (Slezak and Lappin, 1990). The brine inflow rate in early years (43 m^3 per room in 100 years) is expected to be absorbed by bentonite in the backfill. Therefore, there will be little or no corrosion and little or no hydrogen from corrosion produced in these early years.

The buildup of other gases from radiolysis (mostly hydrogen) and bacterial action (mostly methane and carbon dioxide) would continue unabated and, at the end of the 20-year Disposal Phase, would amount to:

$$Q = \frac{.55 \text{ moles}}{\text{drum-yr}} \times \frac{90000 \text{ drums}}{\text{panel}} \times \frac{22.4 \text{ L}}{\text{mole}} \times \frac{\text{m3}}{10^3 \text{ L}} \times 20 \text{ yr}$$

$$= 2.2 \times 10^4 \text{ m}^3 \text{ of gases at STP (per panel).}$$

These gases would be contained in a waste-filled panel that is half-closed from salt creep with a remaining void volume of about 15,000 m^3, resulting in a partial pressure of these gases of 1.5 atmospheres or 22 psi, well under the lithostatic pressure of 2200 psi.

An assessment has also been made of the potential for the burning or detonation of these waste-generated gases (see Appendix F.3.3). The essence of this analysis is that:

- Concern with the accumulation of flammable or detonable gases is limited to those conditions where sufficient oxygen is also present, i.e., at least 5 percent oxygen by volume for hydrogen and 12 percent for methane.

- The flammability limits of hydrogen and methane, given sufficient oxygen present are about 4 percent for hydrogen and 5 percent for methane. In addition, a large enough volume has to be present for a flame front to make the transition to a detonation.

- An ignition source is assumed.

Because all containers shipped to the WIPP would be vented, not enough of either of these gases would accumulate in them to be a hazard during transportation, during waste handing and emplacement, or during retrieval if that were necessary. In the Test Phase, four of the five waste-containing alcoves would be in anoxic environments, i.e., little or no oxygen would be present; therefore, these experiments are not a significant operational safety concern. There would be oxygen in the remaining alcove, but not enough hydrogen or methane would accumulate for the mixture to be flammable.

In the Disposal Phase, rooms would be closed with bulkheads as they are filled. As gas is generated in these rooms, an equal volume of the mixture of gas and air already present would be displaced out past these bulkheads. At the time the panel is filled, the first room filled would have the highest concentration of gas, estimated at 3.4 percent methane and 0.7 percent hydrogen, both gases being below flammability limits. When all rooms and accessways in a panel are filled, each entrance to the panel would be sealed with a massive plug. Hydrogen and methane would continue to accumulate in the open space above the backfill in the panel.

The potential consequences of a detonation within a sealed panel have been calculated, assuming an optimal (worst-case) mixture of methane and oxygen in the open space above the backfill. A flame front was assumed to start at the far end of the head space in an accessway, which makes the transition to a detonation front before reaching the massive seal. The resultant pressure on the seal, although with a peak pressure of about 800 psi, would be of very short duration, dropping to 120 psi within a third of a second. The concrete of the end plugs of the seal is a very dissipative medium and would attenuate the shock wave so that the plug would not move. The shock wave would form cracks in the salt surrounding the seal, but these cracks would be only 1 or 2 feet in length (Slezak and Lappin, 1990) which is shorter than those already expected in the disturbed rock zone (See Subsection 4.3.2.4) of 3-15 feet.

In summary, flammable gases will be generated by the waste stored at the WIPP, but these gases are not expected to result in significant consequences during the Test Phase, retrieval at the end of the Test Phase (if that becomes necessary), Disposal Phase, or long-term performance.

7.15-6 <u>Comment</u>

A commenter said that as an alternative to incineration, volume reduction of the waste by compaction should be considered. Compaction will allow more efficient utilization of TRU waste storage capacity. Supercompaction has been demonstrated to give very high volume reduction efficiencies abroad and more recently at utilities in the United States. Shredder/compactor reduction factors of 13 to 15 are possible. Incineration can reduce volumes by factors of 10 to 20, depending on the material being processed. The volume reduction benefit of incineration will not be as great if the volume of the spent scrubbing solution is accounted for. In addition, ash solidification will also reduce the volume reduction factor.

7.15-6 <u>Response</u>

See the response to comment 7.10-1 and Subsection 6.4.

7.15-7 <u>Comment</u>

The EEG, the EPA, and others stated that the discussion of mitigative measures in the draft SEIS is incomplete and too general to be useful in determining what measures are really available and how each measure would provide specific mitigation at the WIPP. The draft SEIS implies that needed mitigative measures would be implemented with automatic success; however, too many decisions regarding mitigative measures are yet to be made. More specific information on the proposed mitigative measures (including costs) is needed for both the decision maker's and public's review and comment. Specific comments included the following:

- The final SEIS should provide additional details on the engineering modifications available for use at the WIPP, and experiments should be performed to better define the potential benefits of these engineering modifications.

- In regard to mitigative measures relating to the geology and hydrology of the WIPP site, the draft SEIS and Test Plan do not discuss the proposed experiments that would provide information for developing mitigative measures. Furthermore, the draft SEIS does not discuss the criteria or any independent review procedures for evaluating the Test Phase information, and no promise is made that maximum mitigative measures would be implemented.

- The final SEIS should analyze specific mitigative measures for the environmental, public health and safety, and socioeconomic impacts that are identified. This analysis should include any impacts of long-term, on-site waste storage at existing DOE facilities and any direct or indirect impacts of developing a long-term, surface storage facility.

7.15-7 **Response**

Certain mitigative measures (e.g., seal designs) are being studied in ongoing research and development activities at the WIPP, and the proposed Test Phase is designed to provide information for the development of other mitigative measures (e.g., waste treatment and backfill modifications). The results of these research and development activities and the Test Phase would be documented appropriately and reviewed by the EEG, the EPA, and the WIPP Panel of the National Academy of Sciences. The discussion of mitigative measures in the SEIS is as specific and detailed as possible and is primarily intended to provide the current status of all mitigative measures. The DOE is committed to implementing whatever mitigative measures are necessary for complying with all applicable regulations and standards, and will consider applying additional measures that may be beneficial. At the conclusion of the Test Phase, another supplement to the EIS would be prepared. Also, compliance with radiation protection standards issued by the EPA for the disposal of TRU waste (40 CFR Part 191, Subpart B) would be determined. The Test Phase would also provide data to verify the WIPP's demonstration that there would be no migration of hazardous constituents as required under the RCRA Land Disposal Restrictions (40 CFR 268). If there were a determination of compliance with the EPA standards and other regulatory requirements, and a favorable Record of Decision on the new SEIS, the WIPP would move into the Disposal Phase.

Mitigative measures for impacts associated with long-term, on-site waste storage at existing DOE facilities or developing a long-term, surface-storage facility are not within the scope of this SEIS and are being addressed separately. Also see the response to comment 2.2-6.

7.15.1 ENGINEERING MODIFICATIONS RELATED TO GEOLOGY

7.15.1-1 Comment

A group of commenters stated that the SEIS acknowledges that the disturbed rock zone (DRZ) may provide a means for fluid to bypass seals and that the only means of mitigating this potential discussed in the SEIS is removal of the DRZ. The commenters noted that it seems that the DOE "does not really know how to deal with this problem" and that the risks are too high for an attitude of "let's try it and see if it works."

7.15.1-1 Response

The development of fractures called the DRZ is common in underground mining. The processes of excavation, ventilation, and salt creep all contribute to the development of the DRZ. A major reason for locating the WIPP in a deep, natural geologic salt deposit was the long-term potential of salt to encapsulate waste and heal induced fractures. This self-healing behavior of salt creep on fractures under pressure has been observed. During operations, the main impacts of the DRZ are on maintenance of the underground area and worker safety. Rock bolts and wire mesh are being used to control the fracturing for safety reasons. Other impacts are hydrological (increased near-field permeability) and the development of a sink structure for gas and brine in the DRZ (Subsection 6.3.1).

The DOE is continuing to evaluate plug and seal construction. Almost all seal tests so far have been small scale. (Data on the small scale seal tests are included in Appendix E.8.) Large-scale seal tests are proposed during the Test Phase. There is also a variety of other sealing system activities. Case IC has been added to the analyses reported in Subsection 5.4.2.5 to estimate the release from near-failure of the shaft and tunnel seals.

7.15.2 ENGINEERING MODIFICATIONS RELATED TO HYDROLOGY AND WATER QUALITY

7.15.2-1 Comment

A group of commenters stated that "DOE floats the idea of 'storing sludges containing nitrate apart from waste containing cellulosic materials.'" They asked if such waste separation is realistic, where it would be done, and how it would occur without presenting additional risks to workers?

7.15.2-1 **Response**

The DOE agrees that segregation of wastes may not currently be realistic across the entire system, but it is an option that should be kept in mind as at least a possibility. The DOE will continue to evaluate this possibility throughout the Test Phase.

7.15.2-2 **Comment**

A group of commenters stated that the draft SEIS concedes, at least in Subsection 6.3.2.2, that backfilling of all waste-filled rooms may be necessary. Yet, the DOE has not analyzed the costs involved, the changes to a waste emplacement time schedule which might be involved or any of the other environmental impacts associated with the need to do such backfilling systematically at the WIPP.

7.15.2-2 **Response**

The DOE fully intends to backfill all open spaces in the disposal rooms, access ways, and shafts before decommissioning the WIPP. The environmental impacts were included in the assessments in the FEIS (Chapter 9), and are included in the assessments in the SEIS (e.g., Subsections 5.4.2.4 and 6.3.2). The cost and time requirements have been factored into the WIPP operational schedules and current budget projections.

7.15.2-3 **Comment**

Commenters expressed concern over the effectiveness of the room and shaft seals and plugs over the long-term performance of the repository. Other commenters questioned the possible use of backfill and the EEG stated that "the feasibility and problems of various engineered modifications should be given now rather than postpone it for several years."

7.15.2-3 **Response**

The feasibility and problems associated with engineering modifications are being studied by the Engineering Alternatives Task Force as discussed in the response to comment 7.15-1. Information on gas generation from experiments is necessary to determine the need for some potential engineered modifications to the facility. This information would be considered in determining if waste treatment is necessary. Facility performance, engineering modifications, and mitigation by waste treatment is further discussed in Chapter 6 of this final SEIS.

All panels and shafts would be sealed in order to eliminate, to the degree possible, the pathways through which waste material might migrate to the overlying Culebra water-bearing zone or even the ground surface itself. Seals would be emplaced, isolating each panel of rooms and access tunnels after they have been filled with waste and backfill material (Figure 6.1). Seal systems would be emplaced in the four shafts after the underground facilities are sealed and backfilled. Crushed salt is the primary component for the seals to be used to ensure long-term effectiveness. (See Appendix E.9.)

Reconsolidated crushed salt would approach the properties of the in-situ salt rock when creep closure of the surrounding drift further consolidates this material. Poured and tamped material or precompressed salt blocks are possible choices for the form of the reconsolidated crushed salt.

The seal design would probably consist of crushed salt retained by rigid end caps. The end caps would be present only to retain the preconsolidated salt in place until tunnel closure causes it to achieve final density. Where fractures in MB139 are critical to seal locations, the fractures could be filled with an anhydrite-compatible grout or eliminated by over excavation.

Seal and plug studies would continue in the proposed Test Phase, (Activities S.2.1, S.2.2, and S.2.3) and it would be unreasonable to expect the DOE to specify final plans on such an important matter until all possible information is in hand.

The disposal rooms and access tunnel systems would be backfilled to shorten the period of time required for closure. Various types of backfill may be used to speed entombment, absorb brine, and minimize gas generation. Under consideration for backfill material are crushed host-rock salt and a 70:30 mixture of crushed salt and bentonite. Additives or "getters" may be included in the backfill material to adsorb gases. Current plans propose that access ways, tunnels, and waste-filled rooms be completely backfilled after waste emplacement and prior to final closure of shafts. More research on these issues would be conducted during to the Test Phase. Further discussion regarding seals and backfill design is presented in Subsections 6.3.1 and 6.3.2 of the SEIS and Section 4.9.2 of Lappin et al. (1989).

Release scenarios simulating the performance of both an undisturbed and disturbed repository have been modeled. The release scenarios for the undisturbed repository provide an estimate of the impact of seal and backfill effectiveness during long-term performance of the repository. These simulations are presented in Subsection 5.4.2.5 of the SEIS. The numerical simulation assumes that the repository is brine saturated and under a driving force equivalent to lithostatic pressure. Under these conditions and expected seal and backfill performance, radionuclide migration did not reach the Culebra aquifer for 4,800,000 years, (Case IA). Under degraded conditions (i.e., the seals did not meet expected performance), the migration time to the Culebra aquifer was 27,000 years. With near-complete failure of the seals, radionuclides reached the Culebra in 400 years and the WIPP-site boundary in 180,000 years (Case IC).

These deterministic simulations strongly suggest that the repository seal and backfill system would perform effectively during the long-term post-operational period.

7.15.2-4 **Comment**

The draft SEIS discusses mitigative measures for the cracking of Marker Bed 139. Commenters asked why there was no similar discussion for Marker Bed 138.

7.15.2-4 **Response**

See the response to comment 7.14-44.

7.15.3 **WASTE PROCESSING OR TREATMENT**

7.15.3-1 **Comment**

A few commenters asked if the vitrification processes being developed at Hanford Reservation and the Savannah River Site could be used to enhance the TRU waste forms prior to emplacement at the WIPP. Other commenters stated that since the draft SEIS states that the technology is "not considered adequately developed for current application specifically to TRU wastes," it has no place in the SEIS.

7.15.3-1 **Response**

Incineration and glassification (vitrification) processes may eventually prove suitable for treatment of TRU waste (see SEIS Subsection 6.4 for additional information). Regarding the Hanford Reservation process, however, work is directed at high-level waste treatment. High-level waste is a liquid waste containing most of the fission products from nuclear fuel reprocessing. In contrast, most of the TRU waste (all of the stored waste) expected for emplacement at the WIPP is solid waste, and the glassification process would require considerable additional development for application to this waste.

Mound Laboratory has purchased a commercially available furnace and demonstrated incineration and glassification of solid low-level waste. This technology may be applicable to TRU waste. Although the resulting waste forms are more stable, the radioactive decay characteristics of the waste remain unchanged. However, the scale of demonstration is still relatively small (23 kg/hr), and additional development would be required to apply it to the waste forms intended for emplacement in the WIPP.

Also, see the response to comment 7.15.3-5.

7.15.3-2 **Comment**

The Roy Process was suggested as a method of transmuting long-lived radioactive waste isotopes (such as those in wastes intended for emplacement in the WIPP) into short-lived radioisotopes. The process should be considered as a waste treatment alternative.

7.15.3-2 **Response**

The waste treatment alternatives discussed in Subsection 6.4.1 of the SEIS (i.e., incineration, immobilization, and compaction) have been demonstrated in full-scale operation in radioactive waste processing applications. Additional communication with Dr. Radha Roy, the originator of the Roy Process, has established that the Roy Process has been developed on a theoretical basis but has not been demonstrated in the laboratory or on a production scale. Therefore, the process is not considered available to address the treatment of waste at this time and consequently has not been included in the SEIS as a treatment technology that may be employed during the Test Phase. The Engineering Alternatives Task Force will continue to evaluate treatment technologies as they become available.

7.15.3-3 **Comment**

One commenter suggested a specific integrated process for waste treatment, including sorting, incineration, metal sizing (by cutting to stackable shapes), intense compaction, and grouting. The integrated low-level waste disposal facility involves placement in engineered, aboveground, earth-mounded, concrete disposal vaults.

7.15.3-3 **Response**

SEIS Subsection 6.4.1 discusses the current development status of radioactive waste incineration, compaction, and immobilization (grouting is included in this topic). The SEIS does not discuss waste sorting or metal sizing operations, but these physical operations are applicable to TRU waste. The DOE recognizes the uniqueness of the integrated low-level waste disposal facility, the Darnell and Larsen concept, because it integrates these technologies into a single facility which is operated in conjunction with the aboveground vault for low-level waste disposal.

Waste treatment systems for plutonium contaminated materials are commonly built with three confinement barriers between the contaminated material and the environment. Low-level waste treatment systems are built with two barriers. Although the reported costs are relatively low, the lack of an additional confinement barrier makes the Darnell and Larsen concept inadequate for wastes intended for emplacement in the WIPP.

7.15.3-4 **Comment**

A group of commenters stated that the discussion of low-level waste treatment technologies and systems in the draft SEIS is totally irrelevant to the potential treatment of TRU waste bound for the WIPP. They also stated that this is another instance where the DOE is relying on potential future developments to correct presently known problems and that this makes it impossible for the public to assess the adequacy of the DOE's mitigation plans.

7.15.3-4 **Response**

The referenced paragraph of the draft SEIS (pages 6-10, paragraph 4) states that the emphasis of the discussion is on TRU waste processing systems, and low-level waste processing systems are only discussed as an indication of the status of development. Both low-level waste and TRU waste processing systems must be designed and developed to meet stringent emission standards and minimize operating personnel exposure with highly reliable components. Plutonium waste processing systems are generally designed with an additional confinement barrier above those used for low-level waste, but the processing hardware itself is frequently the same. Subsection 5.2.1 and Appendix P provide information on TRU waste retrieval, handling, and processing at representative DOE facilities.

The vitrification development status was described and qualified to ensure it was not misrepresented. It is a technology which has attracted much interest; the final SEIS (Subsection 6.4) has been revised to clearly indicate the pertinent TRU waste processing system information.

7.15.3-5 **Comment**

EEG stated that the TRU waste bound for the WIPP may have to be incinerated to eliminate the organic components and reduce gas generation. Commenters stated that the draft SEIS is biased toward waste incineration and that the DOE's interest in waste incineration seems to be to reduce waste volume rather than the environmental risks. These commenters believe that waste incineration involves public health and safety concerns, costs, and regulatory requirements that were not adequately addressed in the draft SEIS.

7.15.3-5 **Response**

Incineration is one of a number of engineering alternatives currently under evaluation by the DOE to minimize gas generation.

In Subsections 5.4.2.4 and 6.4 of the SEIS, three gas generation mechanisms are mentioned: biological, corrosion, and radiolytic. The effects of waste treatment on these mechanisms are summarized in Table 6.1, and incineration essentially eliminates biological gas generation. The environmental impacts of incineration or other waste treatments, and all other proposed mitigations and engineering alternatives will be addressed in the SEIS to be prepared prior to the Disposal Phase (also see the responses to comments 7.15.3-1 and 2.2-5).

7.15.3-6 **Comment**

A group of commenters stated that compaction is briefly addressed as a waste treatment technology, but it is acknowledged to result in increased gas generation due to radiolysis. They believe that suggesting a treatment technology of this nature is improper.

7.15.3-6 **Response**

Current estimates are that radiolysis may only result in 5 percent of the total gas generation, with corrosion and bacterial breakdown generating most of the gas. The cited paragraph stating the increased gas generation from radiolysis also indicates that retarded gas generation rates are expected from biological and corrosion mechanisms. The paragraph also indicates other benefits from retarded dissolution of radionuclides and heavy metals and accelerated repository closure. The net effect is a positive benefit from compaction. Compacted waste would be one of a number of engineering alternatives monitored during the Test Phase. The effects of compaction on gas generation are discussed in Subsection 6.4.

7.15.3-7 **Comment**

A group of commenters asked what the effect would be on gas generation if hot asphalt were used as an immobilizing agent and why the DOE has not chosen this technology?

7.15.3-7 **Response**

The selection of a waste solidification medium and processing is matched to the waste to be processed and considers disposal factors. Although this European technology has found some acceptance in the commercial sector, the unique wastes produced in the DOE facilities are not compatible with its use. There has also been some concern about fire safety with hot asphalt systems.

The hot asphalt process dries aqueous waste and encapsulates the non-volatile material in the asphalt. It is expected that the asphalt would become additional organic matter for biological activity. Gas generation is expected to increase because of this factor.

7.15.3-8 **Comment**

A group of commenters stated that the SEIS references West Germany's in-drum cement solidification and implies approval of this manual, open-drum process. This contradicts the earlier assertion that opening the drum for sampling is unsafe.

7.15.3-8 **Response**

Because of occupational safety considerations and DOE's philosophy of maintaining radiation exposures as low as reasonably achievable, the DOE does not propose the large-scale opening of drums of TRU waste. The nature of the DOE's operations is such that there are some relatively large volume waste streams where automated systems are justified and required. There are also some small quantity, low activity TRU wastes (a few drums per month) where manual activities can be safely undertaken with the appropriate procedures.

Subsection 5.2.1 and Appendix P describe drum sampling that would be undertaken for preparation of bins. Also see the response to comment 3.7-4.

7.15.3-9 **Comment**

A group of commenters stated that the draft SEIS presents information on a substantial cost benefit for compaction over incineration although the document seems biased toward incineration. They requested that the perceived benefits of incineration be explained in this respect.

7.15.3-9 **Response**

The additional discussion on the purpose and benefits of incineration was included because the treatment anticipated in the FEIS was slagging pyrolysis incineration at the Idaho National Engineering Laboratory. Although the slagging pyrolysis incinerator proved to be inappropriate for the task, the DOE has a rotary kiln incinerator, PREPP, which is a research and development facility designed to process retrievably stored waste which cannot meet the WIPP Waste Acceptance Criteria. (The mission of PREPP is described in Subsection 5.2.1 and Appendix P).

The specific advantage of incineration is the elimination of all organic matter and, therefore, the elimination of the gas generated by biological processes after emplacement. Incineration also facilitates compliance with the hazardous organic solvent concentration limits of the EPA's Land Disposal Restrictions (40 CFR 268). Also see the responses to comments in Subsection 3.7.

7.15.3-10 **Comment**

A group of commenters noted that the SEIS assertion of the volume reduction benefits of the Rocky Flats Plant compactor are different than the 70 to 80 percent values given in other DOE documents. Another commenter encouraged more waste minimization efforts and compaction procedures.

7.15.3-10 **Response**

The draft SEIS lists volume reduction factors (original volume divided by final volume) of 2.6 for metal waste and 6.8 for combustibles (Subsection 6.4.1.3). On a percentage basis, the 2.6 factor would be equivalent to a 62 percent volume reduction (38 percent of the original volume remains), and the 6.8 volume reduction factor would be equivalent to an 85 percent reduction. The average waste volume reduction would be a value between these two extremes and dependent on the actual mix of combustible and metal waste. The volume reduction factors presented in the SEIS and the percentage reduction values presented elsewhere are consistent.

Waste minimization involves methods of reducing the amount of waste being generated by a particular process. Waste volume reduction involves reducing the volume of waste that already exists. The DOE's encouragement of efforts to reduce the overall volume of waste at all facilities is explicitly stated as guidance in the Radioactive Waste Management Order (DOE Order 5820.2A)(DOE, 1988f). Current waste minimization efforts are directed at avoiding waste generation. Other efforts are directed at reducing waste volume after generation. A Rocky Flats Plant supercompactor is proposed to be operational in 1990. Also see the response to comment 7.10-1.

7.15.3-11 **Comment**

A commenter asked if a recently introduced process using jimsonweed as a means of selectively capturing and recycling hazardous metals and plutonium has application for nuclear waste.

7.15.3-11 **Response**

This process may eventually prove suitable for treatment of various hazardous or radioactive wastes. In laboratory cell tissue studies, Los Alamos National Laboratory research has found that prepared jimsonweed (Datura innoxia) cells have the ability to take up soluble cadmium and bind it within the plant's cells by complexation. These tissue studies were carried out on waste waters containing cadmium. Similarly, soluble plutonium was taken out of the waste water by the plant cells and bound to the external cell walls of living or dead cells. These researchers estimate that it will take more than two years to develop the process and construct a pilot plant to utilize this phenomenon for waste water treatment.

The application of this approach to the WIPP TRU waste, where the plutonium is already contained in a waste package, is not straightforward. Additional development studies may identify a way to use the biochemicals involved, but those studies have not been performed or planned. A second problem with the use of jimsonweed is that it has been demonstrated on soluble metals. The plutonium in the TRU waste is typically in an insoluble oxide form, a form which the plant cells cannot take up.

The application of jimsonweed absorption of toxic and radioactive metals is an interesting and valuable discovery, although very preliminary. It will be several years, at best, before it is ready for field application. In the meantime, Los Alamos National Laboratory researchers are continuing to seek support for further development of the process for future application.

7.15.3-12 **Comment**

The EEG and others commented that the discussion of waste treatment mitigation in the draft SEIS was incomplete and too general to be useful in determining which options are really available and how each treatment method would provide specific mitigation. Specific comments included:

- Postponing consideration of waste treatment needs and options (including design, construction, and costs of facilities) will cause a delay in the opening of the WIPP. The impact of this delay should be discussed in the final SEIS.

- The draft SEIS does not discuss the indirect, long-term benefits of waste treatment (e.g., meeting performance requirements). The draft SEIS does not discuss the specific benefits of the waste treatment options, who will decide what waste treatment is beneficial," or whether waste treatment will be performed at the WIPP or at the generator and storage facilities.

- The DOE has not considered waste treatment as a means to control source contaminants. The discussion of waste treatment technologies in the draft SEIS is virtually identical to the discussion in the 1980 FEIS even though the draft SEIS acknowledges that this discussion needs to be updated. Three treatment technologies discussed in the FEIS were not included in the draft SEIS and no explanation was provided.

- The SEIS should contain a thorough analysis of any proposed waste treatment strategies and facilities.

7.15.3-12 **Response**

The DOE agrees that more evaluation concerning waste treatment is needed, and this is one of the purposes of the Test Phase. The waste treatment technologies were presented as possible mitigating features which could be used, based on results of the Test Phase. It is true that the long-term benefit is currently quantitatively uncertain, (qualitative benefits are summarized in Table 6.1) and whether the retardation will actually resolve a repository failure is not yet known. Should waste treatment be required, the information utilized to make such a decision would also be available to quantify the benefits.

A determination of the need for additional mitigation features would not be made until after the Test Phase. Each of the waste treatment processes under consideration by the DOE gives some degree of control over source containments. Development of waste treatment systems is already being pursued by the DOE for wastes which do not meet the WIPP Waste Acceptance Criteria (WAC) (DOE, 1989e) or require processing to meet transportation requirements. Waste treatment systems, currently planned or under development, may provide treatment of TRU waste should it be required.

The treatment technologies presented are those which are developed and demonstrated to the point that they can be considered currently available for DOE use. Other waste treatment concepts are being developed, but the time periods associated with development, demonstration, construction, and regulatory acceptance are such that their inclusion at this time is unwarranted.

Controlled air and rotary kiln incineration were cited incinerator types because the DOE has constructed TRU waste incinerators of these types. Although the various incinerator types generate ash (non-combustible residue) of varying properties, the overall impact on performance in the repository is expected to be similar enough that incineration can be considered a single technology.

The draft SEIS discussion of immobilization technologies reports of then current activity on the various techniques. It stated in the subsection headed "Glass Immobilization" that there is no current activity in ceramic or slag immobilization. Similarly, there is no metal matrix waste treatment development. Therefore, these technologies were not discussed in the draft SEIS. The draft SEIS indicated that there is current DOE development activity for waste vitrification but no DOE activity in radioactive waste immobilization in polymers.

The draft SEIS devoted additional attention to incineration, because the FEIS in Subsection 5.3 recommended slagging pyrolysis incineration as the waste treatment. Subsection 9.8.3.2 of the FEIS included the environmental effects of slagging pyrolysis incinerator processing. As a result, the draft SEIS addressed the current activity in radioactive waste incineration in more detail.

The citation of six planned DOE incinerators is misleading as many of these are low-level waste incineration units. The Los Alamos National Laboratory controlled air incinerator and the Idaho National Engineering Laboratory PREPP incinerator are the only two constructed for the purpose of processing TRU waste. Subsection 6.4.1 of the SEIS has been modified to indicate the TRU waste incinerators.

Subsection 5.3 and Appendix F of the FEIS discussed the Rocky Flats Plant rotary kiln and fluidized bed incinerators in the context of one of many incineration and immobilization techniques that were considered to be available, at that time, to meet the WAC (DOE, 1989e). Subsection 6.4.1 of this SEIS also discusses waste treatment technologies in a similar context. The Rocky Flats Plant fluidized bed incinerator is a specialty, low-temperature incinerator constructed for enhanced plutonium recovery from facility scrap and combustible trash. The required RCRA permit process was initiated, but the unit is currently not operating pending a decision on whether to proceed with permitting and operation. The Rocky Flats Plant rotary kiln was a development unit which was dismantled after testing.

Controlled air incinerators are relatively simple, low-maintenance units which are advantageous for small waste generators with well-sorted waste. This is frequently the situation at DOE facilities.

The status of the development of waste treatment technologies was addressed to show that the DOE is pursuing numerous alternatives. The term "theoretically" (in reference to reducing gas generation and solubilities) was poor terminology, but the concept is soundly based. For instance, incineration of all organic materials in the waste will result in a waste form which will contain no biodegradable material, so a reduced gas generation is more than "theoretically" possible.

The DOE operates its facilities under the policy that all activities should be designed to minimize personnel radiation exposure. The DOE considers safety to be the most important factor in its considerations. Also see the response to comment 7.15-7.

7.15.3-13 **Comment**

One commenter asked how much TRU waste the Idaho National Engineering Laboratory expects to process and how much of it will go to the WIPP.

7.15.3-13 **Response**

Table 3.1 of this SEIS lists 1.07 x 10^6 of contact handled (CH) TRU waste retrievably stored at Idaho National Engineering Laboratory. Of this, approximately 318,000 ft^3 would require some type of treatment to meet the current WIPP WAC (DOE, 1989e).

7.15.3-14 **Comment**

One commenter asked what environmental documentation will be developed for the INEL PREPP incinerator, and what are the environmental effects of an accident? The State of Idaho asked if waste from other DOE facilities would be shipped to the PREPP incinerator?

7.15.3-14 **Response**

An Environmental Assessment is being prepared for the PREPP incinerator. The environmental effects of the incinerator are discussed in that document. The PREPP is a research and development treatment facility designed to demonstrate the efficacy of a process to certify certain TRU waste. Eventually the PREPP treatment technology may be used in a production facility to certify (to the WIPP Waste Acceptance Criteria) a limited volume of TRU waste in retrievable storage. The PREPP is an incineration-based technology developed subsequent to the Slagging Pyrolysis incinerator (SPI) technology discussed in Subsection 9.8.3 of the FEIS. A brief description of the PREPP process is provided in Appendix P. There are no plans for treating waste not stored or generated at Idaho National Engineering Laboratory in the PREPP incinerator.

7.15.3-15 **Comment**

One commenter asked for information on the incineration of TRU waste. This same commenter asked why the Rocky Flats Plant's fluidized-bed and rotary-kiln incinerators were not discussed in the 1980 FEIS and why controlled-air incinerators have found acceptance in the industry. Another commenter stated that incinerator accident scenarios and the effect of an incinerator accident on the general public must be considered in the SEIS.

7.15.3-15 **Response**

The Rocky Flats Plant fluidized-bed incinerator utilizes low temperature catalytic combustion and in situ neutralization of acid gases. This makes the system well suited for processing waste containing high levels of chloride without the generation of a secondary aqueous waste stream. The unit is presently not being operated pending evaluation of processing alternatives and a decision to proceed with the RCRA permitting process. The Rocky Flats Plant rotary kiln incinerator was dismantled after initial tests revealed design deficiencies which resulted in sub-standard performance.

Controlled air incinerators are simple, low maintenance units which are advantageous for small waste generators with waste that has been segregated into selected categories. This is frequently the situation in DOE facilities, so controlled air units may be a preferred choice.

7.15.4 **TRANSPORTATION**

7.15.4-1 **Comment**

Nearly a hundred commenters in New Mexico inquired about the status of proposed bypasses around New Mexico communities along the WIPP transportation routes. Many of the commenters believe that the DOE "promised" that bypasses would be in place around the communities of Roswell, Artesia, Hobbs, and Carlsbad before shipments to the WIPP would commence. Nearly all commenters expressed their concern that, without these bypasses, TRU wastes will be shipped through their communities.

7.15.4-1 **Response**

Although the DOE has committed to assisting the State of New Mexico in securing funding for highway improvements including bypass construction, the DOE is not directly involved in funding these projects. Nor, in agreements or other commitments, did the DOE "promise" that bypasses would be in place before the first phase of WIPP shipments began.

In December 1982, the DOE and the State of New Mexico signed an agreement called the Supplemental Stipulated Agreement (DOE and New Mexico, 1982) committing the agency to help the State secure $58 million in highway funding to improve New Mexico highways along the proposed WIPP transportation routes. Since then, the funding was successfully obtained by the State, and highway improvements are in progress. In August 1987, this agreement was amended, and the DOE agreed to support State efforts to obtain another $190 million for construction of highway bypasses (DOE and New Mexico, 1987). The DOE agreed to make a good faith effort immediately to join and support the State and its delegation in seeking a special appropriation from Congress of an amount not to exceed $190 million (1987 dollars) for the purpose of assisting the State in the construction of the following new roads in New Mexico that the New Mexico Highway Department has proposed for funding as WIPP project relief routes:

1) a Hobbs Relief Route;
2) a Los Alamos/Santa Fe Relief Route;
3) a Roswell Relief Route;

4) a Santa Fe Bypass;
5) an Artesia Relief Route; and
6) a Carlsbad Bypass (Eddy County Loop Route).

The agreement acknowledged that funding would be appropriated over a number of years and that, given the WIPP's schedule, funding would be needed immediately for construction of the relief routes to begin before a substantial portion of the waste started to be transported over New Mexico highways.

The DOE's good faith effort included submitting written testimony and testifying, if appropriate, before Congress in support of the appropriations. The agency also agreed to support the New Mexico delegation with information where appropriate. In addition, the DOE agreed to coordinate and cooperate with the Federal Highway Administration to enlist support of the requested appropriation and to cooperate in response to public inquires about the appropriation. The DOE has participated in all of these "good faith" efforts and will continue to support the State's request for funding to improve the roads and highways expected to carry the WIPP shipments.

Also see the response to comment 7.3.3-5.

7.15.4-2 **Comment**

Almost 30 commenters, most from in and around Santa Fe, New Mexico, expressed serious concerns about TRU waste shipments coming through their communities. If trucks must be used to transport TRU waste from Los Alamos National Laboratory to the WIPP, many ask, why hasn't a bypass been constructed around Santa Fe so that shipments won't be routed through some of the busiest thoroughfares in the city?

7.15.4-2 **Response**

The State of New Mexico has completed the first of three construction phases of the Northwest Santa Fe Relief Route bypassing the central part of the city and expects to complete the remaining parts before waste shipments would begin from Los Alamos National Laboratory to the WIPP. Part of a 25-year State transportation plan, the relief route will connect U.S. 84/285 with I-25 by a highway well west of central Santa Fe. Although the primary purpose of the bypass is to relieve traffic congestion in the city, it will also serve to route hazardous materials around congested St. Francis Drive in Santa Fe. In an environmental assessment, the State Highway Department determined there are no significant environmental impacts from construction of the nearly 14-mile bypass from near the intersection of Camino Alto and SR14, to an interchange at U.S. 84/285 near where Camino La Tierra goes over Canada Rincon.

The State also issued a summary of public comments concerned with possible hazardous materials accidents. In response to these concerns, the State examined hazardous materials transportation statistics compiled by the DOT. These statistics show that from 1971 to 1983, there were 1,300 incidents nationwide involving hazardous materials. Of these incidents, 63 percent involved flammable liquids and 25 percent involved corrosives. However, only one incident, or 0.001 percent, involved radioactive materials.

In addition to the considerable safety benefits provided by the Type B packaging in which TRU waste must be shipped, the State will rely on its inspectors, trained in detecting safety violations in trucks carrying hazardous materials, to help avert accidents which might be caused by equipment failure. In addition, the State will complete construction of the bypass in the next 5 years provided funding continues to be available. This should continue to reduce the concern expressed about transporting TRU waste through Santa Fe.

7.15.4-3 **Comment**

Many commenters ask why highway bypasses around populated areas along the WIPP transportation routes have not been constructed or other road improvement completed prior to beginning the shipping campaign.

7.15.4-3 **Response**

The construction of new highway bypasses throughout the nation solely for the transportation of TRU waste is not a realistic alternative given the number of shipments involved and the fact that TRU waste shipments are not significantly more dangerous than other hazardous materials. Where highway bypasses exist, however, the TRU waste transportation routes will include them. The DOE also stands ready to work with individual routing authorities within the States to designate alternative routes (under U.S. DOT guidelines and regulations) if these alternative routes will improve the safety of transporting defense TRU waste.

7.15.4-4 **Comment**

A number of commenters requested information on mitigation activities that would reduce the risk of transporting waste to the WIPP. Queries included: what could the DOE and States do to improve the safety of truck transport; what could be done to protect drivers from contamination in case of an accident; how to overcome "the absolute lack of adequate medical and emergency training" in hospitals along the routes; what can be done to protect schools along the routes; who will pay all the associated costs?

7.15.4-4 **Response**

In every phase of the TRU waste transportation system, the DOE has considered actions to mitigate the potential risks of transportation:

- Preparation of the waste to meet the Waste Acceptance Criteria (DOE, 1989e) for both emplacement in the WIPP and to comply with DOT safety requirements for hazardous waste transportation;

- Certification of the TRUPACT-II by the NRC as a Type B container (and plans to certify the NUPAC 72B for RH waste) complying with that agency's requirements that it be able to safely survive an accident;

- Compliance with DOT safety requirements to use interstate highways, bypasses, and State-designated routes where they exist for TRU waste shipments;

- Execution of an extensive and detailed contract with the trucking company with specific requirements on routes to be used, equipment inspections, driver qualifications and training, procedures for emergencies, and penalties for exceeding speed limits or deviating from designated routes;

- Operation of a satellite vehicle tracking system combined with two-way telephone communication to monitor the position and status of the TRU waste shipments providing the dispatcher with almost real-time capability to identify problems and dispatch assistance;

- Provision of emergency-response information and training to law enforcement, firemen, and other appropriate personnel in cities and communities along the proposed shipping routes along with procedures for the DOE to cooperate with the States in responding to accidents involving TRU waste shipments.

- Information on medical and emergency training and associated costs is presented in the responses to comments 7.12.9-1, 7.12.9-2, 7.12.9-5, and 7.12.9-11, respectively, and Appendix C.

Potential methods to make more information and medications used for treating radiation exposure available to hospitals and emergency room physicians along the routes are being considered by the DOE. In addition, the DOE will cooperate with States to comply with vehicle inspection procedures for enhanced safety. The western States are already moving to standardize inspection procedures among their jurisdictions through work done by the Pacific States Nuclear Waste Committee and the Western Governors' Association. The DOE has supported emergency response training in the affected States and expects to continue this support.

7.15.4-5 **Comment**

Several commenters wanted to know how the use of proposed bypasses for TRU waste shipments would affect the transportation risk results presented in the SEIS.

7.15.4-5 **Response**

The SEIS transportation risk analysis, in its conservatism, does not consider the benefits of new highway bypasses. Factoring this information into the assessment would reduce estimates of both radiological and nonradiological transportation risks. This is because highway bypasses generally move traffic away from more densely populated areas, thus reducing the potential for routine and accident-related radiological exposure and, by moving traffic around congested areas, bypasses tend to reduce the opportunities for accidents to occur.

Although the use of new bypasses should reduce the actual transportation risks, this information has not been used in the SEIS assessment in order to keep the analysis conservative.

7.15.4-6 **Comment**

The question was raised as to when and how often the DOE intends to monitor the level of radiation on St. Francis Drive.

7.15.4-6 **Response**

Construction of the Northwest Santa Fe Relief Route is in progress by the State of New Mexico. The bypass is expected to be complete before shipments of TRU waste would be shipped from Los Alamos National Laboratory to the WIPP. Consequently, it is not expected that TRU waste would be transported through Santa Fe on St. Francis Drive.

8.0 PUBLIC INFORMATION AND INTERGOVERNMENTAL AFFAIRS

8-1 Comment

Several commenters, including the representatives of the Southern States Energy Board (SSEB), elected officials from the State of Colorado, and agency representatives from the States of Washington and Oregon, stated the need for an extensive public outreach program that would keep State and local governments and private citizens informed of the WIPP both today and in the future.

8-1 Response

The DOE supports the need for an effective public outreach program in order to consult and inform citizens regarding transport of transuranic waste through their communities to the WIPP site. The DOE encourages the assistance of State governments in communicating with the general public. To date, the DOE has conducted public information sessions in Idaho, Utah, Wyoming, Colorado, New Mexico, Louisiana, and Mississippi. Many of these States cosponsored the public information sessions with the DOE. Many communities used these public forums to display their local emergency response capabilities along with the DOE displays. These sessions have been successful and will be continued in the future.

The DOE has conducted hundreds of meetings and briefings with State and local officials to inform them of the impending WIPP shipments and to keep them updated on the status of WIPP. At these meetings, the States have been offered emergency response training programs, public information and education programs, and training on the transportation tracking and two-way digital communication system (TRANSCOM) to track the waste shipments to the WIPP. In addition, the WIPP has established a Speakers Bureau which travels throughout the country making presentations on the WIPP to interested civic organizations, special interest groups, and schools. These programs and others would continue to be offered throughout the life of the WIPP Project and would be available upon request. The DOE is committed to a pro-active public outreach program, and encourages information exchanges to facilitate the resolution of transportation issues.

In addition, in October the Secretary of Energy distributed the draft Decision Plan for WIPP which describes the activities that need to be completed and the process for their completion before WIPP can be considered ready for waste receipt. State governors, members of Congress, Federal agencies, and other oversight groups were briefed on the Plan and their comments were requested. The Plan is revised and updated regularly as new information develops and comments are received. Revision 1 of the Plan was released in December and Revision 2 is scheduled for February. A working session with State representatives and SSEB and Western Governors Association was held in November and additional meetings will be scheduled.

8-2 **Comment**

Several commenters commended the DOE for allowing the public the opportunity to comment on the draft SEIS but expressed disappointment that the DOE did not participate in a joint discussion on the WIPP sponsored by the Albuquerque City Council, the Sierra Club, and the League of Women Voters.

8-2 **Response**

The DOE believes it has done a great deal to fulfill its requirements for public participation. In compliance with the National Environmental Policy Act, Council on Environmental Quality regulations, and DOE guidelines, the DOE held nine public hearings and received thousands of written comments on the draft SEIS during the 90-day comment period. The DOE participated in a WIPP debate sponsored by the National League of Women Voters in the spring of 1989, but did not participate in an open WIPP discussion sponsored by the League of Women Voters, Sierra Club, and the Albuquerque City Council because the DOE judged the forum to not be impartial in its staging or conduct. Appendix H has been revised to present the public input opportunities provided throughout the SEIS process.

8-3 **Comment**

One commenter stated that the best alternative is the "No Action" alternative and suggested that the existing DOE facilities become centers for public education on TRU waste activities.

8-3 **Response**

Specific centers providing public education strictly on the DOE's TRU waste activities are not warranted. However, information regarding the DOE's waste management activities, including TRU waste activities, is provided to the public in a variety of forms. For example, each DOE operations office maintains a public reading room where citizens may review various documents addressing DOE operations and waste management activities. These operations offices also have established programs for speaking to citizen groups, schools, local governments, social organizations, etc. Additional information may be requested through the Public Affairs Office of a DOE facility.

8-4 **Comment**

It was noted that there was a lack of participation in the hearings on the part of New Mexico Hispanics, and that this was due to a lack of outreach. A New Mexico State Representative and others requested that the SEIS be published in Spanish, citing the New Mexico constitution, which "requires that all materials published by governmental entities and all materials related to elections and issues of public debate be published in Spanish as well as English." It was also stated that the DOE's decision to choose a site in New Mexico for the WIPP was racially motivated (i.e., the DOE selected a site near Carlsbad because of New Mexico's large Hispanic and Indian populations).

8-4 **Response**

The DOE actively communicated with all groups that expressed an interest in WIPP transportation or disposal issues. This effort included briefings and numerous conversations with groups such as Leadership-Santa Fe, Concerned Citizens for Nuclear Safety, the Sierra Club, Americans for Rational Energy Alternatives, the Radioactive Consultation Task Force, the Committee to Make WIPP Safe, the Southwest Research and Information Center, Compadres for a Safe WIPP, and the League of Women Voters. The DOE's broad-based outreach effort to organizations interested in environmental issues in general, and WIPP issues in particular, involves New Mexicans of all ethnic backgrounds, including Hispanics.

The New Mexico State law referenced in the comment is applicable to State agencies but not Federal entities such as the DOE. Even though there is no legal requirement to publish the SEIS in Spanish, the DOE considered whether such publication was advisable. The DOE reviewed its experience with the FEIS and found that, although the FEIS Executive Summary was translated into Spanish, the DOE only received one request for it. Thus, at the time of the SEIS's publication, there was no reason to believe that publication in Spanish was warranted. The DOE is currently in the process of making a number of the WIPP general information fact sheets available in Spanish.

The DOE's decision to locate the WIPP near Carlsbad was based on technical factors (see Subsection 2.2 of the 1980 WIPP FEIS) and was not racially motivated.

8-5 **Comment**

A commenter representing the Umatilla Indian Tribe appreciated the opportunity to publicly comment on the document but "was disturbed that the Department feels that delivering a seven-inch thick document containing thousands of pages of technical information constitutes adequate consultation with the Indian tribes. . . . " The commenter also stated that the Tribe does not have the personnel nor the resources to do the comprehensive review of this document that is needed to assure the health and safety of the reservation residents.

8-5 **Response**

The DOE has made an extensive effort to keep the various Indian Tribes along the WIPP transportation routes informed of WIPP activities. WIPP status and update briefings were conducted for the Council of Energy Resource Tribes and the National Congress of American Indians in early March of 1989. In addition, the Indian Tribes were contacted to inform them of the hearings and the extension of the public comment period, and to give them the SEIS toll-free number to call if they needed further assistance or additional information. In addition, nine Indian Pueblos participated in the emergency response training program during 1988. The DOE will continue to provide the Tribes the same resources, training, and public information/outreach opportunities provided to the States throughout the duration of the WIPP Project.

8-6 <u>Comment</u>

Several commenters, including an elected official of the State of New Mexico, stated that notification of speaking times at public hearings was not adequate and that the allotted 5-minute speaking time for each commenter was not long enough and could have been extended at those hearings where attendance was less high.

8-6 <u>Response</u>

In order to accommodate the large number of individuals wishing to preregister to speak at a hearing, the DOE generally designated 7 days prior to the hearing as the cut-off period for preregistration. Once preregistration closed, the speakers were assigned speaking times, and notification cards were mailed out within 24 to 36 hours. When possible, requests for specific speaking times were accommodated. In many cases, individuals failed to leave (at the toll-free WIPP SEIS telephone number) a sufficient mailing address or phone number. This complicated the speaking notification process. Due to the 7-day cut-off and the distance between Atlanta and Albuquerque, all those who preregistered to speak in Atlanta were contacted by phone. In the case of the Albuquerque and Santa Fe public hearings, for those individuals who did not leave an address, attempts were made to contact the individual by phone. If individuals did not receive their notification cards, and missed their assigned speaking times, they were not denied the opportunity to speak, but were simply scheduled for the next available time slot.

Speaking times for all individuals were assigned on a first come, first serve basis unless the individuals specified the need to speak at a certain day and time due to a prior commitment (classes, work, etc.) The hearing procedure was standardized and generally maintained throughout all nine hearings. If attendance at the hearing was low, individuals were still confined to their 5- or 10-minute time slot in order to ensure consistency in hearing conduct and procedure at all nine hearings. Finally, the public was notified in writing and at the hearings that comments could be submitted in writing and would be provided the same consideration as oral comments. Written comments, transcripts of oral statements, and exhibits are included in Volumes 6 through 13 of this SEIS.

8-7 <u>Comment</u>

Several commenters objected to the way the hearings in Santa Fe (one of nine locations where hearings were held) were conducted. Commenters objected to the concurrent sessions, lengthy hours, and notification of a third day of hearings only 8 days in advance and in a different location from where the first 2 days of hearings were held.

8-7 **Response**

Throughout the planning for the public comment period, the DOE attempted to provide adequate opportunity for both oral and written comments. Santa Fe was one of six additional hearing locations added to the originally anticipated three, and unlike other locations, the DOE planned for 2 days of hearings because of the large number of individuals anticipated to comment orally.

As the process for preregistering commenters proceeded, 2 days of hearings appeared adequate to accommodate Santa Fe, until approximately 2 weeks before the end of preregistration. At that point, the DOE made arrangements for a third day of hearings to accommodate additional commenters. Because the facility being used for the first 2 days of hearings was not available, the DOE selected a facility that was within walking distance of the original location.

It became apparent less than a week before the end of preregistration that even 3 days of hearings might not be adequate to accommodate all potential speakers. At that point, the DOE initiated the steps necessary to ensure that all individuals who wanted to comment orally and on the record in Santa Fe be given that opportunity. Concurrent sessions were chosen as the best means to provide that opportunity.

All comments were recorded by a court reporter and presided over by an official hearing officer. In addition, concurrent sessions were held in adjoining rooms, making it possible for observers to easily attend any session of their choice. All the comments offered during these concurrent sessions were considered by the DOE and responded to in Volume 3 of this SEIS.

The length of the hearing sessions was established to ensure that adequate opportunity was provided to all members of the public who desired to speak. The DOE attempted to accommodate requests for specific speaking times, both during preregistration and at the hearings themselves. In particular, the DOE was flexible in allowing people with later speaking times to arrive earlier and, as soon as an opening was available, allowing them to speak at a time more convenient for them.

8-8 **Comment**

A few commenters stated that more effort should be made in the area of public information and outreach.

8-8 **Response**

The DOE considers its public outreach and information program to be very good, but would welcome any suggestions for further improvement. Over the last decade the WIPP has received considerable publicity and scrutiny in New Mexico and across the country. Numerous groups and individuals have monitored developments at the WIPP site since its inception. The general public has been kept apprised of site and facility plans through a vigorous public outreach campaign which includes the broad dissemination of written materials, consultations, briefings, public meetings, hearings, and media outreach. The DOE is committed to a timely and meaningful public education, information, and involvement program. Appendix H contains a detailed presentation of the activities conducted since the FEIS was published in 1980.

8-9 **Comment**

A commenter noted that from a psychological standpoint, people generally find it difficult to deal with their feelings about nuclear issues, and as a result they do not seem to have any feelings about nuclear issues at all, even though they should. As a consequence, the commenter suggested that the DOE examine its public education efforts and develop a program that helps people deal with issues of nuclear waste and its disposal on an emotional level.

8-9 **Response**

The DOE acknowledges the complexity of issues involved in the production and disposal of nuclear waste. The DOE will continue to provide all relevant information to the public about the WIPP so that each individual, according to his or her own values, can determine how he or she feels about the WIPP. Beyond communicating openly and honestly with the public about all aspects of the WIPP's operations and impacts, the DOE believes it is inappropriate with its charter to involve itself in programs designed to manage the emotions of American citizens.

8-10 **Comment**

The DOE received comments that indicated some citizens were having difficulty completing calls to the toll-free SEIS hearing registration phone line and that they would have preferred speaking to an individual rather than to an answering machine.

8-10 **Response**

After evaluating the experience of other agencies involved in public hearing pre-registration, the DOE concluded that a toll-free number, coupled with an answering machine, was the most accurate way to record requests to preregister, as the tapes which recorded registration calls would remain intact. Periodically (at least once a day), the tapes were transcribed and requests to preregister were placed in a log. On June 8, the telephone line itself went out of service and the long-distance carrier was not able to restore service for several hours. Because of the difficulty people experienced in reaching the toll-free number in the days before the cut-off date (June 8) for the Santa Fe hearing, the DOE extended the cut-off period 24 hours to give those who experienced difficulty in registering additional time to preregister once the toll-free number had been restored.

To allow callers an unlimited time to leave their message, the answering machine used on the toll-free line featured a voice-activated message system that would record as someone was speaking. However, after several seconds of silence or a pause in someone's speech, a voice-activated system is designed to end receipt of incoming messages. This feature may explain why some callers were not able to complete their calls.

For those people who wanted to talk directly with WIPP SEIS personnel, the outgoing message on the answering machine offered to have a staff person return their call if that was their preference. The DOE contacted anyone who made such a request through the toll-free number.

8-11 Comment

A commenter asked if the DOE had conducted the public awareness tour along the route from Savannah River, South Carolina, to Carlsbad, New Mexico, during this year.

8-11 Response

The DOE has offered the public awareness program to all of the States along the route from Savannah River to the WIPP. At their invitation, the DOE gave public awareness presentations in the States of Mississippi, Louisiana, and Texas. The remaining States have agreed that tour presentations should be delayed until the DOE establishes a firm schedule for TRU waste shipments through their States.

8-12 Comment

Commenters noted their appreciation for the efforts that were undertaken to notify the public of the draft SEIS and the public hearings, but they felt that, had a more extensive effort been made, more people would have participated in the public hearings.

8-12 Response

The DOE conducted an aggressive public outreach effort in support of the WIPP SEIS hearing process. The DOE used a multi-faceted approach to notify the public of all impending public hearings through public service announcements, display ads in newspapers, press releases, and press conferences. Prior to release of the draft supplement, over 1,500 copies of a fact sheet were distributed nationwide to notify the public and media of the project and upcoming hearings. Approximately 2 weeks prior to a hearing, public service announcements were sent to radio and television stations serving the local communities and outlying areas. Display advertisements were placed in local and outlying newspapers 7 to 14 days prior to the hearing. A press release was issued to all local and outlying media affiliates providing details on the hearing location, time, etc., 2 days prior to the hearing. A press conference was held the day before each hearing and included members of the radio, television, and newspaper media. In addition, locations and times of the hearings were printed in the Federal Register, as well as in newsletters published by private organizations and businesses.

8-13 <u>Comment</u>

The Environmental Evaluation Group (EEG) suggested that the following sentence be added to the section on the EEG in Appendix H: "The EEG has published 40 major reports on their investigation and analyses of the WIPP." The group added that this is far more significant than citing the number of quarterly meetings between the DOE and the EEG, which appears to trivialize 11 years of work.

8-13 **<u>Response</u>**

The DOE recognizes the important role that the EEG has played in the development of the WIPP. The statement has been added as requested in this SEIS.

9.0 OUT-OF-SCOPE ISSUES

9-1 Comment

A number of commenters provided testimony, exhibits, and written documents that were related neither to the WIPP nor to the issues considered in this SEIS. Some, but not all, of the comments dealt with such topics as:

- the motives of those who oppose the WIPP
- the Hopi Creator's Life Plan
- the need for everyone to become global citizens
- the pro-democracy demonstrations by Chinese students in June 1989
- the negative effect of uranium mining on Indians
- an invitation to species from other planets to assist Earth in resolving waste management problems
- the greed of corporate America and government officials
- computers that have been programmed to kill people
- economic conversion to peaceful industries
- the complaint about a Santa Fe newspaper that had stopped printing letters to the editor regarding the WIPP
- the epidemic of cancer brought on by an unhealthy environment
- radioactive emissions not yet defined by earthlings
- the decline of western civilization
- the award for irresponsible advertising given by Science in the Public Interest to the Coal and Nuclear Energy Institute
- the need for Americans to reduce their disproportional consumption of natural resources
- the difficulty of making technological decisions in a democratic society
- NRC certification of nuclear reactors and the lack of opportunity for public input
- mankind's redemption through prayer to the Great Spirit
- the failure of public education to train American leaders to be compassionate
- the loss of faith in government because of inaccurate media coverage of a demonstration in Nicaragua
- socially responsible financial investing
- subsidizing disposal of waste generated by commercial nuclear electric utility companies
- combined effort by Soviet Union and United States to eliminate nuclear weapons and develop nuclear waste disposal technologies.

9-1 Response

It is beyond the scope of this SEIS to address the above issues.

9-2 **Comment**

Several commenters focused on contamination produced at two DOE defense facilities, the Rocky Flats Plant and the Idaho National Engineering Laboratory. One commenter suggested that in return for letting the DOE build the Special Isotope Separation facility at Idaho National Engineering Laboratory, the DOE should clean up buried transuranic (TRU) waste that is leaking there. Other commenters provided details of environmental contamination that stemmed from operations at the Idaho National Engineering Laboratory and the Rocky Flats Plant and, in one case, purported genetic abnormalities that Rocky Flats Plant contamination has caused in the Denver-Boulder area.

9-2 **Response**

This SEIS identifies the potential environmental impacts of continuing with the phased development of the WIPP, including a Test Phase and Disposal Phase, or proceeding with an alternative. Comments on contamination, remediation efforts, and the construction of other projects at other DOE facilities are not within the scope of this SEIS, except to the extent that the WIPP may prove to provide a permanent solution for the disposal of transuranic waste stored or generated at DOE defense facilities.

9-3 **Comment**

Several commenters focused on the economic viability and environmental impacts of various energy-producing technologies. Both support for and opposition to nuclear power were expressed. Those opposed asked the DOE to modify policies favoring nuclear power over alternative, renewable energy sources and energy conservation. Energy alternatives specifically suggested for more research and development included solar, wind, geothermal, ocean thermal energy conversion, fossil fuels, wood, and gravity.

9-3 **Response**

Comments on the DOE's energy-related policies and the preference for development of one energy technology over another are outside the scope of this SEIS.

9-4 **Comment**

Commenters asked the DOE to speculate on why some New Mexico members of Congress support the WIPP and some do not. Another denied that one local Idaho party official was the representative speaker for the Republican party on Idaho National Engineering Laboratory issues.

9-4 **Response**

It is inappropriate for the DOE to speculate about anyone's position on the WIPP; the DOE is obligated to consider the comments of all individuals regardless of the validity of their claims of party affiliation.

9-5 <u>Comment</u>

A commenter claimed that "the development of the Waste Isolation Pilot Plant is based on an assumption of the torment and mutilation of animals" and that there must not be any project supported by the government which is based on the torment and mutilation of animals.

9-5 <u>Response</u>

The research and development activities being conducted at the WIPP do not now and are not planned to include experiments with live animals.

9-6 <u>Comment</u>

A commenter asked about a statement allegedly made by a DOE representative regarding potential plans to move the Rocky Flats Plant to another location.

9-6 <u>Response</u>

Any plans for moving the functions of the DOE's facility at the Rocky Flats Plant, Colorado to a new location would be outside the scope of this SEIS.

9-7 <u>Comment</u>

Many commenters expressed their anger with statements made by New Mexico Governor Carruthers that businesses that oppose the WIPP should not receive any discretionary State contracts. A New Mexico State senator and several commenters felt this was an attack on citizens' rights to free speech.

9-7 <u>Response</u>

Positions or policy statements from the governor or other State officials are State matters that are outside the DOE's jurisdiction.

9-8 <u>Comment</u>

Many commenters stated that they did not trust the Governor of New Mexico, his appointees, or committees to oversee the WIPP site. Furthermore, the commenters said that the Governor's support of the WIPP is a personal stance and not that of the State.

9-8 **Response**

New Mexico Governor Garrey Carruthers' credibility, based upon his support, remarks, and decisions regarding the WIPP project, are State matters that are outside of the DOE's jurisdiction.

9-9 **Comment**

A commenter questioned why the U.S. Government subsidizes the disposal of nuclear waste generated by commercial nuclear electric utility companies.

9-9 **Response**

Although not germane to the WIPP project, the disposal of nuclear waste generated by commercial nuclear electric utility companies is administered under the Nuclear Waste Policy Act (NWPA). The NWPA (Public Law 97-425) was enacted by Congress in 1982 to solve the high-level, commercial nuclear waste problem. The Act established a schedule for siting, constructing, and operating repositories with assurance that the public and environment will be protected as well as a fee mechanism which provides funds for direct support of the commercial waste repository program. The NWPA also assigned the responsibility for high-level waste management to the DOE. In 1987, the Nuclear Waste Policy Amendments Act named Yucca Mountain, Nevada, as the only site for characterization as a high-level nuclear waste repository and directed the DOE to site and construct a repository there subject to existing NRC licensing requirements.

9-10 **Comment**

A few commenters stated that work should proceed on developing the Yucca Mountain site for disposal of high-level radioactive waste. One commenter noted that the question of disposal of nuclear waste, both defense/government-related and commercial-related, needs to be settled before serious consideration is likely to be given to expanding commercial nuclear power.

9-10 **Response**

Although not germane to the WIPP Project, the DOE is committed to meeting its scheduled directives of site characterization, construction, and operation of a high-level radioactive-waste repository at Yucca Mountain, Nevada for disposal of both defense and commercial high-level waste.

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