

United States  
Environmental Protection  
Agency

Air And Radiation  
(6602-J)

EPA 402-R-93-072  
December 1993



# High-Level And Transuranic Radioactive Wastes

## Response To Comments For Amendments To 40 CFR Part 191



**RESPONSE TO COMMENTS FOR AMENDMENTS TO  
40 CFR PART 191**

**ENVIRONMENTAL STANDARDS FOR THE MANAGEMENT AND DISPOSAL OF  
SPENT NUCLEAR FUEL, HIGH-LEVEL AND  
TRANSURANIC RADIOACTIVE WASTES**

December 1993

U.S. Environmental Protection Agency  
Office of Radiation and Indoor Air  
Washington, D.C. 20460-0001

JAN 10 1994



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## Chapter 1. INTRODUCTION

The U.S. Environmental Protection Agency (EPA) has the responsibility of developing and promulgating the Federal environmental standards for spent nuclear fuel, high-level and transuranic radioactive wastes. Standards for disposal were first promulgated in 1985. The standards were challenged in court in 1987 and Subpart B was remanded to the Agency for further consideration. The court found that the bases for the ground-water and individual protection requirements were insufficient. Following the court decision, the Agency began developing the necessary technical bases and preparing to reissue the standards.

In 1992, the Waste Isolation Pilot Plant Land Withdrawal Act (WIPP LWA) reinstated the 1985 disposal standards, Subpart B, except for the portions that were the subject of the remand. The legislation requires the Agency to issue final disposal regulations and specifies that the regulations shall not be applicable to sites characterized under Section 113(a) of the Nuclear Waste Policy Act (Public Law 97-425).

In response to the WIPP LWA, the Agency published the proposed amendments to 40 CFR 191 in the *Federal Register* on February 10, 1993 (58 FR 7924). The proposal addressed a portion of the underground injection control (UIC) program regulations (40 CFR 144.31) and the portions of 40 CFR Part 191 that deal with individual and ground-water protection.

This document addresses comments received on the proposed regulations. Comments were initially solicited by the Agency for a 40-day period beginning with the publication of the *Federal Register* notice. In response to input from the public, the comment period was extended until April 12, 1993. Public hearings were held in Carlsbad, Albuquerque, and Santa Fe, New Mexico. In addition, written comments were received from individuals and organizations. Comments were also received on the Background Information Document and the supporting technical documents.

The comments were categorized as either policy issues or technical issues. These groups were then subdivided into the following areas:

### Policy Issues

- P1. Opportunity for Public Comment
- P2. Scope of Comments Permitted
- P3. Ground-Water Protection
- P4. Compliance With UIC Requirements
- P5. Release Scenarios
- P6. Use of Engineered Barriers
- P7. Implementation Guidance in Standard
- P8. Above-Ground Waste Storage
- P9. Potential Use of Standards at Sites Other Than WIPP

**P10. General**

**Technical Issues**

- T1. Regulatory Time Period**
- T2. Individual Dose Limit**
- T3. Background Information Document**
- T4. Economic Impact Analysis**
- T5. General**

The Agency has considered all substantive and relevant comments, both written and oral. This document summarizes the concerns expressed by the commenters and presents the Agency's response to the comments. Some comments addressed parts of the standards that are not under the purview of this rulemaking and thus are not all listed in this document. EPA has decided not to reopen, at this time, the portions of the standards which have been reinstated by the WIPP LWA. Each commenter is identified by a letter and a number after the comment. In the interest of clarity and economy, some comments are paraphrased and some closely related comments are combined. Policy issues are addressed in Chapter 2 and technical issues are addressed in Chapter 3. A list of the commenters and their identification numbers is given in Appendix A. A list of acronyms and the terms they represent are in Appendix B.



## **Chapter 2: POLICY ISSUES**

### **P1. Opportunity for Public Comment**

**Comment P1.A1:** The public comment period is too short.

(A-04,13,14,22,29,30,32,45,61,63),

(D-07,19,20,24,36,39,40,41,42,53,60,62,73,88),

(S-06,07,11,26,29,30,31,32,33,34,37,41,49, 50,54,55,59,63,75,83,88,90,93,96,101,104)

**Comment P1.A2:** The public comment period should be extended to 60 days. (S-09,22,57),

(D-53,60)

**Comment P1.A3:** The public comment period should be extended to 90 days. (S-56)

**Response (Comments P1.A1 through 3):**

In response to public comments, the comment period deadline was extended from March 22, 1993 to April 12,1993.

**Comment P1.B1:** Additional public hearings should be conducted in states other than New Mexico. (A-45,49), (D-04,08,16,20,65), (S-04,06,29)

**Comment P1.B2:** Citizens and/or agencies in Mexico should be allowed to comment on the Standard because of WIPP's proximity to the border. (S-59)

**Response (Comments P1.B1 through 2):**

The Agency believes that the most relevant comments to the proposed Standard would be in the state of New Mexico because of the research being conducted at the WIPP facility. The Agency therefore opted to accept comment via public hearings in that state. The Agency did not limit or deter any individual from commenting in written form or speaking at these public hearings. Furthermore, comments received in writing receive the same consideration as public testimony at a hearing.

**Comment P1.C1:** The revised standard should be subject to an additional review cycle. (D-04), (S-14,87)

**Response:**

The Agency believes the present process provides adequate review and is in accord with the Administrative Procedure Act (5 U.S.C. 553).

## **P2. Scope of Comments Permitted**

**Comment P2.A1:** Public comments should be accepted for the entire Part 191, not just the individual and ground-water protection portions. (A-25,32,49),(D-22,26,40,49,51,53,54,62,64,73), (S-04,08,11,28,31,33,34,51,55,56,57,59,68,69,82,89,90,92,93,94)

**Comment P2.A2:** By accepting comments only on the individual and ground-water protection requirements, EPA has violated both the intent of Congress in the WIPP Land Withdrawal Act and the ruling of the Appeals Court in the 1987 remand. (S-02,93), (D-24,71,73)

**Comment P2.A3:** New definitions in the proposed Standard affect the entire Standard. Therefore the entire standard should be open for public comment. (A-06),(D-49,53)

**Comment P2.A4:** DOE has agreed to limit the scope of its comments to the individual and ground-water protection requirements, as requested by EPA in the *Federal Register* notice and in the interest of complying with the timetable for issuing final disposal regulations. Limiting DOE's comments to these specific provisions, however, does not negate previous comments provided to EPA on four working drafts of revised disposal regulations. (D-87)

**Comment P2.A5:** EPA should review all public comments. (D-53,54)

**Comment P2.A6:** EPA should commit to reevaluate the Standard if it is ever applied to a commercial spent fuel repository. (D-77)

### **Response (Comments P2.A1 through A6):**

The EPA stated its position and reasoning for reviewing only the individual and ground-water protection requirements in the *Federal Register* notice containing the proposed rule (58 FR 7924) and has done so again in the preamble to the final rule. The Agency acknowledges the court action remanding all of Subpart B of the 1985 Standards (50 FR 38066), but also accepts the Congressional reinstatement of the original Standards with the exception of the sections being reviewed here, which were also the focus of the remand. Any regulation applicable to disposal at sites required to be characterized under §113(a) of the Nuclear Waste Policy Act of 1982 will be subject to a separate rulemaking.

### **P3. Ground-Water Protection**

**Comment P3.A1:** No explanation is given for the departure from the four millirem (mrem) dose limit in the SDWA. (S-91)

**Comment P3.A2:** A higher standard should be applied for the protection of especially valuable ground water. (A-05,09,21,59), (D-03,07,38,39,51)

**Comment P3.A3:** EPA should develop a no-degradation requirement for especially valuable ground water. (D-76)

**Comment P3.A4:** A zero-degradation criterion should be applied for ground-water protection.  
(A-22,32,34,45,49,52,53), (D-01,03,04,06,07,15,20,29,37,40,41,42,51,53,54,55,62,64,68,83), (S-03,13,14,22,26,30,31,32,33,34,38,49,51,54,55,57,58,68,82,89,94,95,96,105)

**Comment P3.A5:** Any ground-water contamination at WIPP is unacceptable. (A-30)

**Comment P3.A6:** All ground water should be protected from contamination. (S-17,38,102), (D-89)

**Comment P3.A7:** The proposed Subpart C should not be adopted. (S-14)

**Comment P3.A8:** The maximum contaminant levels (MCLs) should not be applied to any underground sources of drinking water (USDWs). Ground water is already adequately protected by the containment and individual protection requirements. (D-77)

#### **Response (Comments P3.A1 through 9):**

In the early 1980s, EPA recognized that the legal bases for protection of ground water were scattered among numerous authorities and largely undefined. In 1984, the Agency adopted a Ground-Water Protection Strategy which presented, for the first time, a consolidated statement of EPA's ground-water policy. A primary goal of this policy was to protect ground water according to its value and use. The most beneficial use of ground water is as drinking water. More pertinent to the present rulemaking, in 1986, a number of States and environmental groups filed petitions for review of EPA's standards for the management and disposal of spent nuclear fuel, high-level and transuranic waste, 40 CFR 191, 50 FR 38066. The petitions were consolidated in the First Circuit. The court issued its ruling on July 17, 1987, NRDC v. EPA, 824 F. 2nd 1258 (1st Cir. 1987) and remanded all of Part 191, including the individual and ground-water protection requirements, for further consideration of their inter-relationship with Part C of the Safe Drinking Water Act (SDWA), among other issues. The court emphasized the parallel environmental goals that exist in the SDWA and the Atomic Energy Act and found that EPA had not adequately explained

why the Part 191 standards were different from those of the SDWA. In accord with the court's findings, EPA does not believe there are persuasive scientific or policy reasons for going forward with a level of radiation protection less stringent than would apply under the SDWA. Therefore, the Agency is adopting the MCLs for radionuclides to protect USDWs outside the controlled area. This approach is also consistent with EPA's overall ground-water protection strategy ("Protecting The Nation's Ground Water: EPA's Strategy for the 1990's," EPA 21Z-1020, July 1991). Accordingly, MCLs under the SDWA are to be used as "reference points" for water resource protection efforts when the ground water in question is a potential source of drinking water. Breaching an MCL would be considered a failure of prevention. For these legal and policy reasons, the Agency believes that MCLs are the appropriate level of protection for USDWs in the accessible environment. The following discussion considers other levels of protection contemplated by the Agency.

The Agency took comment as to whether there could be some types of ground water that warrant additional protection either because they are unusually valuable or are more susceptible to contamination. The Agency had attempted to accomplish this while developing its ground-water protection strategy. The 1984 Ground-Water Protection Strategy proposed a category of ground water called Class I, which is generally characterized as both highly vulnerable to contamination and either an irreplaceable source of drinking water for a substantial population or a valuable ecological habitat. After issuing draft guidelines for ground-water classification in 1986, which further defined three classes of ground water, including Class-I ground waters, the Agency did not codify these classes but left the draft classification system as an example to assist States in their classification efforts. Comments on the draft ground-water classification proposed by EPA revealed that numerous States had established their own classification systems for ground water, usually tailored to their specific needs. For the present rulemaking, the Agency evaluated whether other Agency water protection programs used this approach and found some do but to a much more limited degree and with different purposes. One primary difficulty is in legally defining the ground water that deserves special protection in the context of a standard covering such an extended time period as does Part 191. Another difficulty is the choice of the level of protection. Some level affording greater protection than the MCLs might be set at some fraction of the MCLs. The Agency has not found or been given a convincing reason for picking any specific fraction of the MCLs as a standard in demonstrating compliance. The Part 191 standards are design standards and will likely rely upon computer modelling over extended time periods. Given the uncertainty associated with such modelling and the presumed lack of institutional controls, it will be exceedingly difficult and probably impossible to demonstrate absolutely no degradation of surrounding ground water over thousands of years.

The Agency is interested in protecting all ground water. The final rule accomplishes this by providing both individual protection requirements (40 CFR 191.15) and standards for ground-water protection (Subpart C of 40 CFR 191). (The containment

requirements at 40 CFR 191.13 protect populations from repository releases.) While Subpart C protects USDWs, the individual protection requirements limit doses delivered via all pathways of radiation exposure, except for water withdrawn from the controlled area. Thus, if ground water in the accessible environment is used for irrigation, for example, such exposures would fall under the umbrella of the individual dose requirements. Subpart C, on the other hand, covers radiation exposures delivered through a single pathway, drinking contaminated water from a USDW in the accessible environment.

**Comment P3.B1:** EPA proposes to require a disposal facility to comply with the provisions of whatever EPA drinking water standards are in effect at the time when compliance is demonstrated. This constitutes a "moving target" that will make it difficult to design a disposal facility. It is also impossible to evaluate the stringency of the proposed standards or the technical or economic practicality of achieving compliance with them. EPA should determine a fixed level of ground-water protection to codify in the standard. (D-58,78)

**Comment P3.B2:** Compliance with the ground-water protection requirements is based on a one-time assessment using the MCLs in effect at that time. If the MCLs subsequently change, a demonstration of compliance using the new MCLs should be required. (D-71)

**Response (Comments P3.B1 through 2):**

The final rule states that the MCLs applicable to a disposal system shall be those MCLs that exist in 40 CFR 141 on the effective date of subpart C. The Agency believes that it is more reasonable to adopt established MCLs rather than speculative future MCLs. This establishes a specific goal for disposal system designers and reviewers of those plans. The Agency desires Part 191 to remain current with the MCLs and has, therefore, stated in the preamble that when the radionuclide MCLs change in the future, the Agency will revise Part 191 to be consistent. This represents a change from the February 1993 proposal, which would have imposed on a disposal system those MCLs in existence at the time the implementing agency determines compliance. Note, however, that in a case where the agency should change the MCLs in part 141 and amend part 191 to incorporate these changes before the date of a compliance determination, the new set of MCLs would then apply.

The USDWs to which the aforementioned MCLs would apply are those which have been identified as of the date on which a compliance determination of the disposal system occurs. The Agency recognizes that there may be disposal systems for which multiple determinations of compliance will be made during the system's operational phase. Any USDWs identified after one determination of compliance must be considered in the next determination. For example, should a new USDW be identified after an initial compliance determination has been made, such a USDW would have to be taken into consideration in the next compliance determination.

**Comment P3.E4:** EPA's proposed groundwater protection standards restrict the combined concentrations of natural and man-made radionuclides from all sources. This is a substantial departure from EPA's 1985 standards, which restricted the incremental increase in groundwater concentrations caused by a disposal facility. EPA should allow an incremental increase, above natural levels, unless EPA can demonstrate that doing so would unacceptably endanger the health of the public. (D-78)

**Response (Comments P3.E1 through 2):**

The Agency proposed to apply the MCLs to USDWs and has chosen to incorporate the current MCLs as the quantitative measure for protection of USDWs. The Agency has not been convinced that limits different from those acceptable in the regulations developed under the SDWA are justified for the situations covered in this rulemaking. The EPA considered applying the MCLs incrementally, that is using the MCLs as the measure of allowable contamination from sources other than natural background. However, in those situations where there are pre-existing concentrations of radionuclides, this approach would not prevent additional contamination of a USDW by a disposal system. Such additional contamination, if allowed to occur in a quantity as great as the quantity that would result in contamination at the level of the MCLs, could cause the total concentration of contaminants to greatly exceed the health-based MCL concentration. Conversely, the Agency's approach in Part 191 will prevent contamination exceeding MCLs without imposing an unreasonable burden on siting or licensing disposal systems.

The Agency recognizes there may be situations in which a potential disposal site is located in the vicinity of a USDW which already contains contaminants. Under the proposed Part 191 standards, a potential disposal system, chosen for its superb capability for isolating wastes, could be precluded from consideration in an area with elevated levels of radionuclides because of the difficulty or impossibility of adequately demonstrating that not a single atom or molecule would be released if that release could cause exceedance of an MCL. Accordingly, EPA has added a new §191.26 to subpart C that sets forth procedures under which the Administrator could develop alternative provisions should the situation of pre-existing elevated levels of radionuclides arise. In such circumstances, EPA believes it is reasonable to consider, on a case-by-case basis, pre-existing concentrations in USDWs in the vicinity of the disposal site along with the isolation capabilities of the disposal site when applying the MCLs.

In particular, an alternative provision would allow for the siting of a good disposal system that has a reasonable expectation of adding only an insignificant amount to existing background concentrations, i.e., an amount that would not significantly increase the effect of contamination on human health and the environment. In contrast, without a de minimis provision, the difficulty or impossibility of adequately demonstrating that not a single atom or molecule would be released from the disposal

system would prevent its being sited in an area that already exceeds the MCLs. In this way, a disposal system offering effective isolation is not precluded just because a USDW in the vicinity suffers from elevated background concentrations. At the same time, a de minimis approach limits the potential for a disposal system to cause or contribute to exceedance of the MCLs to only those amounts that, as a legal and technical matter, are trivial.

The Agency's experience in applying the MCLs has always had public health and environmental protection as the primary goal. EPA is not aware of any grounds for departing from that goal in adopting the MCLs in the Part 191 standards being promulgated in this final action or in providing for alternative standards in §191.26. Nevertheless, in situations where there is an existing background concentration above the MCLs, EPA believes that provisions should be made to allow a disposal system to add a de minimis amount to that concentration. De minimis exceptions from regulatory requirements are generally permissible, except where Congress has explicitly precluded them. See, e.g. Alabama Power Co. v. Costle, 636 F. 2d 323, 360-61 (D.C. Cir. 1979). None of the sources of statutory authority--the Atomic Energy Act, Reorganization Plan No. 3 of 1970, the Nuclear Waste Policy Act, and the WIPP Land Withdrawal Act--upon which EPA relies in this rulemaking contain such a prohibition. Accordingly, de minimis exceptions are legally permissible. This approach for considering pre-existing natural or anthropogenic concentrations maintains environmental and public health protection as the paramount goal but allows the regulatory agency limited discretion to consider the use, value and vulnerability of the ground water in question in establishing site-specific limits in accordance with Agency policy.

Under the SDWA, variances may be issued under sections 1415 or 1416. These apply to public water supply systems and both sections require that some compliance schedule and actions be established to return to compliance. While more flexible limits or variances may be appropriate during a period of active institutional control, such governmental controls cannot be expected beyond the institutional control period applicable to a geologic repository. Given such a long regulatory time period with no presumed institutional controls, 40 CFR 191 establishes environmentally protective standards in the context of a pre-operational compliance assessment to encourage the selection of geologies offering long-term isolation and good engineering designs.

Comment P3.F1: The entire controlled area should be excluded from ground-water use in performance assessments. (D-87)

Comment P3.F2: EPA states (58 FR 7929) that use of ground water within the controlled area need not be considered when evaluating compliance with the individual protection requirements. NRC agrees with this view, but is concerned that the wording of EPA's standards might permit other interpretations. (D-58,78)

**Response (Comments P3.F1 through 2):**

The individual protection requirements and ground-water protection requirements apply to undisturbed performance. Therefore, if an individual intrudes into the controlled area to obtain water for drinking or other purposes, such exposures are not to be considered in the context of the individual or ground-water protection requirements. However, if water from the controlled area would contaminate, through likely processes and events, water in the accessible environment, radiation doses resulting from such contamination would have to be included in the analysis of individual doses or the ground-water protection requirements.

Comment P3.G1: In section 191.24(b), it would be helpful to substitute "performance assessment" for "compliance assessment." (D-58,78)

**Response:**

The term "performance assessment" is already defined in 40 CFR 191 and has particular meaning and application to 40 CFR 191.13, Containment Requirements. As such, the term "performance assessment" incorporates the consideration of all pertinent disruptive events which relates to the examination of disturbed performance. The final amendments to 40 CFR 191 relate to ground-water contamination and individual doses delivered through all pathways which occur as a result of the undisturbed performance of the repository. Therefore, the Agency believes the term "compliance assessment" is a more appropriate term to describe the kind of assessment required for the individual and ground-water requirements in the context of an analysis of undisturbed performance to prevent confusion with the term "performance assessment".

**P4. Compliance with UIC Requirements**

Comment P4.A1: Disposal in a repository constitutes underground injection and therefore must comply with all requirements of the SDWA [SDWA § 1421(b)(3)(c)]. (A-05)

Comment P4.A2: It needs to be clarified whether or not a geologic repository constitutes underground injection. (C-01),(A-01),(S-01),(D-23)

**Response (Comments P4.A1 through 2):**

In the preamble to the proposed Part 191 amendments, EPA stated that it was not necessary to address whether the disposal of radioactive waste in a geologic repository covered under Part 191 constitutes underground injection under the SDWA since the proposed Part 191 standards conformed with the MCL standards for radionuclides under the SDWA. EPA maintains this position and, in further explanations in the



final rule, the Agency has concluded that the underground disposal of containerized radioactive waste in geologic repositories subject to the Part 191 standards does not constitute underground injection within the meaning of the SDWA or EPA's regulations governing the UIC program. In keeping with these further explanations, EPA has revised that portion of the proposed rule that amended Part 144 by withdrawing that proposed amendment.

Section 1421 of the SDWA defines "underground injection" as "the subsurface emplacement of fluids by well injection." 42 U.S.C. § 300h(d)(1). The statute defines neither "fluids" nor "well injection." Moreover, neither the statute nor the legislative history directly addresses whether the underground disposal of containerized radioactive waste constitutes the "subsurface emplacement of fluids by well injection." Even though the legislative history states, "[t]he definition of 'underground injection' is intended to be broad enough to cover any contaminant which may be put below ground level and which flows or moves, whether the contaminant is in semi-solid, liquid, sludge, or any other form or state," H.R. Rep. No. 1185, 93d Cong., 2d Sess. 31 (1974), the legislative history does not specifically address whether the underground disposal of containerized radioactive waste into geologic repositories of the type covered by these Part 191 rules constitutes the "subsurface emplacement of fluids by well injection."

The EPA has concluded that the underground disposal of containerized radioactive waste in geologic repositories subject to Part 191 does not constitute underground injection both because the materials to be emplaced are not "fluids" and because the mode of emplacement of these materials is not "well injection."

The EPA does not consider the type of containerized radioactive wastes which are covered under Part 191 to be "fluids." Instead, the wastes, which consist almost entirely of solid materials themselves are enclosed in steel or metal barrels and drums or other types of containers. The Agency does not believe the SDWA's reference to "subsurface emplacement of fluids" was intended to address the subsurface disposal of solid or containerized materials.

The position adopted by the Agency, furthermore, is consistent with the legislative history of the SDWA. In floor debate in 1980, Senator Domenici stated that "the [UIC] regulations would cover all types of injection wells, e.g., industrial and nuclear disposal wells, oil and gas wells, solution mining wells or any hole in the ground designed for the purpose of injecting water or other fluids below the surface." See 126 Cong. Rec. 30189 (November 19, 1980)(remarks of Sen. Domenici, emphasis added). Similarly, when amending the SDWA in 1985, Congress stated "underground injection is the process of forcing liquids underground through a well." (H.R. Rep. No. 168, 99th Cong., 1st Sess. 540, 1985). In both instances, the legislative intent was focused on the injection of liquids, not the containerized solids to be disposed of in radioactive waste repositories.

Reflecting this statutory approach, EPA's UIC regulations similarly do not treat containerized radioactive wastes as fluids or liquids for the purpose of control under the UIC program. EPA's regulations at 40 CFR 146.3, tracking the legislative history, define "fluid" as "material or substance which flows or moves whether in a semisolid, liquid, sludge, gas, or any other form or state." In adopting this regulatory definition of fluid, EPA did not consider the emplacement of containerized radioactive wastes in geologic repositories to be fluids subject to the UIC regulations.

EPA's past stated policy on well injection clearly is directed at other than containerized solid materials. Administrator's Decision Statement #5 (39 FR 12922), defines parameters for well injection which include data requirements for volume, rate, injection pressure of the fluid, degree of fluid saturation, and formation fluid pressure.

EPA has never interpreted its UIC regulations to encompass the subsurface emplacement of containerized wastes or solid materials that do not flow or move. EPA has stated instead that in general the placement of containerized hazardous waste in geologic repositories such as underground salt formations, mines, or caves, is regulated under the Subtitle C of the Resource Conservation and Recovery Act (RCRA) hazardous waste program.

EPA specifically addressed the status of containerized waste under RCRA and SDWA in the preamble to the final rule promulgating standards for hazardous waste miscellaneous units under Subpart X of the RCRA regulations at 40 CFR 264. See 52 FR 46946, 46952 (December 10, 1987). As EPA indicated in the preamble to the Subpart X regulations, the 40 CFR 146 technical standards do not address practices other than the injection of noncontainerized liquids, slurries, and sludges, and do not fully address some potential disposal or storage practices that may fall under EPA's regulatory definition of well injection. (52 FR 46953). In the Subpart X rule, EPA provided that, to the extent that miscellaneous disposal practices subject to Subpart X may be determined to be underground injection, a Subpart X permit would constitute a UIC permit for well injection of hazardous waste for which current 40 CFR 146 technical standards are not generally appropriate. EPA stated, however, that it was not "specifying that these miscellaneous management practices constitute underground injection."

In NRDC v. EPA, 824 F.2d at 1258, the First Circuit was concerned that radiation itself might be considered a fluid within the meaning of the SDWA and EPA's UIC regulations at 40 CFR 146.3. The Agency believes that radiation itself does not meet the UIC regulatory or statutory definition of "fluid." Radioactivity is a specific characteristic of the waste but does not define the form of the waste. Radioactivity results in the emission from the waste of ionizing radiation in the form of electromagnetic energy or subatomic particles. Electromagnetic radiation is a form of energy, not a "material or substance," and hence not a "fluid." Subatomic particles,

such as alpha and beta particles, will either be absorbed in the waste or the container and, therefore, not travel beyond the container, or will travel very short distances in comparison to the distance to the boundary of the controlled area. In any event, EPA believes that since the activity at geologic repositories consists of the emplacement of containers of radioactive wastes underground, this is emplacement of solid materials, not "fluids." Even though these containers may eventually disintegrate or dissolve and release some radiation, liquids, or gasses, the activity in question still consists of emplacement of containers and solid materials that will not flow or move at the time of emplacement underground.

Moreover, EPA does not consider the emplacement into geologic repositories of containerized and solid wastes that do not flow or move to be subsurface emplacement "by well injection." For example, at the WIPP, a potential repository subject to part 191, containerized waste will be placed in a mined underground repository, located in a salt bed formation approximately 2150 feet below the earth's surface. The waste containers are lowered mechanically down a vertical elevator shaft. Once underground, the waste containers are transported and placed in rooms mined into the formation or in underground horizontal boreholes in the salt formation. Once enough containers are accumulated, the room is sealed. To date, approximately 15 acres of underground disposal rooms have been mined.

The EPA's UIC regulations define "well injection" as "subsurface emplacement of fluids through a bored, drilled or driven well, or through a dug well, where the depth of the dug well is greater than the largest surface dimension." 40 CFR 146.3. A "well" is defined as "a bored, drilled, or driven shaft, or a dug hole, whose depth is greater than the largest surface dimension." *Id.* Although transmission of the materials underground in geologic repositories such as the WIPP involves waste handling "shafts," or "holes," these are elevator shafts or tunnels through which containerized solid materials are transported, not "wells" into which fluids are being "injected" within the meaning and intent of the SDWA or EPA's UIC regulations. In addition, the overall configuration of a repository is, for example, a complete network of interconnecting, mined rooms, and is far different from a "drilled," "driven," or "dug" injection well.

EPA does not believe that the emplacement of containerized waste by conveyors or elevators down a shaft should be covered under the UIC program. Such emplacement is in no way similar to the pressurized or gravity-fed flow of fluids, liquids, or sludges injected into a well that has been the traditional focus of the UIC program. See 41 FR 36726, 36732 (August 31, 1976). Even Class-V wells, a general category of injection wells not included in Classes I-IV, are not used for the disposal of containerized waste. Class V covers the subsurface emplacement of fluids, usually by gravity flow, into the injection well. Although Class-V wells include some types of wells that may not traditionally be thought of as injection wells, e.g. septic systems, all of these well types do involve the emplacement of noncontainerized fluids into

drilled, bored, dug, or driven wells, typically through gravity flow rather than pressurized flow.

Moreover, the regulatory criteria and standards applicable to underground injection, contained in 40 CFR 144 and 146, have never been intended to apply to a geologic repository. The concepts of area of review, pressure buildup and pressure monitoring, restrictions on injection pressure and other operating requirements and the mechanical integrity testing of injection wells that are included in the Part 146 regulations are meaningless as applied to geologic repositories. As noted above, some of the repositories, like the WIPP, may be mined containment areas in which humans operate mechanical equipment to transport waste packaged in containers surrounded by both engineered and natural barriers designed to isolate such waste from the environment. The UIC regulations are directed at injection of fluids by pressure or gravity flow; this activity is different from an engineering perspective from the subsurface emplacement of containerized wastes into geologic repositories.

EPA, in the final rulemaking of 40 CFR 191, has provided substantive protection of the general environment equivalent to that called for under the SDWA by requiring that MCLs be met at the boundary between the controlled area and the accessible environment. Subpart C of 40 CFR 191 has incorporated the primary radiation protections provided under the SDWA, namely, that such repositories be designed to assure that the USDWs not be endangered, i.e., the radionuclide MCLs are not to be exceeded in USDWs in the accessible environment.

Comment P4.B1: EPA's proposed amendment to 40 CFR 144.31 fails to fully comply with the SDWA. (D-76)

Comment P4.B2: Subpart C, which changes the UIC requirements, is not legal because it presumes to take away the states' authority to regulate the UIC program. This leaves states out of the review process. (A-06), (D-04,24,29,53,60,64,71,73,89), (S-02,03,06,11,15,30,34, 49,51,54,55,58,62,88,89,95,96,102,105)

Comment P4.B3: The Standard should indicate specifically which requirements of 40 CFR 144 are satisfied through compliance with 40 CFR 191. (D-82)

Comment P4.B4: EPA's claim that compliance with Part 191 constitutes compliance with underground injection control requirements is unsubstantiated. (A-05)

**Response (Comments P4.B1 through 4):**

The Agency has decided to withdraw the proposed addition to the UIC regulations at 40 CFR 144.31(a). As indicated in the preamble to these final amendments, while comments regarding a potential lack of procedural equivalence at potential disposal sites other than WIPP may have some merit because detailed and extensive procedural requirements for facilities other than WIPP are not specified, they may have no

bearing on the outcome of this Part 191 rulemaking. In the final amendments the Agency has determined that the disposal of radioactive waste in geologic repositories is not underground injection, as explained in the response to comments P4.A. The preemption effect of this determination, if any, cannot be determined in this rulemaking, but rather must be addressed by the parties to any future proceeding that seeks to apply State Underground Injection provisions to disposal systems. No other repository is under consideration that is arguably within this category and, thus, there is no prospect that disposal at such a repository would occur before EPA completes rulemaking. The final rule reserves §191.24(a)(2) for further development of provisions for disposal systems above or within a formation which within one-quarter mile contains an underground source of drinking water. EPA is reserving final action with respect to such repositories in order to explore in greater detail what effect, if any, the prohibition on "class IV" wells under the SDWA regulations at 40 CFR 144.13 might have on them. The EPA will address this category of disposal systems in the same context as its rulemaking to establish disposal standards for Yucca Mountain pursuant to the 1992 Energy Policy Act.

Comment P4.C1: DOE is concerned about potential far-reaching impacts to the future of deep geologic disposal of radioactive waste by application of the SDWA to facilities under 40 CFR 191. The key concerns are the potential implications of interpreting geologic repositories as underground injection wells under the SDWA and the stringency of the SDWA MCLs as they would apply to repositories under 40 CFR 191. (D-87)

Comment P4.C2: The SDWA should not be applicable to the disposal facility. (D-85)

**Response (Comments P4.C1 through 2):**

The promulgation of the final amendments to 40 CFR 191 addresses a significant feature of the SDWA requirements, namely, that USDWs not be endangered. The need for EPA to address this issue was clearly articulated by the findings of the court in NRDC v. EPA, 824 F.2d 1258 (1st Cir. 1987). This is accomplished by limiting radioactive contamination, caused by disposal that might endanger USDWs in the accessible environment, to the MCLs. The Agency believes it is prudent to protect ground-water resources from contamination rather than rely upon clean-up after the ground-water has been contaminated. This helps to prevent present or future community water suppliers from having to implement expensive treatment processes. Also, in the final amendments, the Agency has concluded that the disposal of radioactive waste in geologic repositories is not underground injection under the provisions of the SDWA and regulations promulgated under its authority.

## **P5. Release Scenarios**

**Comment P5.A1:** Human intrusion should be included as a viable release scenario when evaluating compliance with individual and ground-water protection standards. The consideration of only the undisturbed performance of the repository is unrealistic. (A-05,25,60), (D-03,04,07,22,39,49,53,62,71,89), (S-02,03,08,17,90,95)

### **Response:**

The purpose of disposal systems is to contain radioactive materials in the area where they are emplaced. This results in high concentrations of radionuclides within the controlled area. An intruder would, therefore, be exposed to potentially large doses. It is illogical to require both containment and dilution simultaneously. The Agency has found no method of lowering individual doses other than at the expense of potentially larger population doses. Therefore, the Agency has maintained the exclusion of human intrusion from the individual and ground-water protection requirements. It should be noted that human intrusion is a part of the analyses required for the containment requirements.

**Comment P5.B1:** In addition to human intrusion scenarios, unusual natural events should be factored into the performance assessment for individual and ground-water protection standards. (D-49), (S-11,37,92)

**Comment P5.B2:** Climate change scenarios should be considered in compliance demonstrations. (S-45)

### **Response (Comments P5.B1 through 2):**

The purpose of the individual and ground-water standards is to provide protection from radionuclides released because of likely events. In contrast, the containment requirements are written to take into account unlikely events. If any scenario, including a climate change scenario, were shown to be a likely event, it would need to be considered in the individual and ground-water protection analyses. It should be noted that Appendix C (formerly Appendix B) to 40 CFR 191 provides some non-binding guidance for handling unlikely events, though this is a matter left to the implementing agency. For example, in performing its implementation duties with respect to the WIPP LWA, EPA will be further considering this question in the context of developing criteria to demonstrate compliance with 40 CFR 191 for the WIPP facility in New Mexico.

**Comment P5.C1:** Undisturbed performance is adequate for analyzing compliance with the Standard because it simplifies the long-term modeling. (S-16)

**Comment P5.C2:** It should be assumed that future human intrusion will be avoided or adequately responded to through developing technology. (D-85)

**Comment P5.C3:** Human intrusion scenarios are subject to arbitrary assumptions and should not be part of a compliance assessment. Rather, siting and design criteria should be used to minimize both the probability and the consequences of human intrusion. (D-77)

**Response (Comments P5.C1 through 3):**

Human intrusion is not a consideration in the current rulemaking and is, in fact, expressly excluded. The Agency agrees that undisturbed performance is adequate to show compliance with the individual and ground-water protection requirements. The Agency does not agree that future human intrusion can always be avoided or adequately responded to through developing technology. In fact, the assurance requirements allow a maximum 100-year period for active institutional controls. Further, the Agency has not been shown an adequate method to maintain the overall protection possible by the entirety of Part 191 and separate out human intrusion except for the individual and ground-water protection requirements where such a requirement is in conflict with the Agency's policy of containment versus dilution (see the response to comment P5.A1).

**P6. Use of Engineered Barriers**

**Comment P6.A1:** The Standard should require the use of robust engineered barriers, such as waste containers, improved waste form, backfill, and seals. (A-25,30,32,34,47,52,54), (D-04,22,24,25,29,42,53,62,64,71,83,86,88), (S-02,08,11,15,30,31,49,51,54,55,57,88,91)

**Comment P6.A2:** EPA should specify performance standards for engineered barriers consistent with those specified by the NRC. (D-71,89)

**Comment P6.A3:** Releases from a repository should comply with NRC limits. (S-37,91)

**Response (Comments P6.A1 through 3):**

The individual and ground-water protection requirements set implicit performance requirements on engineered barriers but allow disposal system designers to take into account all pertinent site-specific factors. The determination of what are the most appropriate engineered barriers and their performance is specific to the waste form and the geologic conditions and, therefore, the Agency has left the specification of engineered barrier requirements to the implementing agency.

**P7. Implementation Guidance in Standard**

**Comment P7.A1:** EPA should determine an acceptable drilling rate on a site-by-site basis, rather than leave it to the applicant's discretion. (A-25), (D-22)

**Comment P7.A2:** A drilling rate of 30 boreholes per square kilometer per 10,000 years is too low for a salt site. (D-71)

**Comment P7.A3:** Future drilling rates should be determined on a site-specific basis and could be based on maximum historic drilling rates. (D-86,89)

**Response (Comments P7.A1 through 3):**

The Agency does not believe it is appropriate to attempt to make site-specific decisions in generic standards since it is not possible to know to what sites these standards will apply in the future, and, indeed, the Agency does not have the authority to make site-specific decisions under the authority of the Atomic Energy Act of 1954, as amended, as assigned to EPA by Reorganization Plan Number 3 in 1970. Rather, this authority charges EPA with the responsibility to develop generally applicable environmental standards. The guidance which discusses the upper bound drilling rate is not mandatory and, therefore, leaves to the discretion of the implementing agency the determination of an appropriate rate.

**Comment P7.B1:** The Standard should include specific techniques for extrapolating data for long-term assessments. (D-48,87), (S-16)

**Comment P7.B2:** The guidance should contain specific assumptions about future population and exposure pathways for long-term calculations. (D-87)

**Comment P7.B3:** Prediction of future environmental and societal conditions will consist chiefly of evaluation based on expert judgment and opinion, with significantly less basis in fact than similar predictions made for the physical system. A defined baseline is required upon which to base such predictions and the resulting analyses. (D-87)

**Response (Comments P7.B1 through 3):**

The Agency agrees that specification of future states would be helpful in focussing the evaluation of potential disposal systems upon factors which the Agency believes are critical rather than upon potentially fanciful scenarios for the environment or society. However, the Agency has decided not to reopen the reinstated portions of the disposal standards at this time. When 40 CFR 191 is reevaluated in the future, this issue will be considered.



Comment P7.C1: EPA should issue an implementation guidance document. (D-82)

**Response:**

Guidance for implementation is provided in Appendix C of 40 CFR 191. The Agency believes that the guidance is sufficient for these purposes.

**P8. Above-Ground Waste Storage**

Comment P8.A1: Waste should remain or be placed in above-ground monitored retrievable storage facilities and not be disposed under the ground. (A-15,35,43,46,57,70,73), (D-04,06,17,29,34,37,39,42,45,46,47,50,51,61,62,65,72,79), (S-11,19,21,25,37,47,48,51,52,53,54,58,59,61,64,74,91,94,96,98,99,106)

Comment P8.A2: Waste should remain in above-ground storage until a way is found to detoxify it. (A-40,44,45), (D-50,51,61,70), (S-10,18,44,66,72,87,104)

Comment P8.A3: Waste requires proper access so that it may be visually inspected. (D-51)

**Response (Comment P8.A1 through 3):**

The Federal laws addressing the disposal of high-level and transuranic waste call for the examination of deep geologic disposal. There are several good reasons why this approach has been taken. It was felt that it was inappropriate to leave the matter of disposal of this generation's waste as something for which future generations are forced to care. Above-ground emplacement in a building is perceived as requiring continuous care and maintenance and this did not fit the intergenerational guideline. Although storage in an above-ground facility appears feasible for a period of time, it is not seen as a practical solution. It also appears from the past history of above-ground facilities that they are more vulnerable to both natural forces and actions by man than underground facilities. This consideration includes storms, fires, vandalism, sabotage, and terrorism. While an above-ground facility may lend itself more readily to some types of inspection, it also more readily lends itself to human intrusion. Methods to "detoxify" nuclear waste do not appear feasible at this time and research efforts have not been sufficiently promising to dissuade the Congress from their presently chosen path of deep geologic emplacement.

**P9. Potential Use of Standards at Sites Other Than WIPP**

Comment P9.A1: The Standard should not exempt waste disposed before November 18, 1985. (S-54)

Comment P9.A2: The proposed rule states that the amended rule will not be applicable to waste disposed of before November 18, 1985, implying that the amended standard will apply to waste disposed of after November 18, 1985. (D-87)

Comment P9.A3: The exemption of wastes disposed before November 18, 1985 is unclear and causes confusion as to which wastes may be affected. The exemption adds unnecessary confusion and could lead to litigation. (D-76)

**Response (Comments P9.A1 through 3):**

In response to a comment which requested that the new sections not be applied retroactively, the Agency reconsidered the applicability provisions and has changed the date of applicability for the individual and ground-water protection sections to 30 days after the date of publication in the Federal Register. Part 191 was in effect from November 18, 1985 until July 17, 1987 at which time the Court vacated and remanded the entirety of Part 191 including, of course, the individual and ground-water protection sections. With today's repromulgation of the individual and ground-water protection provisions, the Agency believes that it is more reasonable to require compliance with them only for waste disposed of after the effective date of these amendments.

The effective date of the 1985 Part 191 standards was November 18, 1985, and the 1985 standards did not apply to wastes disposed of prior to that date. Similarly, today's standards do not reach back to apply to wastes disposed of prior to November 18, 1985. On July 17, 1987, the First Circuit decision vacated and remanded Subpart B, which included four categories of requirements: containment, assurance, individual protection, and ground-water protection. From that time until 1992, when Congress enacted the WIPP LWA, Subpart B was not in effect. However, applicability of the regulations changed when Congress, in section 8 (a)(2)(A) of the WIPP LWA, reinstated all of Subpart B except for those aspects of sections 191.15 and 191.16 that were the subject of the First Circuit remand, that is Congress reinstated the containment and assurance requirements as they were promulgated in 1985.

Since there is no indication that Congress intended to allow a regulatory gap in this important area, EPA interprets section 8(a) of the WIPP LWA as reinstating Part 191 Subpart B except for those aspects that were remanded by the court, retroactive to July 17, 1987, the date of the First Circuit decision vacating Part 191.

Because the containment and assurance requirements were not found inadequate by the First Circuit decision, Congress' action in the WIPP LWA reinstated these regulatory provisions exactly as they were in effect in 1985. Promulgation of today's standards does not change these 1985 containment and assurance requirements, and thus they remain effective today, with provisions unchanged from those effective on November 18, 1985. As a consequence of their initial promulgation in 1985, Congress' reinstatement in 1992, and promulgation of today's regulations that do not

change their provisions, the containment and assurance requirements became effective on November 18, 1985, have been effective since that time and continue to be effective after the effective date. Thus, the containment and assurance requirements of Part 191 as promulgated in 1985 and reinstated in 1992 apply to wastes disposed of on or after November 18, 1985.

However, the effective date of the individual protection and ground-water protection requirements, the other two categories of Subpart B, is necessarily different. This is because the First Circuit's decision specifically found that aspects of the individual protection and ground-water protection provisions were inadequate or inconsistent with other statutory mandates and because the WIPP LWA specifically did not reinstate them. New regulations were required, and these are the regulations promulgated today. Therefore, the effective date for the individual protection and ground-water protection requirements is the effective date of today's standard, and it is today's individual protection and ground-water protection requirements that apply to wastes disposed of after today. Any facilities at which disposal-related activities were initiated after the date of the First Circuit decision might not be covered by the ground-water and individual protection requirements of Part 191 as promulgated in 1985, which were vacated by the court and not reinstated by Congress. However, EPA is not aware of any such facility.

The Agency believes that it is reasonable, due to the design nature of the 40 CFR 191 standards, that the standards which were in existence from 1985 until the First Circuit decision in 1987 are appropriate to be used for activities which occurred, or were begun, during that time rather than imposing new and different standards on such activities. The effective date for § 191.13, Containment Requirements, and indeed all of 40 CFR 191, except those provisions being promulgated today, remains November 18, 1985. In accord with this, disposal which occurred on or after November 18, 1985 is subject to the containment and assurance standards as they existed on November 18, 1985.

EPA informed the Department of Energy, prior to the First Circuit decision in 1987, that the 1985 version of Part 191 was applicable to any disposal activities at the Greater Confinement Disposal (GCD) Facility. Therefore, any radioactive waste, as defined in § 191.02, that was disposed of at the GCD facility is subject to all of the requirements of 40 CFR 191 promulgated in 1985, and the First Circuit decision, the WIPP LWA, or today's promulgation of revised regulations change that determination.

Finally, it continues to be the Agency's intention that any waste which was disposed prior to the effective date of today's action is not exempt from Subparts B and C of 40 CFR 191 if it is exhumed and redispersed. That disposal will be subject to all the provisions of 40 CFR 191 as they exist at the time of redispersion.

**Comment P9.B1:** The Standard should reflect the fact that it will apply only to the WIPP for the foreseeable future. (A-25,34), (D-22,62)

**Comment P9.B2:** EPA should state that the regulation is specifically applicable to the WIPP. (D-83)

**Comment P9.B3:** The disposal standards should be tailored to the WIPP as much as possible. (D-89)

**Response (Comments P9.B1 through 3):**

While it is correct to say that 40 CFR 191 applies to the WIPP, it also applies to the GCD system and any other waste disposal system not required to be characterized by section 113(a) of the Nuclear Waste Policy Act. This is a result of the authority under which the Agency is promulgating these amendments, the Atomic Energy Act of 1954, as amended (42 U.S.C. 2201 et. seq.), and Reorganization Plan No. 3 of 1970. The Reorganization Plan assigned to EPA the authority to issue generally applicable environmental standards. This means that if no other authorities are applicable, EPA's standards cannot be site specific. Therefore, these amendments cannot be and are not tailored to any particular site.

**Comment P9.C1:** The relationship of 40 CFR 191 to sites regulated under the Nuclear Waste Policy Act is unclear. (C-01), (A-01,05), (S-01), (D-23,82)

**Response:**

The preamble and the applicability statements for Subparts B and C both state that the standards are not applicable to sites characterized under section 113(a) of Public Law 97-425 (the Nuclear Waste Policy Act of 1982). The site at Yucca Mountain, Nevada is the only current site which falls under that restriction.

Also discussed is the fact that the Energy Policy Act of 1992 has mandated the National Academy of Sciences to conduct a study for the purpose of providing EPA advice on writing standards for the Yucca Mountain site.

**Comment P9.D1:** The Standard should apply to temporary waste storage facilities. (D-29), (S-30,49)

**Response:**

The Subpart A standards apply to NRC-licensed management and storage facilities and to non-NRC-licensed disposal facilities. To change coverage at this time would require reopening Subpart A. However, as stated above, the Agency has decided not to reopen sections of 40 CFR 191, other than those being promulgated, at this time. Therefore, Subpart A coverage has not been changed at this time.

## **P10. General**

**Comment P10.A1:** The Standard should be as strict as possible.

(A-23,24,32,33,36,37,42,43,53,56,58,61,62,63,64,69,72,75), (D-02,20,39,62),  
(S-06,12,30,37,40,67,71,86,88)

### **Response:**

The EPA, with the input of many individuals and organizations from the scientific community outside the EPA, has established standards that it considers protective of public health and the environment.

**Comment P10.B1:** More research is needed on disposal technologies, especially the possibility of transmutation of radionuclides to non-radioactive isotopes.

(A-07,11,31,40,41,44,56,63,73),  
(D-01,08,11,14,41,50,51,56,61,62), (S-11,32,43,61,65,72,75,78,83,84,87,94,100,102)

**Comment P10.B2:** All waste should be vitrified before disposal. (S-37), (D-39)

### **Response (Comments P10.B1 through 2):**

The Part 191 standards do not preclude the application of any technology to stabilize or "neutralize" the waste. Technology research in this area is carried out by the Department of Energy.

**Comment P10.C1:** It is too early to finalize the standards; more public and technical input is needed. (A-06), (D-19), (S-14,101)

**Comment P10.C2:** The EPA's programs should not be driven by deadlines, as they are now. (S-39,59,89,93,103)

**Comment P10.C3:** No waste should be disposed until long-term modeling uncertainties can be reduced. (A-02,67), (S-53)

**Comment P10.C4:** The Standard should not be issued in its present form. It contains errors which should not be propagated. (D-71)

**Comment P10.C5:** EPA should periodically reevaluate the scientific soundness of the standard. (D-89)

### **Response (Comments P10.C1 through 5):**

Work on amendments to Part 191 has been underway since 1987. Much technical review and advice has been received since that time. Since Congress has mandated expedited amendments, EPA is legally bound to make these changes now. If in the

future new scientific data demonstrate that there is a flaw in the rationale behind the rule, EPA can then reopen the rulemaking process and amend all or part of these standards.

Comment P10.D1: The regulations should be written in less technical language. (S-39,62)

**Response:**

The Agency attempts to write standards which are readily understandable by all readers. However, this is a highly technical area and to be useful to those who must implement the standards, there is a need to be as technically accurate and complete as possible. The Agency makes technical documents containing information supporting its standards available upon request, as availability allows. In addition, the Agency is receptive to comments and questions on these matters.

Comment P10.E1: When disposal regulations are issued for facilities under the NWPA, there may well be two sets of disposal regulations for geologic repositories. DOE is concerned about the potential differences between the two standards and how such differences will be reconciled. It is essential that EPA make a commitment as to how they will reconcile any differences before issuing this standard as final. (D-87)

**Response:**

As required by the Energy Policy Act of 1992, EPA is required to seek advice from the NAS on the development of standards for Yucca Mountain. The form of the ensuing standards may or may not be quite different from those of 40 CFR 191. In view of this, the Agency believes it would be premature to commit to future amendments to the existing 40 CFR 191. The Agency will determine the necessity of future amendments at such a time as the NAS study has been completed.

Comment P10.F1: The 10,000-year "regulatory period" should be referred to as the "modeling period" to be consistent with 40 CFR 268.60 (solid waste regulations). (D-82)

**Response:**

The Agency uses the words "regulatory period" to signify the period during which the ground-water, containment and individual protection requirements apply. The meaning of this term is not and need not be affected by the use of similar terms in other regulations.

Comment P10.G1: EPA proposes to redefine "radioactive material." This proposed definition is contrary to common usage, since most people refer to all radioactive material as "radioactive material." (D-58,78)

**Comment P10.G2:** Introduction of the new term in 191.12, "radioactive material," appears to broaden the scope of material covered under this rule. (D-87)

**Response (Comments P10.G1 through 2):**

The term "radioactive material", as defined in the standard, is meant to include materials other than spent fuel, high-level and transuranic wastes that might be disposed in the same disposal systems as these wastes. Examples of such radioactive materials are greater-than-class-C low-level, low-level, and naturally occurring radioactive wastes (54 FR 22578). Use of this term is not intended to broaden the scope of coverage of the rule but merely to clarify it.

**Comment P10.H1:** The difference between "implementing agency" and "certifying agency" should be clarified. (D-87)

**Comment P10.H2:** The term "implementing agency" is not adequately defined. EPA's regulatory authority over the WIPP should be made clear. (D-71)

**Response (Comments P10.H1 through 2):**

Three agencies are responsible for determining compliance with 40 CFR 191, however, the term "certifying agency" is not used for any of them. There is one case where an agency is held responsible for "certifying" compliance and that is EPA in the case of the Waste Isolation Pilot Plant under the provisions of the WIPP LWA. The definition of "implementing agency" has been amended to more clearly reflect EPA's role as it pertains to Part 191, at WIPP. In addition, EPA is required under §8(c) of the WIPP LWA to promulgate compliance criteria, which will further define EPA's responsibilities as an implementing agency for the WIPP site.

**Comment P10.I1:** The EPA's description of the legal basis for Nuclear Regulatory Commission licensing authority (58 FR 7929) notes NRC's licensing role for Yucca Mountain under the Nuclear Waste Policy Act (NWPA), as amended. NRC's authority is broader than this and has a different genesis. There exists a significant potential for NRC implementation of the Part 191 standards even though they do not apply to Yucca Mountain. (D-58,78)

**Response:**

The Agency agrees with this comment.

**Comment P10.J1:** The term "reasonable expectation" should be better defined. (A-60), (D-62)

**Comment P10.J2:** The concept of "reasonable expectation" was omitted from the ground-water and individual protection requirements and should be retained. (D-87)

**Comment P10.J3:** Compliance with the individual and ground-water protection requirements should be based on a 95<sup>th</sup> percentile curve generated through random sampling. (D-71)

**Response (Comments P10.J1 through 3):**

The term "reasonable expectation" and associated expanded explanatory sections have been added to 191.15(c) and 191.24(b), making the amendments consistent with the reinstated containment requirements from the 1985 issuance of the rule. These added provisions are found in the final rule at 191.15(c) and 191.24(b). These provisions are intended to make it clear that compliance assessments need not provide complete assurance that the requirements will be met. They note that proof of the future performance of a disposal system is not to be had in the ordinary sense of the word in situations that deal with much shorter time frames. For the WIPP facility, this matter is subject to further consideration in EPA's development of the compliance criteria. For other facilities to which this rule may be applicable, this issue would be addressed by the appropriate implementing agency. EPA notes that Appendix B of the 1985 standards, now Appendix C, discusses compliance determinations for 191.13 as using "complex computational models, analytical theories, and prevalent expert judgment relevant to the numerical predictions." The Appendix goes on to say that implementing agencies may choose to supplement numerical predictions with qualitative judgments as well. The results of such evaluations must provide reasonable expectation that regulatory requirements are met.

**Comment P10.K1:** The Standard needs to consider possible synergistic effects of radiation and hazardous chemicals. (S-68)

**Response:**

EPA is not aware of synergistic effects that would take place in the environment at levels of exposure allowed by EPA's radioactive and hazardous waste disposal standards.

**Comment P10.L1:** All waste should be fully retrievable for a period of approximately 50 years after disposal. (D-71)

**Comment P10.L2:** Mixed waste should not be allowed for disposal at WIPP. (S-37)

**Comment P10.L3:** Thermally stressed halite at WIPP will move the radioactive wastes packages "significant distances". (D-62)



Comment P10.L4: The WIPP site is not suitable for waste disposal. (A-04,07,13,19,26,27,32,35,36,39,40,49,50,65,66,68,73,74), (D-09,11,16,18,34,35,39,52,62,88), (S-04,14,19,35,36,37,41,46,47,51,60,62,74,85,100,104)

Comment P10.L5: The WIPP site is unstable and should not be used for waste disposal. (D-09,39), (S-05)

Comment P10.L6: The WIPP project is needed and should move ahead. (S-27,77)

Comment P10.L7: Disposing radioactive waste in underground salt formations is contrary to the traditional beliefs of the Acoma People who reside near the WIPP site. (S-86), (D-52)

Comment P10.L8: Monitoring at WIPP would be difficult, so the site should be disqualified. (A-11), (S-14,32)

Comment P10.L9: The EPA should use data from DOE only after the data has been carefully reviewed and verified by non-DOE reviewers. (A-39)

Comment P10.L10: Effective oversight of DOE activities is necessary to ensure compliance with the Standard. (S-02), (D-71)

**Response (Comments P10.L1 through 10):**

The EPA uses data from many sources and uses its judgment as to the reasonableness of that data. Almost all data that is used is from publicly available printed documents. The Agency's authority for oversight of other agencies' activities is specifically assigned by Congress. In relation to 40 CFR 191, EPA has direct oversight only at the WIPP. The EPA will be writing standards for Yucca Mountain but that will be under the authority of the Energy Policy Act of 1992 and will likely be separate from 40 CFR 191.

A decision on the suitability of WIPP is outside the purview of this rulemaking but will be addressed thoroughly during the certification-of-compliance process.

Comment P10.M1: The standards should include requirements for site stability. (D-16,63,72)

Comment P10.M2: A repository should not be sited in an area with valuable natural resources. (A-32,34,47,52), (D-04,25,29,31,37,39,53,62,64,88), (S-08,15,30,49,51,53,54,96)

Comment P10.M3: Strengthen the siting criteria to exclude areas with oil and gas resources. (A-60), (D-62), (S-41)

**Response (Comments P10.M1 through 3):**

This is outside the purview of the rulemaking.

## **Chapter 3: TECHNICAL ISSUES**

### **T1. Regulatory Time Period**

**Comment T1.A1:** The time period for the ground-water and individual protection standards should be extended beyond 10,000 years. (A-03,07,09,10,11,28,29,32,37,53,63), (D-04,06,24,28,37,41,54,55,62,63,71), (S-02,07,31,32,48,50,58,73,86,87,94,105)

**Comment T1.A2:** The time period for the radionuclide containment requirement should be extended beyond 10,000 years. (A-03,06,22), (D-04,07,28,37,41,71), (S-02,49,105)

**Comment T1.A3:** The time period should extend far enough beyond 10,000 years to determine any long-term trends in disposal system performance. (A-25), (D-22)

**Comment T1.A4:** The regulatory assessment period in the Standard should be 100,000 years.  
(A-04,06,16,34,38,48,51,52,60), (D-19,20,25,29,42,53,62,64,68,71,73,83,84,88),  
(S-03,11,17,36,49,51,54,55,57,73,82,88,87,95,96,105)

**Comment T1.A5:** The regulatory assessment period should be about 240,000 years.  
(A-15,20,45,49), (D-39,61,65,66,72), (S-12,37,68)

**Comment T1.A6:** The regulatory assessment period should be 1,000,000 years.  
(A-02), (D-63), (S-22)

**Comment T1.A7:** The regulatory assessment period should extend for as long as the waste remains hazardous. (D-12), (S-08,59)

**Comment T1.A8:** The regulatory assessment period should extend forever into the future.  
(D-55)

**Comment T1.A9:** EPA has previously agreed to require more than a 10,000-year analysis, but this is not in the proposed Standard. (S-23)

**Comment T1.A10:** The regulatory time period should be no shorter than the proposed 10,000 years. (D-76)

**Comment T1.A11:** There needs to be more technical justification for choosing a 10,000-year regulatory assessment period. (C-01), (A-01,05,32), (D-21,23,47,62), (S-01,55)

**Comment T1.A12:** The 10,000-year time period is too long because geologic parameters are too uncertain. (D-48), (S-16)

Comment T1.A13: A time period of no more than 1,000 years should be used for individual and ground-water protection. A longer time frame has not been shown to provide a higher level of protection. (D-77)

Comment T1.A14: The ground-water protection and individual protection regulatory periods should be 1000 years. (D-85)

Comment T1.A15: The 10,000-year regulatory framework is adequate. (A-25), (D-22,52), (S-24,92)

Comment T1.A16: The 10,000-year period for individual dose regulation is appropriate. (D-89)

Comment T1.A17: The 10,000-year period for ground-water protection is appropriate. (D-89)

**Response (Comments P1.A1 through 17):**

The First Circuit court decision required the EPA to reexamine the regulatory time frame for the individual protection requirements. The court made this decision based on the determination that the 1985 1,000-year regulatory time frame was not adequately justified. The use of a 10,000-year time frame for the containment requirements was considered adequate to differentiate between poor sites and potentially acceptable sites and yet avoid gross uncertainties. When evaluating the long-term performance of potential sites, as is done generically in the BID, a time period on the order of 10,000 years is often necessary to reveal differences among or between disposal systems. While a time period of more than 10,000 years can provide insight into the performance of the disposal system, the uncertainties associated with these long time periods makes it difficult to rely on them. The 10,000-year period for ground-water and individual risk assessments had been thought to be too uncertain to include in the 1985 standards. However, other regulatory programs and recent assessments have shown that it is feasible. With this information in mind, EPA believes a 10,000-year time frame is appropriate and long enough to help differentiate among potential sites, but at the same time, short enough that uncertainties do not invalidate the modeling results. The EPA has never "agreed" to use any particular time period. In a working draft, EPA had indicated an interest in using 100,000 years but that was associated with the containment and assurance requirements. Those requirements were reinstated and are not under consideration in this rulemaking.

Comment T1.B1: A 10,000-year quantitative assessment could be supplemented with a qualitative assessment for the period beyond 10,000 years. (A-05)

Comment T1.B2: The regulatory period should be 10,000 years, but trends should be evaluated out to 100,000 years. (D-86)

**Response (Comments T1.B1 through 2):**

EPA has not included such a requirement since in these generally applicable standard neither the impact of the additional analysis nor the standard of judgment to be used was able to be defined. An implementing agency may wish to consider this requirement under its own authority on a site-specific basis.

Comment T1.C1: EPA's selection of 10,000 years as the regulatory time frame for the individual and ground-water protection requirements should not be implemented unless adequate detailed guidance is provided for dealing with uncertainties. (D-87)

**Response:**

Due to the site-specific nature of uncertainties that arise in a compliance demonstration, EPA feels it is not appropriate to give detailed guidance on the treatment of uncertainties. This is left to the discretion and technical judgment of the implementing agency.

**T2. Individual Dose Limit**

Comment T2.A1: The EPA should present a health-based justification for the 15-millirem-per-year (mrem/yr) dose limit. (D-71)

Comment T2.A2: The 15 mrem/yr dose limit is based on insufficient information. (S-90)

Comment T2.A3: The draft BID does not provide justification for the 15 mrem/yr dose limit. It shows zero dose from ground water for all analyses. (S-23)

Comment T2.A4: The 15 mrem/yr dose limit is too high.  
(A-22,32),(D-29,39,53,62,64,76),(S-08,49,53,54,58,64,73,87,94,96)

Comment T2.A5: The 15 mrem/yr dose limit is too low. (D-48), (S-16)

Comment T2.A6: The dose limit should be 10 mrem/yr. (A-37), (D-53,68,73,86), (S-03)

Comment T2.A7: The individual dose limit should be 4 mrem/yr. (S-22,49,91), (D-76)

Comment T2.A8: The dose limit should be a few (1-3) mrem/yr. (A-54), (S-11)

Comment T2.A9: Any level of individual dose is too high; the dose limit should be lowered to zero, or near zero. (A-05,15,55,71), (D-04,15,37), (S-51,54,58,73,90,93)

**Response (Comments T2.A1 through 9):**

The dose limit of 15 mrem/yr was chosen because it is believed that this level is sufficiently protective in situations where, at most, only a few individuals will likely receive the maximum dose. Further, the Agency finds it consistent and reasonable to adopt a standard for multi-media exposure (through all media, i.e. food, air and ground water) that is greater than that allowed by regulations for a single environmental medium (compare 10 mrem/yr allowed for air releases and 4 mrem/yr for drinking water). Analyses of the undisturbed ground-water flow scenario made using base case parameter values show no individual doses or ground-water contamination at any of the sites during the first 10,000 years after disposal.

Comment T2.B1: The dose limit should be based on the most up-to-date information on radiation effects. (S-04)

Comment T2.B2: The organ-weighting factors in Appendix B are taken from ICRP 60, rather than from ICRP 26, as was done in the BID. (D-87)

Comment T2.B3: Appendix B appears to be based on ICRP Publication 60. This is inconsistent with current Federal guidance and the consensus developed in a Federal Interagency Working Group. The consensus of that group (chaired by EPA) is that the incremental benefit associated with adoption of ICRP 60 methodology is not sufficient to justify the associated cost and regulatory burden. Thus, EPA's proposed Appendix B should be rewritten, based on ICRP-26 methodology, to be consistent with current Federal guidance and the practices of other Federal agencies. (D-58,78)

Comment T2.B4: The proposed amendments to the individual protection requirements include calculational techniques incorporating weighting factors from ICRP Publication 60, which has not been accepted by the technical community in the United States. (D-87)

Comment T2.B5: The use of the CED dose calculation method developed by the ICRP is endorsed as the basis for the individual protection requirements. (D-49)

**Response (Comments T2.B1 through 4):**

While not rejecting the validity of the ICRP 60 factors, the Agency has determined that the proposal was premature and has adopted the organ-weighting factors in ICRP 26, for purposes of this rulemaking, in order to be consistent with Federal Guidance Number 11.

Comment T2.C1: The dose limits should not be changed from 25 mrem to 15 mrem until adequate opportunity is given to comment on the different methodology for the dose (whole body vs. committed effective dose) and the "equivalent risk" approach presented in the proposal. (D-77)

**Response:**

The Agency believes there has been adequate opportunity for comment. The EPA first announced its intention to use CED in 1987 (52 FR 2822) when recommending standards for exposure of workers to radiation (Federal Guidance Number 11). The methodology was first recommended by the ICRP and is now employed by the EPA and other Federal agencies. And finally, notice of the opportunity for public comment was provided with the newly published amendments to 40 CFR Part 191.

Comment T2.D1: Consistency of general radiological terminology in the proposed rule is not consistent with current usage by national and international agencies. (D-87)

Comment T2.D2: The terminology for the individual dose is inconsistent with other sources, such as ICRP 26 and 30. (D-30,87)

Comment T2.D3: The symbols used in the equations of the proposed Appendix B ("Calculation of Annual Committed Effective Dose") cause confusion. In the second equation, " $H_T$ " is used to denote the equivalent dose in tissue T. Then, in the third equation, the same symbol is used for both the integrated 50-year equivalent dose and the equivalent dose rate. The right-hand side of the third equation should use a symbol that clearly indicates the dose rate, i.e., the derivative of  $H_T$  with respect to time. (D-58,78)

**Response (Comments T2.D1 through 3):**

The nomenclature used in these equations is the same as that used by ICRP. For clarification, please note that the symbol for committed equivalent dose is  $H_T$  as a function of tau,  $\tau$ , whereas the symbol for the equivalent-dose rate is  $\dot{H}_T$  as a function of  $t$ .

Comment T2.E1: EPA's proposed individual protection standards would restrict potential doses to "any member of the public." This seems to mean the most highly exposed member of the public. (D-58,78)

**Response:**

The EPA standard does apply to the maximally exposed individual, consistent with other EPA regulations.

**Comment T2.F1:** In 1985, EPA established individual protection requirements of 25 mrem/yr for the whole body or 75 mrem/yr for other organs. At that time, EPA did not provide a convincing basis of support for those dose limits. In 1985, EPA equated its dose limits to a lifetime risk of  $5 \times 10^{-4}$ . However, EPA did not argue that  $5 \times 10^{-4}$  was the maximum level of risk that could be considered acceptable, nor did EPA demonstrate that its dose limits were reasonably achievable. In addition, EPA never proposed its individual protection requirements for public comment. (D-58,78)

**Comment T2.F2:** The individual dose limit should be 25 mrem/yr unless there is some basis for changing it. (D-85)

**Comment T2.F3:** The justification for the individual protection requirements has not been sufficiently provided, neither for the proposed new dose limit of 15 mrem annual committed effective dose nor the 1985 dose limits of 25/75 mrem (for the whole body/organs). (D-87)

**Comment T2.F4:** Replacement of 25 mrem whole body/75 mrem critical organ with 15 mrem annual dose equivalent needs further justification. (D-87)

**Comment T2.F5:** Retain the limit at 25 mrem EDE/yr or amend the Supplemental Information to include the technical justification for the use of a 15 mrem annual CED (which should be EDE/yr, see Issue G.4), and demonstrate that it is equivalent to the 25/75 mrem limit. (D-87)

**Response (Comments T2.F1 through 5):**

The 25 mrem/yr dose limit in the 1985 standard was based on a lifetime fatal cancer risk of about  $5 \times 10^{-4}$  using a cancer risk factor of  $2.8 \times 10^{-4}$  fatal cancers per rem. More recent information on radiation risks, described in the 1993 BID, leads to a cancer risk factor of  $3.9 \times 10^{-4}$  fatal cancers per rem (BID p. 6-75). Thus, the radiation risk factor has increased by about 40 percent. The dose limit is correspondingly decreased by approximately the same percentage to arrive at 15 mrem CED/yr.

**Comment T2.G1:** The 15 mrem/yr CED appears consistent with the previous 25 mrem annual whole-body dose. (A-25), (D-22)

**Response:**

EPA chose the new dose rate with the goal of being consistent with the previous whole-body dose limit.



### **T3. Background Information Document**

**Comment T3.A1:** Tables 3.3-1 and 3.3-2 in the draft "Background Information Document for Proposed Amendments to 40 CFR Part 191" (EPA 402-R-93-007) need revision. The Idaho Chemical Processing Plant (ICPP) values in both tables for liquid, sludge, salt cake, slurry and calcine have been shifted to the right by one column. In addition, the commercial acid waste values for liquid, sludge, salt cake, slurry and calcine in Table 3.3-1, and the commercial acid waste and alkaline waste values for the same waste types in Table 3.3-2 have been shifted to the right by one column. In addition, the subtotal and grand total values in both tables have numerous errors that require correction. (D-82,87)

**Response:**

The final background information document (BID) contains the correct values.

**Comment T3.B1:** EPA's proposed standards would restrict radionuclide concentrations in ground-water and potential doses to individuals outside a "controlled area" that is allowed to extend up to five kilometers from a disposal facility. The analyses of EPA's draft BID evaluate potential concentrations and doses at a two-kilometer distance, rather than the full five-kilometer distance allowed by EPA's standards. In EPA's analyses, an individual is assumed to withdraw ground water for drinking at a distance of two kilometers from a deep geologic repository containing transuranic wastes. (D-58,78)

**Response:**

The two-kilometer distance is consistent with the generic risk analyses supporting the original promulgation of the rule in 1985. It is correct that the standards allow the implementing agency to assume a distance of up to five kilometers to the accessible environment. The analyses in the BID used two kilometers and showed that the Standard is technically feasible at this distance. The BID analyses are conservative in this respect. If the implementing agency chooses to use a five-kilometer distance instead, the performance assessment will show a greater margin of safety than if a two-kilometer distance is used.

**Comment T3.C1:** EPA uses essentially the same conceptual model for all four hypothetical repositories considered in its BID. Using the NEFTRAN-S code, EPA uses a single "pipe" to simulate transport of radionuclides from a repository to an overlying or underlying aquifer and then uses a second "pipe" to simulate transport to a ground-water well located two kilometers away. The coarseness of this model precludes simulation of fractures, failures of borehole or shaft seals, or other inhomogeneities in the geologic media. NEFTRAN-S may not be adequate for such purposes anyway, and a computer program implementing mathematical models of the appropriate processes would have to be used. Thus, EPA is unable to determine whether relatively rapid transport of small amounts of waste might

occur, leading to potential violations of the proposed individual and ground-water protection standards. (D-58,78)

**Response:**

The Agency believes that the NEFTRAN-S model is adequate for the BID analyses. The comment is correct that the same conceptual model was used for all sites; this is in keeping with the Agency's approach of modeling generic sites. Some capabilities of the NEFTRAN-S code were not used in the generic analyses. One, in particular, is the capability to model a dual-porosity medium. Fracture flow could be modeled with this option but the required data would be highly site-dependent. As is the case with any computer code, NEFTRAN-S will not model all types of inhomogeneities in the geologic medium. However, NEFTRAN-S has the capability to model flow and transport through boreholes or failed shaft seals, although separate computer runs are required for each of these scenarios. Flow through shaft seals and improperly sealed boreholes were included in the risk assessment for the containment requirements and are contained in the Technical Support Document.

The NEFTRAN-S model was used in the generic risk assessments for a number of reasons. Among these are its ability to model generic geologic media and its ability to perform uncertainty evaluations by varying a wide range of input parameters. The code can be used for sensitivity studies and Monte Carlo probabilistic analyses. The NEFTRAN-S model is a useful tool for demonstrating technical feasibility of the standard and estimating the impacts on ground water and individuals.

Comment T3.D1: Some of EPA's simplifying assumptions presented in the BID may be causing EPA to underestimate doses. For example, Table 7.5-15 postulates an aquifer thickness of 2400 meters at a tuff site. Even if the physical thickness of an aquifer were this great, the effective thickness within which radionuclides would be mixed and transported would be much less. Thus, EPA may have overestimated dilution of releases (and underestimated doses) by one to two orders of magnitude. (D-58,78)

**Response:**

The Agency has performed an analysis in which the aquifer characteristics of the generic tuff site are consistent with the characteristics assumed for the generic basalt and granite sites, i.e., an aquifer thickness of 30 meters. This enhances the Agency's intent of providing comparative analyses of the technical feasibility of the health-based standard at a variety of generic sites. The results of the analysis did not affect the standard.

Comment T3.E1: In the BID, EPA uses retardation factors originally developed for the National Academy of Sciences' 1983 Waste Isolation Systems Panel's HLW report. The waste form for EPA's current analyses is transuranic waste, which includes organic trash,

chelating agents, etc. EPA should explain why it thinks the retardation factors developed for HLW would be appropriate for transuranic wastes with much different chemical characteristics. (D-58,78)

**Response:**

Radionuclide retardation factors in geologic materials are highly uncertain. Among other things, the retardation factors are sensitive to the physical properties of the geologic material, the presence of minerals, and the chemical form of the radionuclides. The retardation values may vary over several orders of magnitude. The values from the National Academy of Sciences report are considered to be reasonably conservative and appropriate for use in generic analyses of TRU waste disposal. However, the values would likely not be suitable for an assessment of a real disposal site where more site- and waste- specific information would be required.

Comment T3.F1: The reinstated criteria of 40 CFR Part 191 define "undisturbed performance" as "...the predicted behavior...if the disposal system is not disrupted by human intrusion or the occurrence of unlikely natural events." Use of the term "undisturbed performance" in the BID is confusing because it includes disturbed performance to the extent that natural disruptions are likely to occur. It is recommended that EPA drop the word "unlikely" from the definition of undisturbed performance. (D-58,78)

**Response:**

The inclusion of likely natural disturbing events in "undisturbed performance" is intended to assure that repository design will consider such events. This will prevent situations arising in which a projected release might meet the containment requirements yet exceed the individual and ground-water requirements. To ignore likely natural events could allow, in theory, a disposal system to be sited on an active fault zone without any concern for the individual dose. If one were to ignore all "natural events", any effect due to shifts in land, no matter how small or frequent, would constitute "disturbed performance" and therefore would not be considered in the repository design.

Comment T3.G1: Section 7.6.2 of EPA's BID seems to endorse use of elicited expert judgment in a performance assessment for demonstration of compliance with the proposed standards. While we recognize that use of expert judgment will be a necessary part of any demonstration of compliance with these standards, NRC staff believe that it is inappropriate to substitute judgment for data unless data are not reasonably obtainable. (D-58,78)

**Response:**

EPA agrees that expert judgment is not appropriate as a replacement for reasonably obtainable data. However, in the context of the types of assessments that are anticipated in showing compliance with these standards, where projections must be made over thousands of years, it is anticipated that there may be cases when expert

judgment will be necessary to interpret the implications of the data. In the case where there is data available, EPA believes that it is not proper to use "expert judgment".

#### **T4. Economic Impact Analysis**

**Comment T4.A1:** The Economic Impact Analysis does not support the determination that no Regulatory Impact Analysis is required. The Economic Impact Analysis contains inadequate bases, findings, and conclusions. Therefore, a Regulatory Impact Analysis is required. (D-87)

**Response:**

A regulatory impact analysis is required by Executive Order 12291 only if there is a significant economic impact. The only economic impact identified by the Agency is a small percentage of the total cost of modeling and, obviously, an even smaller percentage of the total cost of disposal. The EPA's experience in environmental pathway modeling suggests that this cost will not exceed one million dollars. This is not a significant impact as defined in Executive Order 12291.

**Comment T4.B1:** Information in the BID to support the Economic Impact Analysis does not address the cost of compliance demonstrations for the number and types of facilities to which it could apply. (D-87)

**Response:**

The Agency has found that information related to the various wastes which could fall under the amendments is not available. In addition, it is not possible to know precisely what types of waste treatments and disposal systems may be developed in the future. Finally, the Agency believes that other types of disposal systems for the subject wastes should be at least as protective as would a geologic repository. Therefore, not only is it impossible to, there is also no need to attempt to, include all possible types of waste and disposal systems.

**Comment T4.C1:** It is incorrect to conclude that because the containment requirements have been reinstated there is no economic impact from the current amendments. (D-87)

**Comment T4.C2:** The calculations in the BID do not support the conclusion of no cost or low cost. Although the BID analyses show no doses, this conclusion may not be true for other types of disposal (such as the Hanford HLW tanks). (D-87)

**Response (Comments T4.C1 through 2):**

The Agency's conclusion of no impact depends upon the fact that the containment portions of the standard were reinstated by Congress and were effective before the amendments were proposed. While there could be costs involved to implement the disposal standards which were reinstated, they cannot be attributed to these amendments. If the argument were to be accepted that both the containment standards and the amendments of the individual and ground-water protection requirements should have costs allocated to them separately, there is no feasible way to allocate the costs since only a single technological solution is envisioned as being used to guarantee both. The Agency did point out that there could be a small cost, as high as one million dollars, as part of the effort to demonstrate compliance with the amendments.

Comment T4.D1: Future costs are discounted to obtain a present value, but projected statistical health effects are not discounted. Health effects should also be discounted to maintain a meaningful comparison of costs vs. benefits. (D-87)

**Response:**

The EPA had several reasons for not discounting health effects over the 10,000-year regulatory period. The first is remarked upon by DOE -- that the health effects would essentially be reduced to zero (which implies that the effects of discounting have been made implicit in the analysis). A related point is that discounting would not allow for a comparison of media, i.e., it is easier to compare large whole numbers than fractions very near zero. A second and more compelling reason for not discounting is that it is not appropriate. Costs and health effects are not directly compared within the framework of a cost-benefit analysis nor do we have "true" costs and benefits since by definition these must be measured against a reference case. As noted previously, this does not exist for this analysis. What are presented are absolute costs and absolute health effects.

**T5. General**

Comment T5.A1: The government is using an economically based safety standard rather than a health-based standard. (D-57)

**Response:**

Protecting public health and the environment is EPA's primary concern. While EPA does take economic factors into account, it was not considered a compelling factor in this rulemaking. The EPA determined that the impact is minimal by adopting a 15 mrem CED/yr dose standard and finds the lifetime risk represented by this level of exposure to present an acceptable risk, as discussed in the preamble to the final rule.

Comment T5.B1: Since EPA is developing a "generally applicable standard" additional issues should be addressed. In particular, releases of C-14 gas should be addressed, even though it is generally not a concern with TRU waste. (A-05)

Comment T5.B2: Limits on the release of carbon-14 should be deleted. (D-85)

Comment T5.B3: The C-14 release limit should be deleted because it is based on a deficient analysis which failed to consider gaseous releases under quiescent conditions. (D-67,74,77)

**Response (Comments T5.B1 through 3):**

The quantity limits on the release of carbon-14 are a part of the containment requirements which were reinstated by the Congress. It is a policy decision made by EPA not to reopen, at this time, portions of the standards which have been reinstated by the WIPP LWA.

The issue of gaseous releases was the subject of an EPA Science Advisory Board study and may be an issue considered in the forthcoming study being conducted by the National Academy of Sciences. That study has been mandated by the Energy Policy Act of 1992 for the purpose of advising EPA on devising standards for Yucca Mountain. In addition, EPA may reconsider the issue whenever 40 CFR Part 191 is reconsidered.

**APPENDIX A**  
**LIST OF COMMENTERS**





## **APPENDIX A**

### **LIST OF COMMENTERS**

Public hearings on the proposed 40 CFR Part 191 were conducted in New Mexico as follows: February 23, 1993 in Carlsbad; February 24, 1993 in Albuquerque; and February 25 and 26 in Santa Fe. The following is a list of those who testified and, where appropriate, the organizations they represented.

#### **Carlsbad Hearing**

- C-01 Arlen Hunt, DOE WIPP Site Project Manager
- C-02 Clifford Stroud, Carlsbad Dept. of Development
- C-03 Chuck Bernhard, Carlsbad Dept. of Development

#### **Albuquerque Hearing**

- A-01 Mark Matthews, DOE WIPP Integration Office Deputy Project Manager
- A-02 Charles Hyder
- A-03 Roger Anderson, Scientists Review Panel
- A-04 Dori Bunting
- A-05 James D. Werner, Natural Resources Defense Council
- A-06 Don Hancock, Southwest Research and Information Center
- A-07 Harry Willson
- A-08 Joseph Shunkamolah
- A-09 Louise Kahn
- A-10 Jim McConnell
- A-11 Rose Shaw, Southwest Organizing Project

A-12 Pablo Marquez  
A-13 Angela Weibock  
A-14 Jerry Messick  
A-15 Janna Rolland  
A-16 Barbara Forshay  
A-17 Arthur Apodaca  
A-18 Mario Villeda  
A-19 Tim Forrest  
A-20 Evelyn Kennerly  
A-21 Gloria Williams  
A-22 Phyllis Hoge  
A-23 Elizabeth Byer  
A-24 Mary Morell  
A-25 Robert Neill, New Mexico Environmental Evaluation Group  
A-26 Don Schrader  
A-27 Bob Anderson  
A-28 Rita Getty  
A-29 John Leahigh  
A-30 Pat Marcelo  
A-31 Lee Sims  
A-32 Alva Morrison, Water Information Network  
A-33 Andres Valdez, New Mexico Vecinos United

- A-34 Susan Gorman, Rio Grande Chapter of the Sierra Club
- A-35 Geraldine Amato
- A-36 Barbara Pfaff
- A-37 Eric Lane, People's Emergency Response Committee
- A-38 Bruce Trigg
- A-39 Janet Greenwald
- A-40 Julia Heinzelman
- A-41 Emmett Garrity
- A-42 Sylvianna Diaz D'Oville
- A-43 Sue Chavez
- A-44 Doug Darien
- A-45 Dan Moore
- A-46 Karen Navarro
- A-47 Glenda Voigt
- A-48 Penny Bradfield
- A-49 Garland Harris
- A-50 Reyna Juarez
- A-51 Chuck Goodmarker
- A-52 Sylvanna Seidel
- A-53 Robyn Seidel
- A-54 Dan Kerlinsky, N.M. Physicians for Social Responsibility
- A-55 Bob Aly

A-56 Susan Pearce  
A-57 Aspen Evans  
A-58 Mimi Leland  
A-59 Pere Gormley  
A-60 Jeff Radford, Business People Concerned about WIPP  
A-61 Lisa Gover  
A-62 Jack Uhrich  
A-63 Allan Moskowitz  
A-64 Deborah Orozco  
A-65 Michele Witzki  
A-66 Stephanie Daw  
A-67 David Hofer  
A-68 Amy Silverman  
A-69 Ari Maslow  
A-70 Kent Gormley  
A-71 Cordelia Friedman  
A-72 Thomas Metcalf  
A-73 Lorraine Evans  
A-74 Jocelyn Brown  
A-75 Jim Morrison

**Santa Fe Hearing - Day 1**

- S-01 Eli Maestas, DOE WIPP Integration Office
- S-02 Tom Udall, New Mexico Attorney General
- S-03 Margaret Carde, Concerned Citizens for Nuclear Safety
- S-04 Sasha Pyle
- S-05 Bonnie Bonneau
- S-06 Robin Laughlin
- S-07 Stephanie Lee
- S-08 Dan Gibson
- S-09 Amy Hamouda
- S-10 Ted Seeley
- S-11 Jean Nichols
- S-12 Kathy Lage
- S-13 Thomas Hatcher
- S-14 Ditto Nowakoski
- S-15 Deborah Reade
- S-16 Len Maki
- S-17 Marilyn Winter-Tamkin
- S-18 Mary Lou Cook
- S-19 Jason Salzman, Greenpeace
- S-20 Doug Doran
- S-21 Bonney Hughes, Religious Society of Friends

S-22 T. Quinn Evans

S-23 Don Hancock, Southwest Research and Information Center

S-24 Stanley E. Logan

S-25 Kenneth Jacks

S-26 Jenny Schatzle

S-27 Baltazar Aragon

S-28 Richard Deyo

S-29 Elliott Skinner

S-30 Mary-Charlotte Domandi

S-31 Linda Hibbs

S-32 John Ussery

S-33 Patricia Theodore

S-34 Bob Samuel

S-35 Jim Brogan

S-36 Bill Gould

S-37 Anhara Lovato

S-38 Florence May Gonzalez

S-39 Maureen Havey

S-40 Lynne Stroud

S-41 John Brito

S-42 Edward Baca, ASME Local 2238

S-43 Bill Doyle

- S-44 Ann Dasburg
- S-45 Dolores Pierson
- S-46 Helen Thompson
- S-47 Elizabeth Dunham
- S-48 Scott Estep
- S-49 Medora Raborg
- S-50 Kirsten Hartman
- S-51 Dawn Harris
- S-52 Mary Riseley
- S-53 Liberty Goodwin
- S-54 Leslie O'Toole
- S-55 Jay Coughlin
- S-56 Peter Cummings
- S-57 Julie Daniel, Business Against WIPP
- S-58 Penny McMullen, Sisters of Loretto
- S-59 Michael Collins
- S-60 David Fine
- S-61 Robert March
- S-62 Carmen Ruiz
- S-63 Richard Schmidt
- S-64 Marvin Mattis
- S-65 Naomi Mattis, Letters from the People

S-66 Ellen Roddick  
S-67 Florence Dance  
S-68 Joni Arends  
S-69 John Stroud  
S-70 Alan Liddell  
S-71 Trish Tanner  
S-72 Nelson Denman  
S-73 Gary Gallup  
S-74 Ed Winter-Tamkin  
S-75 A. Mona  
S-76 Don Brayfield  
S-77 Thomas A. Morgan  
S-78 Penelope Place  
S-79 Mansi Kern  
S-80 Susan Myers  
S-81 B. Watt

**Santa Fe Hearing - Day 2**

S-82 Marcia Summers  
S-83 Joan Halifax  
S-84 David Coffey  
S-85 Jonas Skardis  
S-86 Stanley Paytiamo, Pueblo of Acoma



S-87 Dominique Mazeaud  
S-88 Christina Brown  
S-89 Laura Clarke  
S-90 Sandy Clarke  
S-91 Reba Lee  
S-92 Judith M. Espinosa, New Mexico Environment Department  
S-93 Nelson Foss  
S-94 Lola Moonfrog  
S-95 Karin Salzmänn  
S-96 Virginia Miller  
S-97 Ed Romero  
S-98 Shama Beach  
S-99 Peter Tadd  
S-100 Alexis Clemens  
S-101 Edwin Treitler  
S-102 Jean McFarland  
S-103 Norah Pierson  
S-104 Eric Larson  
S-105 Carrie Hitch  
S-106 Mike Castro  
S-107 Richard Schmidt  
S-108 Patricia Strout  
S-109 Naomi Mattis

Written comments on the proposed 40 CFR Part 191 were received into Docket Number R-89-01. Comments were logged during the comment period in the order they were received. The following is a list of those who wrote and, where appropriate, the organizations they represented.

- D-01 George Greer & Requa Tolbert, Santa Fe, New Mexico
- D-02 Anna Katherine, Santa Fe, New Mexico
- D-03 Llyn Peabody, Santa Fe, New Mexico
- D-04 Janet Degan, Santa Fe, New Mexico
- D-05 Helen Thompson, Rowe, New Mexico
- D-06 Lea Shepperson, Albuquerque, New Mexico
- D-07 Robert M. Bernstein, M.D.
- D-08 Retta Johnston, Santa Fe, New Mexico
- D-09 Charles Hyder
- D-10 Cliff Hall, Squash Blossom, Alamogordo, New Mexico
- D-11 Dolores Pierson, Santa Fe, New Mexico
- D-12 Bettie Witt, Roswell, New Mexico
- D-13 Frances Tyson, Las Vegas, New Mexico
- D-14 Sheila M. Stevens
- D-15 James M. Hardin, Derwood, Maryland
- D-16 Bonnie Bonneau, El Prado, New Mexico
- D-17 Dee Homans, Andrew D., H. Howans, Santa Fe, New Mexico
- D-18 Raymond Singer, Santa Fe, New Mexico
- D-19 Abraham Ellis Goldminz & Irene Judith Goldminz, Carlsbad, New Mexico
- D-20 Emmy Koponen, Ojo Sarco, New Mexico

- D-21 Coalition for the Sensible Management and Disposal of Radioactive Waste, signed by Pamela Aycock
- D-22 New Mexico Environmental Evaluation Group, Robert H. Neill
- D-23 U.S. Department of Energy, presented at public hearings by Arlen Hunt and Eli Maestas
- D-24 New Mexico Attorney General, Tom Udall
- D-25 Gladys R. Winblad, Albuquerque, New Mexico
- D-26 Georgia Power Company, signed by J.T. Beckham, Jr.
- D-27 Cliff Stroud, Carlsbad Dept. of Development
- D-28 Roger Y. Anderson, Scientists Review Panel
- D-29 Elizabeth Dunham, Santa Fe, New Mexico
- D-30 Centerior Energy, Perry Nuclear Power Plant, signed by Robert A. Stratman
- D-31 Bob E. Watt (Human Intrusion), Los Alamos, New Mexico
- D-32 Bob E. Watt (WIPP Test Phase), Los Alamos, New Mexico
- D-33 Bob E. Watt (WIPP EIS), Los Alamos, New Mexico
- D-34 Susan Myers, Santa Fe, New Mexico
- D-35 Mansi Kern
- D-36 Richard Schmidt, Ranchos de Taos, New Mexico
- D-37 Penelope McMullen, Sister of Loretto
- D-38 Florence May Gonzalez, Santa Fe, New Mexico
- D-39 Anhara Lovato
- D-40 Patricia Theodore, Concerned Citizens for Nuclear Safety
- D-41 John W. Ussery, El Rito, New Mexico
- D-42 Linda Hibbs, Santa Fe, New Mexico
- D-43 Richard Deyo, Santa Fe, New Mexico

- D-44 Stanley E. Logan, Santa Fe, New Mexico
- D-45 Bonney Hughes, Religious Society of Friends
- D-46 Doug Doran, Citizens for Alternatives to Radioactive Dumping
- D-47 Jason Salzman, Greenpeace
- D-48 Leonard M. Maki, Santa Fe, New Mexico
- D-49 Judith M. Espinosa, New Mexico Environment Department
- D-50 Dominique Mazeaud, Santa Fe, New Mexico
- D-51 Lola Moonfrog, Santa Fe, New Mexico
- D-52 Stanley Paytiamo, Pueblo of Acoma
- D-53 Margaret Carde, Concerned Citizens for Nuclear Safety
- D-54 Marcia Summers, New Mexico
- D-55 Norah Pierson, Santa Fe, New Mexico
- D-56 Da Vid, The Human Ecology Party
- D-57 Patricia Strout
- D-58 U.S. Nuclear Regulatory Commission, draft comments signed by Magaret V. Federline and Daniel J. Fehringer
- D-59 Richard Deyo
- D-60 Don Hancock
- D-61 Naomi Mattis Document
- D-62 Albuquerque Hearing Submissions from commenters A-02, 05, 25, 32, 34, 60, 72, 73, 74, 75
- D-63 Concerned Citizens of Cerrillos, signed by Ross Lockridge, president
- D-64 Lon Murphy, Portland, Oregon
- D-65 Mary Burton Riseley, Santa Fe, New Mexico

- D-66 Hannah Riseley-White, Santa Fe, New Mexico
- D-67 Southern Nuclear Operating Company, signed by J.D. Woodard
- D-68 Environmental Defense Institute, signed by Chuck Broschious
- D-69 David Okrent, University of California, Los Angeles
- D-70 Retta Johnston, Santa Fe, New Mexico
- D-71 Attorney General of New Mexico, signed by Tom Udall and the Attorneys General of Arkansas, Minnesota, Nevada, and Texas
- D-72 Basia Miller, Santa Fe, New Mexico
- D-73 Susan Butkovich, Santa Fe, New Mexico
- D-74 Nuclear Management and Resources Council, signed by Thomas E. Tipton
- D-75 Nevada Division of Environmental Protection
- D-76 Natural Resources Defense Council, signed by Thomas B. Cochran, James D. Werner, and David P. O'Very
- D-77 Edison Electric Institute, signed by David L. Swanson
- D-78 U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards signed by Robert M. Bernero
- D-79 Kenneth Jacks, Santa Fe, New Mexico
- D-80 Nevada Agency for Nuclear Projects, Nuclear Waste Project Office, signed by Robert R. Loux
- D-81 Southwest Research and Information Center, signed by Don Hancock
- D-82 Westinghouse Electric Corporation, signed by S.A. Green
- D-83 Sierra Club, signed by Anne Ehrlich
- D-84 Victor Ferkiss, Corrales, New Mexico
- D-85 Yankee Atomic Electric Company, signed by D.W. Edwards
- D-86 New Mexico Environmental Evaluation Group, signed by Robert H. Neill

D-87 U.S. Department of Energy, signed by Paul D. Grimm

D-88 Citizens for Alternatives to Radioactive Dumping, Albuquerque, New Mexico

D-89 State of New Mexico, Radioactive Waste Consultation Task Force, signed by  
Anita Lockwood

## **APPENDIX B**

### **ACRONYMS**





**APPENDIX B**  
**LIST OF ACRONYMS**

<b>AEA</b>	Atomic Energy Act of 1954, as amended
<b>CFR</b>	Code of Federal Regulations
<b>DOE</b>	U.S. Department of Energy
<b>EPA</b>	U.S. Environmental Protection Agency
<b>FR</b>	<i>Federal Register</i>
<b>HLW</b>	High-Level Waste
<b>ICRP</b>	International Commission on Radiological Protection
<b>MCL</b>	Maximum Contaminant Levels
<b>NRC</b>	U.S. Nuclear Regulatory Commission
<b>NWPA</b>	Nuclear Waste Policy Act
<b>RCRA</b>	Resource Conservation and Recovery Act
<b>SDWA</b>	Safe Drinking Water Act
<b>TDS</b>	Total Dissolved Solids
<b>TRU</b>	Transuranic
<b>UIC</b>	Underground Injection Control
<b>USC</b>	United States Code
<b>USDW</b>	Underground Source of Drinking Water
<b>WIPP</b>	Waste Isolation Pilot Plant
<b>WIPP LWA</b>	Waste Isolation Pilot Plant Land Withdrawal Act



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