

# NEW MEXICO ENVIRONMENTAL EVALUATION GROUP PERSPECTIVES ON PROPOSED EPA HIGH-LEVEL AND TRANSURANIC WASTE DISPOSAL STANDARDS

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## ABSTRACT

The New Mexico Environmental Evaluation Group (EEG) performs independent technical evaluation of the Waste Isolation Pilot Plant (WIPP) project, a federal repository intended for permanent disposal of defense transuranic (TRU) waste. WIPP has to comply with the same disposal standards as the high level nuclear waste repository but will not be licensed by the Nuclear Regulatory Commission. These standards, promulgated by the U.S. Environmental Protection Agency (EPA) in 1985, were vacated in 1987 and are being revised for repromulgation. EEG took an active role in the initial development of the standards and is doing so in the repromulgation process as well, to ensure adequate protection of the public health and safety for the people of New Mexico. We would like to see the repromulgated standards contain adequate consideration of the possibility of human intrusion since WIPP is underlain by oil, gas and potash resources; resolve the issue of an appropriate TRU unit comparable to 1,000 MTHM of spent fuel; contain specific requirements for container life, waste form and other engineered barriers; retain the conservatism in the probabilistic assessment; and be repromulgated as soon as possible.

## INTRODUCTION

In 1985, the U.S. Environmental Protection Agency promulgated, Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear, High-Level and Transuranic Radioactive Wastes (40 CFR Part 191). Subsequently, Subpart B of the Standards was remanded in 1987 and EPA has subsequently issued four working drafts for discussion prior to re-proposing the Standards. This paper will address both the 1985 Standards and specific working drafts for repromulgated standards.

Since WIPP is not regulated by the Nuclear Regulatory Commission (NRC), the EPA Standards will be the only Federal or State nuclear health and safety standard applicable to the disposal of transuranic waste at WIPP. The Environmental Evaluation Group, (EEG) which is responsible for technical oversight of the WIPP Project for New Mexico, considers the Standards to be very important for the protection of the public health and safety. We have been heavily involved in commenting, testifying, and interacting with EPA and others on the contents of the Standard since 1981.

## WIPP SPECIFIC ISSUES

There are several differences between the WIPP Project for the disposal of transuranic waste, and the Yucca Mountain Project for the disposal of high level waste, that need to be recognized and kept in mind during development of the 40 CFR 191 Standard. These issues are both institutional and technical.

### Institutional Issues

At the present time, the Department of Energy (DOE) self-regulates by determining whether they have complied with 40 CFR 191. As the implementing agency, DOE has not issued regulations similar to NRC's 10 CFR 60 that WIPP must meet. EPA included Assurance Requirements in the 1985 Standard and in all subsequent working drafts. The inclusion of Assurance Requirements caused objections from both the NRC (even though they do not apply to NRC licensed

repositories) and DOE. EEG has always taken the position that the Assurance Requirements are essential because of the inherent uncertainties in the calculations and should remain in the Standards. We recognize that the general nature of the Assurance Requirements in 40 CFR 191 gives the implementing agency for TRU waste far more flexibility than would be possible if compliance with 10 CFR 60 were required.

Another WIPP specific issue is that the repository was sited, designed, and construction started prior to the issuance of the 1985 Standard. DOE gave very little consideration prior to 1986 or 1987 concerning the ability of the Project to show compliance with 40 CFR 191, even though by 1983 the general nature of the Standards was generally known. There has also been a tendency for DOE to consider designs completed prior to 1985 should be "grandfathered" rather than modified to meet the Standards. The normal sequence in setting standards to limit population exposure is to evaluate the benefits, costs and risks, determine the appropriate level of protection, select a site, design the facility and then proceed with the construction. In this instance the process is backwards since both sites were selected by law and the design and construction is underway. Therefore, every proposed change in the Standards is immediately scrutinized by the DOE for its impact on the existing commitments.

The difficulties in showing compliance with the 1985 Standard have contributed to delay the opening of WIPP for disposal and have required the initiation of a number of field studies that ideally should have occurred much earlier in the siting and design process.

The final institutional issue is whether there will be a valid 40 CFR 191 (Subparts A and B) for WIPP to comply with at the time Performance Assessment has been completed. At present there is no standard because Subpart B was vacated in 1987 and has not been repromulgated. EPA's current schedule is to propose a revised 40 CFR 191 in the summer of 1992 and to promulgate the Standards in 1993. However there are pressures for significant changes which could delay the issuance of the Standards. When the Standards are finally repromulgated, it is possible legal action will again be taken

to vacate them. The likelihood of successful legal action is probably greater the more the repromulgated Standards differ from the 1985 original.

The 1987 Second Modification to the Consultation and Cooperation Agreement between the State of New Mexico and the Department of Energy requires DOE, in the absence of repromulgated Standards, to continue its performance assessment planning as though the 1985 Standards were in effect. Various Congressional WIPP Land Withdrawal Bills recognized this potential problem and specify that compliance can be shown with the 1985 Standard if a valid Standard does not exist at the appropriate time. The Bills also impose time constraints to repromulgate. Significant changes could substantially delay the demonstration of compliance with the Standards.

### Technical Issues

Technical issues specific to WIPP involve the site itself, waste characterization, waste form, and repository designs. These all differ significantly from Yucca Mountain conditions.

**WIPP Site.** The WIPP Site is located in a resource rich area even though the conventional wisdom has always been to avoid such areas. Guidance in the 1985 Standards and the subsequent drafts states that one should use a maximum exploratory drilling rate for sedimentary formations ten times that required for non-sedimentary formations. A higher drilling rate obviously makes human intrusion more of a potential threat to the repository.

Approximately 50% of the projected waste storage area at WIPP is believed to be underlain by a pressurized brine reservoir in the Castile formation. Such brine reservoirs contain sufficient pressure and volume to flow thousands of cubic meters of brine to the surface if intercepted by exploratory drilling. Their presence drastically increases the potential consequences from some human intrusion events. There is an existing well with a valid lease to extract oil and gas from under the WIPP site.

**Waste Characterization.** Transuranic waste is very heterogeneous. It contains combustibles, concreted or cemented sludges, glass and metal non-combustibles, filters, and other miscellaneous waste forms. The majority of the waste contains sufficient hazardous material to be classified as a mixed waste and subject to RCRA regulation. The problem with 40 CFR 191 is that it is difficult to know the source term with a great deal of accuracy and the variation may be somewhat greater in individual waste storage rooms. The issue of the appropriate TRU waste unit that should be comparable to 1,000 MTHM of spent fuel needs to be resolved.

**Waste Form.** Essentially none of the existing waste is treated or fixed in any manner. It has high void fractions, contains respirable fines, produces significant quantities of gas from organic decomposition as well as anoxic corrosion of the carbon steel drums, contains up to 1% free water, considerable bound water in the sludges and an enormous range of solubility. These waste forms increase problems caused by lack of room closure and increased mobility of radionuclides and also increase the uncertainty of predicting behavior.

**Repository Design.** Since contact handled TRU (CH-TRU) waste is voluminous and non-heat producing, waste containers (after insuring no criticality problems) can be placed side by side and stacked two or three boxes or drums high in the waste disposal rooms. This results in a large surface

area of waste (about 110,000 m<sup>2</sup>) and increases the probability an exploratory borehole will intercept waste containers. Also, the contents of multiple containers could become involved in a human intrusion event.

At the present time it is uncertain whether there will be any backfill other than salt in the waste storage rooms. There are plans to install panel seals to isolate the waste into 10 approximately equal volumes. If the panel seals perform as planned, it would be possible for up to 10% of the waste volume (and more of the radioactivity) to be involved in some scenarios. Either EPA or the implementing agency should provide specificity for container life, waste form, and acceptability of mineral extraction because they are still open issues at WIPP.

### Results of WIPP Preliminary Performance Assessments

Preliminary comparisons with Subpart B of the 1985 Standards by Sandia National Laboratory (SNL) suggest that the 1985 Standards might be met with the current waste form and repository design, perhaps by an order of magnitude. EEG believes some of the assumptions used were not conservative and the distribution of values used in some key parameters are unproven. However, we agree that SNL may be able to show compliance with the 1985 Standard even though the site, waste form, and design of WIPP are all conducive to maximizing the deleterious effects of human intrusion.

### EEG POSITION ON 1985 STANDARDS

EEG agreed with most of the 1985 Standards at the time they were promulgated. We had reservations about variance procedures in Subpart A and to a lesser extent the Alternative Provisions in Subpart B (191.17). We re-iterated our previous objection to the definition of the TRU waste unit.

The 1985 Standards had a beneficial impact on the WIPP Project, even after Subpart B was remanded in 1987. The data needed to show compliance with the containment requirements have forced the DOE to undertake additional site studies and evaluations. The studies yield more understanding about expected waste disposal room behavior in the future as well as radionuclide transport toward the accessible environment. Results of the Preliminary Comparisons indicate those parameters that are most sensitive to performance assessment and need more detailed studies. A principal benefit of this probabilistic approach is it forces quantitative data to be obtained through rigorous site characterization and analyses.

EEG does not object to the use of the 1985 Standards for WIPP Performance Assessment. We recognize there are some inconsistencies and one could always argue about the numbers used in Table 1 (Appendix A, 40 CFR 191) or elsewhere and on the very basis of the Standards. Yet it is sufficiently conservative to force an understanding of the Site. The WIPP Site, even though it has some drawbacks, can meet the Standards although waste form modification and/or repository design changes may be required.

EEG's views on the 1985 Standards and the future Standards are strongly influenced by our experience in evaluating WIPP. We have four basic concerns:

1. the unique features of a TRU repository not be overlooked in a standard written primarily for a spent fuel/HLW repository;

2. the effectiveness of a TRU repository in isolating radioactive waste should be equivalent to that required of a spent fuel repository;
3. the Standards should require extensive site studies and evaluations to force as good an understanding of the site and repository design as possible to minimize the uncertainties of predicting performance for 10,000 years;
4. the Standards should be stringent enough to adequately protect health, safety and the environment but not so stringent or calculationally cumbersome that it would be unlikely any site could show compliance.

### FEBRUARY 3, 1992 WORKING DRAFT

In response to the 1987 objections raised by the Court, EPA made changes in the working drafts issued since that time. They also have considered recommendations by others and the February 3, 1992 Working Draft is significantly different from the remanded 1985 Standards. Still some organizations and individuals believe these changes have not gone far enough.

EEG will make detailed comments to EPA on this latest working draft. Our thoughts on the major provisions of Subpart B in this Working Draft are presented below.

#### General Comments

EEG supports the major components of the 1985 Standards including:

- Release limits in Table 1 that are related to the number of waste units;
- Probabilities to determine the appropriate Table 1 limits.
- Human intrusion scenarios in the performance assessment;
- Guidance on human intrusion and other assumptions;
- A 10,000 year time period for the containment requirements;
- Individual dose limits for undisturbed performance;
- Assurance requirements.

All of these components still remain in the February 3, 1992 working draft although alternative approaches are offered in some cases. Our views on current wording are discussed below.

#### Table 1 Release Limits

The release limits that would result in 10 deaths from latent cancer fatalities in 10,000 years were determined by generic pathways modeling and were rounded to the nearest order-of-magnitude. The values in Table 1 apply specifically to a waste unit equivalent to a spent fuel quantity of 1,000 Metric Tons of Heavy Metal (MTHM). Other waste forms are related to this basic waste unit by definitions included as footnotes to Table 1.

EEG believes it is not necessary to update the pathway modeling and change the Table 1 values. Rounding the numbers to one significant figure would be better. However, we do believe the definitions of the Transuranic (TRU) waste unit should be changed.

The present TRU waste unit is defined as 1 million curies of alpha emitting TRU with half-lives greater than 20 years being equal to 1,000 MTHM. Since 1,000 MTHM contains about 3.5 million curies of TRU one year after removal from a reactor this definition allows about 3.5 times the fractional release from a TRU repository as from a spent fuel repository. This is inconsistent with EPA's intent to require about the same degree of containment for all waste forms.

EEG has advocated a definition of 3 million curies of TRU = 1,000 MTHM since 1983 which would result in a more equal retention requirement for both waste forms.

We still believe the 3 million curie definition would be much better than the 1 million curie definition. It would be better to relate the TRU waste unit (or any other waste unit) to the health effects present in 1,000 MTHM if it were all present in the environment for 10,000 years. This would make it possible to calculate a more accurate equivalency for whatever mix of radionuclides a waste contained. This procedure is discussed in more detail in two recent papers (1) (2).

#### Probabilistic Assessment

The Working Draft proposes a procedure developed by the NRC staff be allowed as an option to the previous method of determining probabilities and plotting them in a complementary cumulative distribution function (CCDF).

This option, referred to as the 3-bucket approach, claims to have the advantage of requiring less precision in determining the probability of low-probability events and be equally conservative.

The present draft does not adequately explain this procedure and the final Standard should either explain it in more detail or reference such an explanation.

EEG tentatively accepts the 3-bucket approach as an acceptable option if events with a probability of greater than .0001 are included. It should be slightly easier to implement and all examples we have tried to date resulted in calculations as conservative as the Standard approach. However, it is not always as conservative if a cut off probability of .001 is used.

#### Collective Dose Alternative

The working draft allows the implementing agency to use either the Table 1 release limits or a collective dose alternative to show compliance with the Containment Requirements. The applicable collective dose would be 2.5 million person-rem (for a 100,000 MTHM repository) for events where the probability was greater than 0.1 and 25 million person-rem for probabilities of 0.001-0.1. This alternative was desired by those who believed it would be easier to comply with than with the Table 1 (Appendix A, 40 CFR 191) release limits.

EEG theoretically agrees that person-rem is the appropriate indicator and that 2.5 million person-rem is the appropriate value. However, this procedure significantly increases the number of assumptions that must be made in the performance assessment and EPA offers little guidance for the assumptions to be used. Unless more guidance is provided, EEG sees no merit to this alternative.

EEG plans to estimate the collective dose within 50 miles of the WIPP Site from a surface release. It appears that compliance with the collective dose alternative may not be much easier than with the Table 1 release limits. Also, the assumptions used on resuspension factors, population size

and location, and food pathway parameters are very important and subject to a great deal of disagreement.

#### Inclusion of Human Intrusion

EEG agrees with the requirement in the 1985 Standard and the working Draft that treats human intrusion in the same manner as unexpected natural events. We will oppose any modification that downgrades the importance of human intrusion in showing compliance.

#### Guidance as Human Intrusion

EEG believes the guidance on human intrusion in the Working Draft is reasonably well balanced and would be acceptable with no modification. The upper bounds that must be considered are conservative, but none are bounding and the implementing agency is allowed to justify lower values.

We believe the presence of guidance is beneficial to the implementing agency, especially with human intrusion, because it permits them to drop incredible assumptions from the evaluation. Also, we commented to EPA that it might be admissible to move some of the Guidance into the Standard itself.

#### 10,000 Year Time Period

EEG believes that the 10,000 year time period is most appropriate for the Containment Requirements. It is long enough to defeat poor sites and short enough to minimize the effects of geological and climatic changes that are more difficult to predict.

We concur with the Working Draft requirement that individual doses should also be determined for the 10,000 year period and should apply to the undisturbed performance of the repository.

EEG is uneasy about the new requirement, 40 CFR 191.12, in the Working Draft that requires undisturbed releases to be modeled over the 10,000-100,000 year period. This

is likely to cause a lot of confusion because of the greater uncertainty in projecting so far into the future and because no guidance is given on what effect the value obtained is supposed to have on the licensing process. We appreciate a desire to model slightly (several thousand years) beyond the 10,000 year period because the findings would give an indication of the confidence in the 10,000 year assessment. More thought needs to be given to this new requirement.

#### Assurance Requirements

EEG believes it is absolutely essential that the Assurance Requirements remain in the Standard and be applicable to repositories not licensed by the NRC.

### CONCLUSIONS

A number of specific changes in the Standard have been recommended by EEG in this paper. These recommendations are primarily refinements to the existing Working Draft and do not object to the basic approach of either the 1985 Standard or the Working Draft.

It is most important that this Standard be re-promulgated in 1993 without major changes. Significant delays and/or changes could result in considerable confusion and delay in showing compliance at WIPP.

### REFERENCES

1. N. J. NUMARK and S. R. PHELPS, "Equivalence to 1,000 MTHM of Spent Fuel: Application of CFR Part 191 To Other Wastes," Proceedings of Third Annual International High Level Radioactive Waste Management Conference and Exposition, Las Vegas, NV, April 1992.
2. J. K. CHANNELL "What is an Appropriate TRU Waste Unit for 40 CFR 191," Presentation at the Second EPRI Workshop-Technical Basis for the EPA HLW Disposal Criteria, Arlington, VA., February, 1992.