

## NEW MEXICO ENVIRONMENTAL EVALUATION GROUP EXPERIENCE IN REVIEWING WIPP

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### ABSTRACT

The purpose of the New Mexico Environmental Evaluation Group is to conduct an independent evaluation of the potential radiation exposure to people from WIPP--a radioactive waste facility intended to permanently dispose transuranic radioactive waste generated from the nation's nuclear weapons program. The concept of a State review of a proposed radioactive waste facility has been endorsed by both Federal and State legislative and executive agencies, and the experiences and interactions of the past four years to solve problems of this first-of-a-kind radioactive waste facility has led to many innovations in conflict resolution. The multidisciplinary Group's position is neither pro nor anti-WIPP and results are published and given broad dissemination to insure technical and public scrutiny of its work.

### INTRODUCTION

In the Summer of 1978, the New Mexico Health and Environment Department expressed a number of concerns about the potential threat to health and safety from the proposed Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico.

The EEG began functioning in November 1978 to conduct an independent technical evaluation of the potential radiation exposure to people from WIPP in order to protect the public health and safety and minimize environmental degradation. We are neither proponents nor opponents of WIPP.

The multidisciplinary group is funded by DOE through a contract with the New Mexico Health and Environment Department, the agency charged with the protection of the health of the citizens of New Mexico.

### INSTITUTIONAL CONCERNS

Although this paper is focused on the technical activities of EEG, there are a number of other concerns expressed by New Mexico. These were contained in a lawsuit brought by the Attorney General and are being resolved by negotiation. Many of the provisions in the Stipulated Agreement to the suit were incorporated by Congress in the Nuclear Waste Act of 1982 and provide guarantees to states on repository siting by the Federal Government.

#### Major Events

Δ November 4, 1978 EEG begins functioning  
Δ May 14, 1981 N. M. Attorney General files lawsuit against DOE  
Δ July 1, 1981 Stipulated Agreement signed by N.M. and DOE  
Δ July 1, 1981 Consultation and Cooperation Agreement signed by N.M. and DOE

Δ December 22, 1982 Supplemental Stipulated Agreement by N.M. and DOE

Under the Stipulated Agreement to the Attorney General's suit, DOE agreed to provide the State with a summary of the results of all experiments and studies conducted during the SPDV phase and site validation phase 60 days prior to commencement of construction.

Additionally, DOE would prepare a series of reports (primarily in the geotechnical area), conduct design validation and other experiments and provide the results to the State. Seven of these reports have been received to date.

DOE would also seek funds to test a brine reservoir in the deformation zone, provide a report on brine reservoirs, investigate the disturbed zone and assess the Rustler aquifers.

The C & C Agreement, (made binding under the Stipulated Agreement), established a formal system for DOE to consult and cooperate with the State with respect to the public health and safety concerns of the State and resolve conflicts.

The Supplemental Stipulated Agreement between DOE and the State of New Mexico resolved the State's off-site concerns in the important areas of:

- Δ State liability (indemnification)
- Δ Emergency response preparedness
- Δ Independent environmental and transportation monitoring by State
- Δ Upgrading and repair of State highways

The amount of Federal financial assistance under the Supplemental Agreement exceeds \$64 million dollars. Many of the rights afforded the State under the Agreement are precedent setting throughout the country in the area of State-Federal relations over nuclear waste storage.

## MISSION

The mission of WIPP is to permanently emplace transuranic waste from the nation's defense programs and temporarily emplace defense high-level waste for experimental purposes.

### Radioactive Inventory at the Time of Closure

	Radioactivity (Curies)	Emplacement	Volume (ft <sup>3</sup> )
CH-TRU	2,800,000	Permanent	6,200,000
RH-TRU	5,100,000	Permanent	250,000
HLW	17,000,000	Temporary	150

The project has undergone a number of changes in its mission. They include:

- a. deletion of 1000 commercial spent fuel assemblies
- b. elimination of NRC licensing
- c. HLW canisters for experiments reduced from 200 to 20
- d. Elimination of veto power by the State

Congressional authorization for WIPP (PL 96-164, Dec. 29, 1979) specifically enjoined NRC from licensing the facility. The generally accepted reason was that civilian regulatory control over the defense project would establish an undesirable precedent. Congress reversed itself three years later on this issue and deemed such licensing for defense HLW repositories necessary in the recently enacted Nuclear Waste Policy Act of 1982.

The following table shows the change of the radioactive inventory with time. Note that the 14.7 year half life Pu-241 and the 29 year half life Sr-90 rapidly decay leaving the radionuclide of design to be more than 400,000 curies of the 24,000 year half life Pu-239.

### Radioactivity in WIPP

Time	Amount of Radioactivity (Curies)	%Pu-239	Other Radionuclide
0	7,900,000	7%	Pu-241 and Sr-90
1,000	540,000	79%	Pu-240 Am-241
10,000	350,000	91%	Pu-240
100,000	24,000	99%	
200,000	1,300	99%	
300,000	120	60%	U-235
500,000	50	.5%	U-235

### METHOD OF OPERATION

EEG both reviews DOE reports (we estimated there are more than 800 publications directly related to

to WIPP issued by DOE and its contractors) as well as undertakes original calculations where indicated. The 18 reports issued by EEG have been widely distributed throughout the State, to the Cabinet, the Legislature, Federal agencies and public interest groups.

Reviews included reports on the geology, environmental impact, waste acceptance criteria, design of the surface and underground facilities, and operational and emergency procedures.

Original work included:

- a. Compilation of Site Selection Criteria.
- b. Consequence analyses of transportation accidents.
- c. Hydrologic breach and leach modeling with sensitivity analyses.
- d. Consequence analyses of geotechnical features in the Delaware Basin including breccia pipes, brine reservoirs, mining activities. This effort is extremely important since determining whether an undesirable geological feature exists in the immediate vicinity of a repository may compromise the integrity of the geologic barrier.

Our approach has been to assume the feature exists in the immediate vicinity of the repository, and through the use of scenarios, modeling and consequence analyses of potential radiation doses determine what the threat is to people.

- e. In trying to obtain some agreement on future geological predictability and stability, we have convened scientists at several meetings to review the geological past in order to try and predict the geological future. While we have not obtained a consensus on the geological predictability 50,000 years hence, we try to ensure that all controversial technical concerns receive the hearing they are entitled to and are subjected to a scientific peer review including scientists from the universities of New Mexico, the State geologists, members of the National Academy of Science WIPP Panel, EPA, NRC, the DOE, and Sandia.

### WHAT HAS BEEN ACCOMPLISHED

1. The following table summarizes some of our calculated doses which are not expected to produce any increase in disease or morbidity rates to our citizens and are well within the allowable radiation exposures established by scientific radiation standard setting organizations. Additionally, these hypothesized releases have a low probability of occurrence.

Estimated WIPP Radiation Exposures to Individuals  
(50-Year Dose Commitment to Whole Body in Millirems)

Transportation (per year)	mrem	Probability <sup>d</sup>
Average Person on Route	0.005 <sup>a</sup>	1.0
Maximum Individual	32. <sup>b</sup>	≈0.1
Transportation Accidents		
CH-TRU Rail	420. <sup>c</sup>	0.0005
RH-TRU Rail	250. <sup>c</sup>	0.0001
Experimental HLW-Rail	990. <sup>c</sup>	≈0.000008
Long-Term Releases		
Breach and Leach at 1000 years	11. <sup>b</sup>	<0.001
Human Intrusion at 100 years	13. <sup>c</sup>	≈0.01
Human Intrusion with brine at 125 years	560. <sup>b</sup>	<0.00000001

<sup>a</sup>This dose would occur each year wastes are shipped to the site.

<sup>b</sup>These are annual dose commitments and could recur in subsequent years.

<sup>c</sup>These are lifetime dose commitments from the accident to the maximum individual.

<sup>d</sup>Probability of occurrence is per year for normal transportation and for repository lifetime for accidents and long-term releases.

2. Last year EEG recommended that the location of the repository be reoriented to the southern part of Zone II for four reasons:

- There is an observed brine reservoir less than 1000' from the closest point to the proposed location of the waste estimated to be 10-20 million barrels in size.
- The evaporite beds on the top of the Castile formation tilt as one proceeds north.
- The seismic reflection measurements used to characterize the underground formation indicate a "Disturbed Zone" further to the north.
- The area in the southern part of Zone II does not have these characteristics.

Our recommendation to relocate was not based on the existing location being unacceptable but rather to select the better of the two geological alternatives. In December DOE announced the waste location would be moved 6000' to the south.

3: DOE changed the waste acceptance criteria.

4. Brought together scientists in geotechnical community of divergant views to evaluate WIPP.

5. Convinced DOE of the need for additional studies of the geology of the site.
6. Established system to evaluate geotechnical hazards.
7. Last but not least, DOE is aware that there is a full-time independent technical review group on WIPP.

PUBLIC CONCERN

Why is the public in New Mexico concerned about the radioactive waste in WIPP? The following are some highly personal observations of factors contributing to people's apprehension that are correctable and may be of some value to you with responsibilities in siting repositories in other states.

1. Justification approach. All too frequently proponents justify the small radiation exposures and risks by comparison to automobile accident rates. Abel Wolman of John Hopkins University once said that we should reject the logic of anyone using the slaughter of 50,000 Americans each year on our highways as a yardstick of acceptability for other hazards. While you may be only doing it for comparison purposes, the public sees it as justification.
2. Voluntary vs. involuntary risks. Proponents tend to compare radiation doses from various sources without regard to whether the risk is optional.
3. Technological needs. The technical community continues to request additional funds for research and development to our present level in FY 83 of more than 300 million \$ and are then quoted as saying we have the technical solutions.
4. Changes in disposal practices. Many waste disposal practices have been discontinued for both technical and political reasons. Deep ocean disposal, shallow ocean disposal, the use of mill tailings for building foundations, liquid HLW tank storage, placing liquid intermediate waste in open pits, and shallow burial of transuranic wastes. There is concern that practices currently being pursued such as geologic disposal may also be discontinued in the future.
5. Public health issues. Although WIPP is perceived as a public health issue, there are relatively few workers in this field that are graduates of schools of public health and members of professional societies such as the American Public Health Association or the New Mexico Environmental Health Association.
6. Apparent inconsistencies in the program. The average concentration of TRU waste in LANL buried under 1-3 feet of fill is <2800 nCi/cm<sup>3</sup> which will

be left in place. The average concentration of stored INEL TRU waste to be shipped to WIPP is  $\approx 6300 \text{ nCi/cm}^3$ . It is difficult to explain why the former can be left under three feet of ground cover and the latter needs to be emplaced 2150 feet below the surface.

7. Enforcement of regulations. The history of LLW disposal is replete with violations of packaging, shipment, disposal and even removing material from the site. People are concerned whether the government is sufficiently disciplined to insure that regulations will be enforced in the future.

#### SOME OUTSTANDING ISSUES

1. The EPA draft standard will not become final and binding until after the decision to construct the repository is made by DOE in April 1983. The standard may undergo substantial revision and thus it is conceivable that N.M. may have a repository that does not meet the final EPA standard.
2. A consensus of geotechnologists has not been reached as to whether the site has been adequately characterized to permit reasonable prediction of the geological behaviour over 50,000 years.
3. It is likely that it will be very difficult for waste generating facilities to meet some of the waste acceptance criteria without processing the waste.
4. Full impact of the DOE Cost Reduction Program has not been detailed.
5. WIPP is not a multiple barrier engineered system. The TRU waste is not fixed in a solid matrix since some sludges are present, the containers are not a barrier and the isolation of the waste is predicated on geological barriers exclusively.

#### SUMMARY

The independent technical review by EEG these past four years has been a success in ensuring that state health and safety concerns are being addressed by DOE and in resolving those concerns. Although there is still a long way to go, the system has worked well and should provide for the nation some useful experiences and approaches to Federal and State consultation and cooperation.

#### ENVIRONMENTAL EVALUATION GROUP REPORTS

- EEG-1 Goad, Donna. A Compilation of Site Selection Criteria, Considerations and Concerns Appearing in the Literature on the Deep Disposal of Radioactive Wastes, June 1979.
- EEG-2 Review Comments on Geological Characterization

Report, Waste Isolation Pilot Plant (WIPP) Site, Southeastern New Mexico SAND 78-1596, Volumes I and II, December 1978.

- EEG-3 Neill, Robert H., et al, eds. Radiological Health Review of the Draft Environmental Impact Statement (DOE/EIS-0026-D) Waste Isolation Pilot Plant, U. S. Department of Energy, August 1979.
- EEG-4 Little, Marshall S. Review Comments on the Report of the Steering Committee on Waste Acceptance Criteria for the Waste Isolation Pilot Plant, February 1980.
- EEG-5 Channell, James K. Calculated Radiation Doses From Deposition of Material Released in Hypothetical Transportation Accidents Involving WIPP-Related Radioactive Wastes, November 1980.
- EEG-6 Geotechnical Considerations for Radiological Hazard Assessment of WIPP. A Report of a Meeting Held on January 17-18, 1980, April 1980.
- EEG-7 Chaturvedi, Lokesh. WIPP Site and Vicinity Geological Field Trip. A Report of a Field Trip to the Proposed Waste Isolation Pilot Plant Project in Southeastern New Mexico, June 16 to 18, 1980, November 1980.
- EEG-8 Wofsy, Carla. The Significance of Certain Rustler Aquifer Parameters for Predicting Long-Term Radiation Doses From WIPP, September 1980.
- EEG-9 Spiegler, Peter. An Approach to Calculating Upper Bounds on Maximum Individual Doses From the Use of Contaminated Well Water Following a WIPP Repository Breach, September 1981.
- EEG-10 Radiological Health Review of the Final Environmental Impact Statement (DOE/EIS-0026) Waste Isolation Pilot Plant, U. S. Department of Energy, January 1981.
- EEG-11 Channell, James K. Calculated Radiation Doses From Radionuclides Brought to the Surface if Future Drilling Intercepts the WIPP Repository and Pressurized Brine, January 1982.
- EEG-12 Little, Marshall S. Potential Release Scenario and Radiological Consequence Evaluation of Mineral Resources at WIPP, May 1982.
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- EEG-14 Zand, Siavosh M. Dissolution of Evaporites and Its Possible Impact on the Integrity of the Waste Isolation Pilot Plant (WIPP) Repository (Draft).
- EEG-15 Bard, Stephen T. Estimated Radiation Doses Resulting if an Exploratory Borehole Penetrates a Pressurized Brine Reservoir Assumed to Exist Below the WIPP Repository Horizon - A Single Hole Scenario, February 1982).
- EEG-16 Radionuclide Release, Transport and Consequence Modeling for WIPP. A Report of a Workshop Held on September 16-17, 1981, February 1982.
- EEG-17 Spiegler, Peter. Hydrologic Analyses of Two Brine Encounters in the Vicinity of the Waste Isolation Pilot Plant (WIPP) Site, December 1982.
- EEG-18 Spiegler, Peter. The Origin of the Brines from ERDA-6 and WIPP-12 Stable Isotopes of Hydrogen and Oxygen, draft.
- EEG-19 Channell, James K. Review Comments on Environmental Analysis Cost Reduction Proposals (WIPP/DOE-136) July 1982, November 1982.