
Sandy H. Straus

ESRA Consulting Corporation

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GOAL

To determine the risks associated with WIPP transuranic waste transportation routes on American Indian Pueblos and Reservations of New Mexico.
MOTIVATION

Results of a WIPP-related risk perception study by Straus (2003) on all environmental leaders ($n = 23$) of the American Indian Pueblos and Reservations of New Mexico following the 11 September 2001 terrorist attacks.
WIPP transportation routes and American Indian pueblos and reservations in New Mexico
DEFENSE TRANSURANIC WASTE
GENERATING AND STORAGE SITES

http://www.wipp.carlsbad.nm.us/
MOTIVATION

Risk perception study (Straus, 2003) yielded concerns about:

• integrity of WIPP,
• security of waste-filled trucks,
• safety of the drivers, and
• hazards along the roads.
MOTIVATION

No independent studies on the impacts of TRU transportation routes on the American Indian pueblos and reservations of New Mexico were included in the:

• WIPP Draft EIS
• WIPP Final EIS
BACKGROUND

Waste Isolation Pilot Plant (WIPP)

• World's deepest and largest geologic waste repository.
• Only defense-related transuranic (TRU) waste disposal facility in the United States.
• Exists in salt deposits 655 m below southeastern New Mexico, nearly 40 km southeast of Carlsbad.

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• Has processed 5,358 CH-TRU shipments.
• Has emplaced 44,755 m$^3$ of CH-TRU since 1999.
• Has plans to accept RH-TRU in 2007.
• Require special shielding, such as concrete or lead, to protect from gamma and/or beta radiation.

Photo: http://www.wipp.energy.gov/TeamWorks/index.htm
METHOD OF TRANSPORTATION

• TRUPACT-II, a transporter, is used to carry CH-TRU transuranic waste in containers from designated waste sites to the WIPP.
METHODOLOGIES

1. Survey all tribal environmental leaders.
2. Generate map of impacted transportation routes.
3. Collect and analyze population and collision data.
4. Perform risk assessments.
5. Report results.
Risk perceptions of these American Indian environmental representatives are influenced by:
quantity and quality of DOE interaction,
New Mexico road maintenance,
economy,
traffic hazards,
emergency preparedness,
radiation awareness,
technical familiarity,
personal assessments,
possible terrorism concerns, and
WIPP expansion proposals.
In order to analyze factors that shape these perceptions, we calculate individual and societal risks, measures of risk often evaluated in Environmental Impact Statements by the Department of Energy, such as for the Pantex Plant.
CALCULATION OF THE AVERAGE INDIVIDUAL RISK

\[ IR_{AVG} = \frac{\sum IR_{x,y} P_{x,y}}{\sum P_{x,y}} \]

Center for Chemical Process Safety (1989)
CALCULATION OF THE AVERAGE INDIVIDUAL RISK

Where

$$IR_{AVG}$$

is the probability of the fatality per year
(Average individual risk in the exposed population)

$$P_{x,y}$$

Number of people at location $$x, y$$
SOCIETAL RISK OR RATE OF DEATH

\[
\text{ROD} = \sum_{i=1}^{n} f_i N_i
\]

where

- \( \text{ROD} \) represents the average rate of death, fatalities per year.
- \( f_i \) represents frequency, per year.
- \( N_i \) estimated number of fatalities.
34.78% of respondents whose tribes live near the WIPP site or any of its waste transportation routes do not feel they were provided essential radiation training and education.
69.56% of respondents feel that their tribe is not adequately prepared to deal with the implementation of the WIPP.
69.56% of all respondents oppose railroad transportation of transuranic wastes to the WIPP.
39.13% respondents worry about the security of the WIPP site, the security of the WIPP waste truck drivers, and any possible WIPP-related security threats to the safety of their tribe.

52.17% respondents question whether the WIPP will be adequately sealed to prevent contamination of soil and water, will be subject to terrorism, and will the WIPP become both a surface and an underground facility.
Tribal respondents report that their tribes believe that WIPP transportation issues can be improved through further road improvements for the waste-filled trucks (30.43%), further road improvements, strengthening of the waste-filled trucks to prevent any possible radiological hazards, and the providing of adequate police protection to all waste-filled trucks to protect against any possible terrorist threats (17.39%).
YUCCA MOUNTAIN

Yucca Mountain is a proposed storage site to accommodate the high-level radioactive waste currently stored at more than 100 different power plants across the USA.

RISK SURVEY REVIEW
HIGHLIGHTS

• 47.83% respondents strongly oppose any high-level waste disposal at the WIPP if Yucca Mountain in Nevada is rejected or delayed for any reason.

INDIAN TRIBES IMPACTED BY PROPOSED YUCCA MOUNTAIN HIGH-LEVEL NUCLEAR WASTE SHIPPING ROUTES BY TRUCK

Dilger, F., Halstead, R. J., and J. D. Ballard (2005)
CONCLUSIONS

Comprehensive risk assessments and risk perception studies remain incomplete, particularly with respect to the American Indians on pueblos and tribes of the State of New Mexico. This represents the first independent study of its kind on the impacts of TRU transportation routes on the American Indian pueblos and reservations of New Mexico.
Based on 11 years of data from 1990 to 2001, American Indians on New Mexico pueblos and tribes are an average of 3.64 times more susceptible to vehicular-related fatalities than motorists on U.S. roads and 2.34 times more likely to vehicular-related fatalities than motorists on New Mexico roads.
The New Mexico American Indian tribal roads may be more vulnerable to traffic-related injuries and fatalities involving WIPP transuranic waste trucks than urban populations. At an annual fatality risk level of 10-4 y-1, the acceptance level translates to the need for monies to control the hazard (Otway and Erdmann, 1970).
CONCLUSIONS

Although the Department of Energy has taken substantial steps to implement emergency preparedness programs with respect to nuclear waste transport, our findings suggest that many key issues remain unresolved after September 11, 2001.
A largely negative perception of WIPP transportation risks among the environmental representatives of all American Indian pueblos and tribes of New Mexico appear to be due to lacks of emergency response equipment, training, and education.
RECOMMENDATIONS

- Integration of tribal input and studies are needed.
- Emergency response infrastructure improvements.
- The disparity between urban areas and tribal lands, with respect to emergency preparedness programs and equipment, requires rectification.
RECOMMENDATIONS

• Further safety measures and risk controls on the roads of New Mexico and American Indian pueblos and tribes.

• Further risk assessment research efforts.
RECOMMENDATION

State and all tribal law enforcement officials implement:

• road improvements,

• speed limits,

• police distribution, and

• public education,

to promote road safety on all pueblos and reservations in New Mexico.
TRAFFIC SAFETY RECOMMENDATION

- Improved and automated driver’s license tests and systems, as well as transportation license screening techniques, such as those computerized vision tests, automated cognition tests, knowledge tests, and operation skills tests developed by Straus (2005, 2005, 2006, 2006, 2007) are also recommended to improve road safety, reduce the high crash rates, and ameliorate waste transport security on and off tribal lands.
TRAFFIC SAFETY RECOMMENDATION

• Study underlying causes of vehicular crash death rates of pueblos and reservations of all tribes, especially along WIPP transuranic waste routes.
TRAFFIC SAFETY RECOMMENDATION

Uniform system of collecting, recording, and reporting traffic data that is applied to pueblos and reservations of all tribes in an automated, national database. Ideally, such a system could also be linked through driver’s licenses as recommended by Straus (2005), FHWA-AZ-04-559(1).
TRAFFIC SAFETY RECOMMENDATION

Traffic risk analyses of the impacts of RH-TRU waste transport on designated transportation routes through tribal lands should be considered.
RECOMMENDATIONS

At a time of war and imminent threats to national security, it is imperative for the U.S. Government to adequately train and equip those who live along the WIPP transportation routes, including the American Indians.
• For further information, please refer to the ESRA reports:

• “After September 11, 2001: Risk Perception and Risk Assessment of American Indian Pueblos and Tribes of New Mexico on the Impacts of the Waste Isolation Pilot Plant and Its Transuranic Nuclear Waste Transportation Routes” (TRB)

• FHWA-AZ-04-559(1)

This report is downloadable at: http://www.esracorp.com
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ESRA

Royal Palm Towers
1650 South Dixie Highway, Third Floor
Boca Raton, Florida 33432
USA
Telephone: (561) 361-0004
http://www.esracorp.com