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U.S. Department of Energy
Finding of No Significant Impact
Conducting Astrophysics and Other Basic Science Experiments
at the Waste Isolation Pilot Plant

AGENCY: U.S. Department of Energy

ACTION: Finding of No Significant Impact (FONSI)

SUMMARY: The U.S. Department of Energy (DOE), Carlsbad Field Office, has prepared an Environmental Assessment (EA) for the conduct of particular types of scientific experiments in the underground experiment gallery at the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico. DOE currently operates WIPP as a disposal site for transuranic and transuranic waste containing hazardous chemical constituents (TRU) waste generated by the nuclear defense activities of the federal government. DOE is proposing to make WIPP facilities and infrastructure available to scientists who wish to conduct experiments there; to the extent such experiments can be conducted without interfering with WIPP's primary TRU waste disposal mission. The deep geologic repository at WIPP could provide a suitable environment for experiments in many scientific disciplines, including particle astrophysics, waste repository science, mining technology, low radiation dose physics, fissile materials accountability and transparency, and deep geophysics. The underground facilities offer an environment far from electromagnetic fields and background radiation and suitable to experiments that require absolute darkness and acoustic isolation.

The WIPP facility is 655 meters (2,150 feet) underground. The proposed experiments would occur in a section of the WIPP North Experimental Area referred to as the experiment gallery. The gallery includes a north/south drift that connects the North Experimental Area with the central part of the facility. This area of the repository has been fully excavated and is not currently in use. The experiment gallery would be nearly 0.8 kilometer (0.5 mile) from the nearest TRU waste emplacement cell. The conduct of the experiments in the WIPP experiment gallery would involve minimal construction and preparation activities, although some additional mining might be needed to accommodate the needs of some of the proposed experiments. The EA analyzed the impacts from

operation of as many as 15 separate experiments over a period of up to 35 years, and eventual decommissioning of the experiment gallery to remove all experimental equipment and materials.

DOE also examined the impacts of the no action alternative, under which no astrophysics or other proposed or anticipated basic science experiments would be conducted at WIPP.

The EA was made available for public review for a period of 30 days, from October 23 through November 22, 2000. DOE also held two sets of public meetings during the comment period, one in Santa Fe, New Mexico (two sessions on November 14, 2000) and one in Carlsbad, New Mexico (two sessions on November 16, 2000). Following completion of the public review period, DOE analyzed the comments received on the EA and revised the EA as appropriate. A summary of the comments and the DOE responses is presented as an appendix to the EA.

Based on the analysis in the EA, and the comments received on the EA during the 30-day public comment period, DOE has determined that the proposed action does not constitute a major federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act, 42 U.S.C. 4321 et seq. Therefore, an environmental impact statement is not required.

COPIES OF THE EA (DOE/EA-1340) ARE AVAILABLE FROM:

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BACKGROUND: DOE currently operates WIPP near Carlsbad, New Mexico, as a disposal site for TRU waste generated as part of the nuclear defense activities of the federal government. TRU waste is contaminated primarily with alpha-emitting radionuclides that are heavier than uranium (that is, their atomic numbers are greater than that of uranium) and that have half-lives longer than 20 years at concentrations greater than 100 nanocuries (13,700 becquerels) per gram of waste. DOE is responsible for the management and ultimate disposition of TRU waste generated at DOE sites and, as directed by Congress, has constructed WIPP for the purpose of disposing of TRU waste resulting from defense activities. The *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement* (DOE/EIS-0026-S-2) (WIPP SEIS-II) describes the potential environmental impacts associated with the disposal of TRU waste at WIPP.

WIPP is located in Eddy County in southeastern New Mexico. It is about 50 kilometers (30 miles) east of Carlsbad, New Mexico, in an area known as Los Medaños ("the dunes"), a relatively flat, sparsely inhabited plateau with little surface water. Surface facilities at WIPP have been constructed, including the Waste Handling Building where TRU waste is received, inspected, and moved to the waste handling shaft for transfer underground. The constructed underground facilities include four shafts, an experimental area, an equipment and maintenance area, and connecting tunnels. These underground facilities were excavated 655 meters (2,150 feet) beneath the land surface. DOE also has excavated the first panel, which consists of seven disposal rooms. This panel currently is receiving waste. A second panel has also been constructed and stands ready for waste emplacement.

PROPOSED ACTION: DOE is proposing to make WIPP facilities and infrastructure available to scientists who wish to conduct experiments there, to the extent such experiments can be conducted without interfering with WIPP's primary TRU waste disposal mission and to the extent that they reflect contemporary budget priorities. Because normal background radiation levels can interfere with many experiments, the low background radiation in the WIPP underground facility is one of the factors that make the site an attractive environment for experiments relating to particle astrophysics, low radiation dose physics, fissile materials accountability, and transparency. Further, WIPP's status as a working deep geologic waste repository also makes it a unique resource for experiments in other fields such as mining, waste repository science, and deep geophysics. Currently, one experiment in astrophysics that has been conducted for several years by Los Alamos National Laboratory is located in WIPP.

Of particular interest to the current astrophysics and basic science proposals is an area of WIPP once planned for underground experiments. This area was among the first excavated at the WIPP site. Excavations in the area, now known as the North Experimental Area, are as long as 1,384 meters (4,540 feet). They are connected to the disposal area by a series of tunnels (also referred to as drifts), each 10 meters (33 feet) wide and 6 meters (20 feet) high. These tunnels, in turn, are crossed by rooms of about the same size as the tunnels every 100 meters (330 feet). The North Experimental Area is largely unused. It is not a part of the disposal area, and there are no plans to use it for disposal. One tunnel and two rooms crossing that tunnel have been identified as a potential location for astrophysics and basic science experiments. This area is referred to as the experiment gallery in the EA and in this FONSI.

To identify the range of the experiments that could be conducted in WIPP's experiment gallery, DOE reviewed nine experiments currently proposed and consulted scientists regarding the needs and potential hazards of these experiments. In addition, these experts identified other potential experiments that could be conducted in WIPP and for which authorization could be sought in the future. Based on these efforts, 15 experiments in the following five categories were identified and analyzed in the EA: particle physics

experiments, other astrophysics and physics experiments, mine safety and geophysical studies, nonproliferation and nuclear accountability experiments, and chemical and material processing experiments. Other experiments could be permitted at WIPP in the future as long as the environmental impacts of those experiments were encompassed within the scope of the impacts considered in the EA.

Construction and preparation activities at the WIPP site would be minimal. DOE would seal the ends of each drift in the experiment gallery at its opening to the rest of the repository with bulkheads that would include both doors for equipment and doors for people. DOE could authorize additional excavation near the experiment gallery as long as it could be done safely by DOE's current excavation staff, could be done without impacting emplacement of TRU waste, and would not impact repository performance. Salt from the excavations would be placed with the other salt from WIPP excavations at the surface of the facility. On the surface, the only anticipated disturbance due to the experiments would be the construction of a small meeting place and laboratory from which experiment scientists could monitor activities below the surface and the shallow (6 to 8 feet deep) burial of an array of detectors in a 6 to 8 square-kilometer (2 to 3 square mile) area above the WIPP facility to identify the nature of the cosmic radiation that would be detected by the proposed OMNIS experiment. Any support buildings would be located in areas already disturbed by WIPP activities, within the fence-line for the facility. Near surface detectors would be placed to avoid impacting biological or cultural resources.

Most of the experiments would require data-gathering using a computer system, replacement of components to test different materials, and chemical processes similar to those conducted in a standard laboratory aboveground.

For purposes of analysis, it was assumed that the 15 experiments would have two individuals in the repository, 40 hours over 5 consecutive days a week. A total of 30 people, therefore, would be expected in the repository's experiment gallery at any one time. In addition, another 8 to 10 individuals might be in the aboveground monitoring

building. It was also assumed that each experiment would continue for 30 years, after 5 years of preparation and construction. Following this 35-year period, the experiment gallery would be decommissioned by removing all experimental equipment and materials.

ENVIRONMENTAL IMPACTS: Because the proposed experiments would take place primarily in the existing underground experiment gallery or aboveground in already disturbed areas and surface detectors would be placed in a manner that would avoid disturbing existing biological and cultural resources, environmental impacts to land use, geology and hydrology, biological and cultural resources, and sensitive noise receptors would not occur. Impacts to Carlsbad infrastructure, housing, schools, and other community facilities from the 30 additional scientists maintaining the experiments would be negligible compared to the increases from WIPP operations described in WIPP SEIS-II.

With respect to air quality, various aspects of the Proposed Action would result in small additional releases of four criteria pollutants: nitrogen dioxide, sulfur dioxide, carbon monoxide, and PM_{10}. Radioactive material would be mostly in the form of sealed sources that would not be susceptible to atmospheric release.

The experiments could introduce potential hazards into the WIPP facility that could result in exposures to hazardous chemical and radioactive materials, fires, inadequate oxygen levels, exposures to magnetic fields, and electrocution. The potential hazards also include existing hazards associated with salt excavation and handling heavy objects in surface and underground facilities. The analysis in the EA indicates that these hazards could be controlled by compliance with Occupational Health and Safety Administration requirements, DOE orders, and other federal standards, as applicable.

Although workers involved in the science experiments could potentially be exposed to the TRU wastes being disposed of at the WIPP facility, the science experiment construction crews and operations personnel would not normally be exposed to the TRU

waste handling systems and emplacement rooms because the ventilation airflow is split between the experimental area and the disposal area. Health impacts to experimental workers were estimated by adjusting the impacts to noninvolved workers that were calculated in WIPP SEIS-II to account for differences in exposure durations and dose rates. These impacts were estimated to be about 0.04 person-rem (assuming 35 years of operation) or about 2E-05 latent cancer fatalities. Therefore, no health impacts to experimental workers were estimated to occur from routine exposures to TRU waste.

Workers in the experiment gallery could be exposed to magnetic fields produced by magnetized iron used in some science experiments, and specifically in neutrino factory detector experiments. The actual magnetic field strength to be produced by the various experiments is unknown at this time. However, worker exposures to magnetic fields would be controlled in accordance with DOE and American Conference of Governmental Industrial Hygienists requirements. Therefore, no impacts to worker health from magnetic field exposures would be anticipated.

Lasers could be introduced into the WIPP facility in support of one or more experiments. The type of laser, power level, and wavelengths of laser radiation required for the experiments are not known at this time. Similar to magnetic field exposure limits, DOE would follow DOE, American National Standards Institute, and Occupational Safety and Health Administration requirements for controlling exposures to laser (nonionizing) radiation; therefore, no worker health impacts would be anticipated from routine exposures to laser radiation.

Accidental releases of hazardous or radioactive materials could occur. WIPP SEIS-II analyzed the impacts of various accidents involving TRU wastes, including container drops, fires, hoist failure, and roof falls. The impacts of these accident scenarios involving the proposed science experiments are addressed in the EA. Engineered safety features (e.g., fire suppression systems, secondary containment for liquids, vehicle barriers) and controls would be instituted based on the hazards analysis for individual experiments to reduce the likelihood or consequences of accidents.

Several experiments propose to introduce water or other liquids such as scintillation fluids into the underground environment, and some of the accidents described previously could result in releases of liquids in the underground facility. However, because the proposed experiments would be physically separated from the disposal rooms, liquid spills would not be expected to significantly affect the long-term performance of the TRU waste repository. All liquids will be managed by providing secondary containment. Experimental personnel will be trained and follow procedures to mitigate the impacts of any liquid spills.

Some experiments would involve the use of sulfuric acid. Sulfuric acid, should it be spilled onto the salt floor, would not react violently but could emit toxic fumes, which are poisonous by inhalation, are an extreme eye irritant, can rapidly destroy tissue, and can cause severe burns. The chemical reaction would be lessened somewhat by the relatively low strength of the acid (7 percent). Sulfuric acid is also capable of igniting combustible materials, but the likelihood would be relatively low due to the low strength of the acid and relative absence of finely divided combustibles. Hydrogen chloride, a likely reaction product, is also toxic by inhalation and is a powerful irritant to the skin, eyes, and mucous membranes. The chemical reaction would also liberate heat. The amount of heat liberated would depend on the amount of sulfuric acid that came in contact with the salt. Exposures of nearby underground workers to the fumes could result in serious burns or respiratory damage, or could be lethal. Thus, engineered and administrative controls would need to be implemented to prevent spills of sulfuric acid onto the salt.

Experiments involving explosives are also proposed. The explosives are anticipated to be small, such as blasting caps and M-80 type explosives; thus, the impacts would be localized. Workers beyond the immediate vicinity of an accidental explosion would not be harmed, nor would workers at the surface or members of the public.

An additional hazard that would be introduced into the WIPP facility by the proposed experiments is the extremely low temperature of liquid nitrogen. Contact between

experimental workers and liquid nitrogen could result in severe burns and even death. Numerous standards and safe working practices are available that would mitigate the risks to experimental workers from accidental contact with liquid nitrogen, including barriers to prevent direct contact with liquid nitrogen-containing components, insulation, secondary containment, protective clothing, and operator procedures and training.

Earthquakes are potential initiating events that could lead to fires, handling accidents, roof collapse, and other potential release scenarios. The consequences of an earthquake would generally be the same as the consequences of the fires and handling events discussed above. There would be no impacts from radioactive or hazardous chemical releases on workers at surface facilities or the general public from an earthquake-induced failure of the proposed experiments.

Disproportionately high and adverse human health or environmental effects on minority or low-income populations would not be expected as a result of the construction and operation of the astrophysics and basic science experiments.

In addition to the direct and indirect impacts described above, DOE analyzed potential cumulative effects of the proposed action, disposal activities at WIPP, and other past, present, and reasonably foreseeable future actions in the vicinity of WIPP. The EA recognizes that the experiments described in the EA, plus the current and foreseeable activities described in Section 5.9 of the WIPP SEIS-II, could cumulatively affect biological resources, cultural resources, and socioeconomics. Overall, socioeconomic impacts from the experimental activities would be negligible because the number of additional personnel would be small. Cumulative impacts to other resource areas are not expected. Therefore, the effects of the proposed action, when combined with those due to current and foreseeable activities, would not result in cumulatively significant impacts.

ALTERNATIVES CONSIDERED: In addition to allowing the proposed experiments in the WIPP experiment gallery, DOE analyzed the no action alternative. Under this alternative, none of the proposed experiments would be conducted at the WIPP facility.

No impacts, including human health or potential accident impacts, due to these experiments would occur.

DOE did not analyze alternative locations for the experiments because the only proposal pending before DOE is whether to allow WIPP to be used for the conduct of the range of experiments analyzed in the EA. DOE is not proposing to conduct the experiments; rather, the agency is only deciding whether to allow its underground facility to be used for experiments proposed by others. Thus, DOE has no basis on which to decide that the experiments should be conducted elsewhere. For this reason, DOE did not analyze the potential impacts of conducting these experiments at other sites.

RESPONSE TO COMMENTS: DOE received 54 comments on the draft EA. These included formal written comments from the New Mexico Environment Department, the Environmental Protection Agency (Region 6), Concerned Citizens for Nuclear Safety, Southwest Research and Information Center, and the Environmental Evaluation Group. Changes were made to the Draft EA as a result of many of these comments. A summary of the comments and the DOE responses is presented as an appendix to the EA.

DETERMINATION: Based on the information in the EA, DOE determines that the proposed action does not constitute a major federal action significantly affecting the quality of the human or physical environment within the meaning of the National Environmental Policy Act, 42 U.S.C. 4321 et seq. Therefore, the preparation of an environmental impact statement is not required and DOE is issuing this FONSI.

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