CHAPTER 4

ENVIRONMENTAL IMPACTS

The following sections describe the environmental impacts that could occur as a result of the proposed activities at the WIPP site.

4.1 HUMAN HEALTH

The human health impacts of the proposed astrophysics experiments are quantified in this section to the extent possible given the uncertainties in the actual experiments to be performed at WIPP. For the most part, the health hazards associated with each experiment are discussed individually, although specific hazards may be associated with more than one proposed experiment. Potential synergistic effects from operating multiple experiments simultaneously were considered. It was determined that there were no significant synergistic effects from multiple, simultaneous experiments on human health, other than those specifically identified in Section 4.1.1 (such as the effects of magnetic fields from neutrino factory detector experiments on other experiments or on experimental workers).

4.1.1 Proposed Action

Many of the experiments described in Chapter 2 are in early planning stages. Therefore, many details typical of human health analyses are not yet available. The objective of this section is to bound potential impacts using the best available information.

The potential hazards that could be introduced into the WIPP facility were identified using the descriptions of the possible experiments in Section 2.1. A comprehensive list of the hazards is presented in Table 4-1. The potential hazards include existing hazards associated with salt excavation and handling heavy objects in surface and underground facilities, exposures to hazardous chemical and radioactive materials, inadequate oxygen levels, exposures to magnetic fields, and electrocution.

Table 4-1 shows that most of the hazards introduced by the potential experiments would be standard industrial hazards (for example, heavy lifting, rotating machinery, electrical hazards, etc.) or laboratory hazards (for example, acids, low temperatures, pressurized containers, and lasers). Radioactive materials that could be introduced to the WIPP facility would include standard calibration sources. Hazardous chemicals that could be introduced into WIPP include large quantities of lead; a scintillation liquid; and sulfuric acid (7 percent). In addition, germanium metal, a widely used and relatively nontoxic substance used in the semiconductor industry, would be introduced into the WIPP facility.

Routine exposures to hazardous chemicals and radioactive materials would be controlled in accordance with OSHA requirements, DOE orders, and other federal standards, as applicable. The hazardous chemicals and radioactive materials would be contained within sealed systems (for example, tanks and piping systems), and routine exposures to workers and the public would be nonexistent. Accidental releases of these materials may occur; the associated impacts are addressed in Section 4.2.

The radioactive materials that could be introduced into the WIPP environment would be significantly less hazardous than the TRU waste being emplaced. Xenon-136 is a noble gas that is radioactively stable and is not an inhalation hazard. Germanium-76 would be in metallic form and is also stable. Some detectors would contain radioactive materials. The type of radioactive materials is currently unknown, but they would be introduced to WIPP in the form of sealed sources. Handling, storage, and use of the radioactive

Table 4-1. Summary of Potential Hazards That Could Be Introduced by the Proposed Science Experiments

Potential Hazard	Cause/Source	Potential Mitigation[a]
Acceleration	Heavy objects (e.g., lead and iron detector) Excavation equipment	Hoist design, safety features Operator procedures, training Redundant lifting equipment
Chemical reactions	Electroplating baths Scintillation liquid[b] Welding gases	Operator procedures and training Chemical safety program Underground access training (including evacuation procedures)
Contamination	Salt environment (airborne salt dust)	Active ventilation Dust control
Corrosion	Airborne salt Sulfuric acid Scintillation liquid	Active ventilation system Dust control Equipment design and material selection Secondary containment Personal protective equipment and operational procedures and training
Electrical	AC power supply and distribution system Electric-power equipment Electronics shop Machine shop	Grounded and insulated electrical cables Operator training
Explosion	Small explosive caps, M-80s Liquid nitrogen tank and piping system Scintillation liquid Welding gases Xenon-136 tank and piping system	Pressure vessel design Pressure relief system Cryogenic system design specifications Operator procedures and training
Fire	Electroplating baths Scintillation liquid Combustible TRU waste Welding gases AC power system	Secondary containment Fire detection and suppression system TRU waste disposal rooms physically isolated from experimental area Welding procedures Self-rescuer Underground access training (including evacuation procedures)
Heat and temperature	Machine shop equipment Electric-driven equipment	Operator training Barriers
High pressure	Xenon-136 tank and piping system Liquid nitrogen tank and piping system Welding gases	Tank, piping system design specifications Pressure-relief systems Operator procedures and training

Table 4-1. Summary of Potential Hazards That Could Be Introduced by the Proposed Science Experiments (continued)

Potential Hazard	Cause/Source	Potential Mitigation[a]
Impact	Heavy objects Excavation equipment Material handling equipment (e.g., forklifts) Roof collapse	Operator procedures and training Vehicle barriers Roof shoring and bracing
Leakage	Liquid nitrogen tank and piping system Dewar-type containers of liquid nitrogen Sulfuric acid containers and electroplating bath Ultrapure water tank Scintillation liquid tank Xenon-136 storage tank and piping system	Secondary containment Ventilation system Leakage monitoring and detection system Inspection/maintenance procedures Operational procedures and training
Low temperature	Liquid nitrogen tank and piping system Dewar-type containers of liquid nitrogen	Cryogenic system design Insulation Secondary containment Personnel protective equipment (insulated gloves, etc.) Operator procedures and training
Natural phenomena	Earthquake Flood Tornado	Site characteristics Evacuation procedures Emergency equipment
Power source failure	Loss of ventilation airflow Loss of lighting system Loss of AC-powered safety systems (e.g., fire detection/suppression system)	Redundant power supply and distribution system Personnel protective equipment Underground access training (including evacuation procedures) Backup battery-powered systems
Radiation	TRU waste Calibration sources Lasers Magnetized iron	DOE, ANSI (laser), and ACGIH (magnetic field) exposure standards Underground ventilation system Filtered vents on TRU waste containers Separation Shielding Operator procedures and training Monitoring/detection systems
Structural damage or failure	Roof collapse Hoist Liquid nitrogen tank Xenon-136 tank Scintillation liquid tank	Hoist and storage tank design standards Subsurface design standards (e.g., shoring and bracing requirements) Secondary containment

Table 4-1. Summary of Potential Hazards That Could Be Introduced by the Proposed Science Experiments (continued)

Potential Hazard	Cause/Source	Potential Mitigation[a]
Toxicity/inadequate oxygen levels (oxygen displacement)	Xenon-136 tank and piping system Liquid nitrogen tank and piping system Lead Germanium Scintillation liquid Sulfuric acid Liquid nitrogen TRU waste Diesel exhaust Carbon monoxide (e.g., from underground fire)/oxygen deficiency	External oxygen supply Underground ventilation system Monitoring/detection systems Fume hood Self-rescuers Operator procedures and training MSHA underground access training (including evacuation procedures)
Vibration and noise	Excavation equipment Ventilation system Machine shop equipment	DOE/OSHA noise limits Ear protection Operational procedures and training

a. ACGIH = American Conference of Governmental Industrial Hygienists; ANSI = American National Standards Institute; MSHA = Mine Safety and Health Administration

b. The scintillation liquid is a mixture of mineral oil (more than 90 weight percent [wt%]), 1,2,4-trimethylbenzene (less than 10 wt%), and aromatic fluors (less than 0.2 wt%).

detectors would be in accordance with DOE requirements for sealed sources, and would represent no more of a radiological hazard than those present at a typical counting or calibration laboratory. Routine exposures to workers would be controlled in accordance with operational procedures and training and DOE radiation exposure limits, including implementation of as low as reasonably achievable (ALARA) requirements. Standard radiological exposure controls and special safeguards controls could be implemented to ensure that the risks associated with the nuclear materials were properly managed. Consequently, the radiological hazards presented by these materials would be insignificant relative to the TRU radionuclides (for example, plutonium-239, americium-241) being handled and emplaced in the WIPP facility. In WIPP SEIS-II, DOE found that there would be less than 1 cancer fatality to involved workers as a result of TRU waste handling and emplacement at WIPP (DOE 1997). Because the types, forms, and quantities of radiological materials associated with the experiments are significantly less hazardous than the TRU waste, health impacts to workers involved in the experiments would be only a small fraction of the impacts calculated for WIPP emplacement workers. For this reason, no additional human health impacts would be anticipated for routine exposures to radioactive materials used in the proposed science experiments in the WIPP facility.

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. Thus, any exposure durations and distances for these workers would be significantly less than those for TRU waste handlers, and the radiological and hazardous chemical exposures to astrophysics experiment workers would be less than those calculated for TRU waste handlers in WIPP SEIS-II.

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. In WIPP SEIS-II, the radiological impacts to the worker population involved in handling and emplacing contact-handled TRU (CH-TRU) waste were calculated to be between 0.4 and 0.5 latent cancer fatalities

(898 to 1,240 person-rem). To arrive at this estimate, it was assumed that 36 workers (32 in the Waste Handling Building and 4 underground) would be exposed at 1 meter (3 feet) from the CH-TRU waste container for 2 hours per day, 4 days per week, 50 weeks per year. The total exposure duration is therefore 14,400 worker-hours per year.

The experimental area would be nearly 0.8 kilometer (0.5 mile) from the nearest waste emplacement cell; therefore, the distance between the underground experimental workers and the emplaced waste would be far greater than the exposure distance for underground emplacement workers. Exposure durations would also be lower for experimental workers because they would not need to pass by or enter the disposal rooms to gain access to the experimental area. The radiation shielding provided by the salt walls and bulkheads that separate the experimental and disposal areas would further reduce the dose rate. Therefore, the dose rate in the experimental area from TRU waste was assumed to be nonexistent.

To estimate the bounding radiological impacts to underground experimental workers, it was assumed that each worker would be exposed for the short time it takes to walk between the access shaft and the experimental area. This was conservatively assumed to take 15 minutes per trip and would occur twice per day. Thus, it was assumed that each experimental worker would be exposed for 30 minutes per day. A total of 30 experimental workers were assumed to be in the underground facility 5 days per week, 50 weeks per year (see Section 2.1.4). This would result in a total exposure duration of about 3,800 worker-hours per year, or about one-third of the exposure duration used in WIPP SEIS-II for involved workers.

A conservative exposure distance of 100 meters (330 feet) from the emplaced TRU waste was assumed. Using the $1/r^2$ approximation ("r" is the distance between the radiation source and the receptor) and a reference dose rate of 2.9 millirems per hour at 1 meter (3 feet) from the waste containers (from WIPP SEIS-II), the dose rate to experimental workers would be four orders of magnitude (one ten-thousandth) of the dose rate used in WIPP SEIS-II to calculate health impacts to involved workers. Combining the reduced dose rates and exposure durations for experimental workers, the health 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.

EXPONENTIAL NOTATION

Exponential notation is used to express very large or very small numbers. For example, the number 1 billion could be written as 1,000,000,000 or, using exponential notation, as 1E+09. Translating from exponential notation to a more traditional number requires moving the decimal point either right (for a positive number after the E) or left (for a negative number after the E). If the value given is 5E+02, move the decimal point two places (insert zeroes if no numbers are given) to the right of its present location. The result would be 500. If the value given is 5E-04, move the decimal point four places to the left of its present location. The result would be 0.0005.

Underground experimental workers would not be exposed to routine airborne radiological and hazardous chemical materials released from emplaced TRU waste because the ventilation airflow is split between the experimental area and the disposal area (see Figure 2-8). Any airborne emissions from TRU waste would be drawn into the ventilation exhaust system for the disposal rooms and discharged to the surface without passing through the experimental area. Routine exposures would be nonexistent; therefore, there would be no health impacts from routine airborne radiological or hazardous chemical emissions from the emplaced TRU waste to experimental workers.[3]

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[3] Because of the split airflow shown in Figure 2-8, activities in the experiment gallery would have no impact on a Confirmatory VOC Monitoring Plan required by the Hazardous Waste Facility Permit issued by the New Mexico Environment Department (see Table 1-1).

As stated in Section 2.1.3, a small building would be constructed at the surface to support underground experimental activities. Exposures of experimental workers in this building to radioactive and hazardous chemical emissions would be the same as those calculated in WIPP SEIS-II to “noninvolved workers.” Noninvolved workers are defined as employees who work at WIPP but are not directly involved in handling and disposing of TRU waste. WIPP SEIS-II estimated that the maximally-exposed noninvolved worker would have a 4E-07 probability of a latent cancer fatality from radiation exposures and a 1E-07 probability of cancer incidence from hazardous chemical exposures. The impacts to experimental workers who would occupy the surface support building would not exceed these estimates because their occupancy assumptions, radiation dose rates, and chemical concentrations would not be greater.[4]

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 (ACGIH) requirements. In addition, the magnetic field from neutrino factory detector experiments might interfere with other experiments. Consequently, shielding or other mitigation may be necessary to reduce the magnetic field intensities from such experiments. This mitigation would also reduce the exposures of experimental workers to magnetic fields emitted by such experiments. 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 (ANSI), and OSHA requirements for controlling exposures to laser (nonionizing) radiation; therefore, no worker health impacts would be anticipated from routine exposures to laser radiation.

4.1.2 No Action Alternative

Under this alternative, no experiments would be emplaced at WIPP. Therefore, no human health impacts due to such experiments would occur.

4.2 ACCIDENTS

4.2.1 Proposed Action

The hazards listed in Table 4-1 form the basis for selecting and analyzing potential accidents that could affect WIPP workers and the general public. Observations about these potential accident scenarios indicate that accidents involving many of the hazards identified in Table 4-1 would most likely occur during handling and maintenance of the experimental components, rather than while the experiments were being conducted. This is because the experiments would be conducted in closed systems, with little operator intervention, in which the hazards would be contained and prevented from reaching a worker or member of the public. For example, the experimental apparatus for the scintillation fluid to be used in the OMNIS experiment would be sealed and would be unlikely to fail unless some external force were applied (for example, seismic event, collision). In other cases, the hazard would be in an inherently accident-resistant form such as solid metallic lead or germanium-76 materials, insulated and grounded electrical cables, calibration-type sealed sources, and so forth. Furthermore, where significant hazards

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[4] The dose rates and chemical concentrations would not be greater because the WIPP SEIS-II calculations assumed that the noninvolved worker would be located at the point of least atmospheric dispersion.

would be readily apparent, engineering and safety requirements designed to prevent a release are already proposed.

An example is the set of design and safety requirements to prevent release of the liquid nitrogen that would be used in the proposed GENIUS experiment. In still other cases, accident mitigation systems are proposed to control the consequences of accidents, should they occur. Examples of these types of systems include the secondary confinement system for the ultrapure water tank and the portable fume hood to be used to contain fumes and aerosols generated in the deep mine electroplating experiment.

Many of the hazards identified in Table 4-1 are standard industrial or laboratory hazards that are not unique to the Proposed Action. Some of these hazards are already present at other sites, where existing safety programs and controls prevent the hazards from becoming accidents. These hazards include electrical hazards, rotating machinery, cutting/drilling equipment, pressurized containers, collisions with heavy objects, low temperatures, moving equipment, and lifting heavy objects. These hazards would be present regardless of the site for the experimental equipment and are neither more nor less hazardous than they would be if the activities were conducted at a surface facility. Thus, accidents resulting from hazards such as these would result in identical impacts at any potential underground facility.

WIPP SEIS-II (DOE 1997) 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 following paragraphs.

4.2.1.1 Fires

WIPP SEIS-II estimated the frequency of an underground fire involving a TRU waste container at about once per ten thousand to once per million years (0.001 to 0.000001 per year). The public radiological consequences were calculated to be a 0.3 probability of a latent cancer fatality in the exposed population and a 4E-03 probability of a latent cancer fatality to the maximally-exposed individual member of the public. The maximally-exposed noninvolved worker was calculated to have a 3E-03 probability of a latent cancer fatality, and the maximally-exposed involved worker was calculated to have a 0.06 probability of a latent cancer fatality. The consequences of exposures to hazardous chemicals from the fire were lower than the radiological consequences.

Fires involving experimental materials would result in lower radiological impacts to the public and noninvolved workers than those calculated in WIPP SEIS-II. This is because of the relatively small quantities of radioactive materials (see Section 2.1.1.4) that could be introduced into the WIPP experiment gallery and the durable form and packaging of sealed sources.

However, a large quantity of scintillation liquid, currently planned to be a mixture of mineral oil (greater than 90 weight percent [wt%]), 1,2,4-trimethylbenzene (less than 10 wt%), and aromatic fluors (less than 0.2 wt%), is proposed to be used in the OMNIS experiment. According to the Material Safety Data Sheet (MSDS) for this material, the scintillation liquid is a combustible liquid that may be ignited by high heat, sparks, open flames, or strong oxidizers such as fluorine, nitric acid, and sulfuric acid. The threshold limit value for 1,2,4-trimethylbenzene is 25 parts per million. The MSDS also warns that combustion/burning of this material can form carbon monoxide, which could be lethal to workers and fire protection personnel in the WIPP underground facility. Special precautions would be required to prevent uncontrolled releases of the scintillation liquid, exposure of the scintillation liquid to ignition sources, or both, in addition to providing fire separation of the scintillation liquid from the TRU waste disposal rooms (for example, bulkheads, fire barriers, split ventilation system) and appropriate fire detection and suppression systems. Note that underground personnel are also required to receive underground access training (including emergency evacuation procedures) and carry self-rescuers (a portable breathing apparatus that chemically eliminates carbon monoxide). These types of accidents would be addressed in a supplement to the WIPP safety analysis report, and appropriate accident prevention and mitigation controls would be implemented. The applied safety features and controls would reduce the frequency or consequences of these types of accidents to below levels at which there would be a concern. Furthermore, specific controls, such as separation, could be required to prevent sulfuric acid or other incompatible chemicals from contacting the scintillation liquid.

An uncontrolled fire could lead to catastrophic failure of the large liquid nitrogen tank to be used in the proposed GENIUS experiment. As stated in Section 2.1.1.1, the cryogenic tank is sized at 1,400 cubic meters (49,440 cubic feet). As with the fire involving scintillation liquid, special precautions in the form of engineered safety features and controls would be required to prevent this accident from occurring in the WIPP underground facility. Potential mitigation measures would include the split ventilation system between the experimental area and the disposal rooms, fire detection and suppression systems, underground access training (including emergency evacuation procedures), and fire barriers to either prevent this type of accident from occurring or reduce its consequences. These controls are assumed to reduce the likelihood of occurrence of such an event to levels below which there is cause for concern. The effects on workers at the surface and the public in the vicinity of the WIPP site would be insignificant because the nitrogen gas released is nontoxic and would be quickly diluted to breathable concentrations in unconfined areas.

Similarly, the 9-metric-ton (10-ton) xenon-136 container system could fail if exposed to fire conditions. However, catastrophic failure of the xenon-136 container system would displace only about half the air in a standard WIPP disposal room and would therefore have significantly smaller localized impacts to underground workers than catastrophic failure of the liquid nitrogen tank. Engineered safety features, such as fire detection and suppression systems or fire barriers, would also mitigate this accident. Precautions similar to those required for the liquid nitrogen tank could be imposed to prevent this accident from occurring. These controls are assumed to reduce the likelihood of occurrence to levels below which there is cause for concern.

4.2.1.2 Handling Accidents

The frequency of an accidental drop, puncture, and failure of a TRU waste container was estimated in WIPP SEIS-II to be once per hundred years (0.01 per year). The resulting radiological consequences were calculated to be 0.02 latent cancer fatalities to the exposed population, a 2E-04 probability of a latent cancer fatality to the maximally-exposed individual member of the public and noninvolved workers, and a 0.06 probability of a latent cancer fatality to the maximally-exposed involved worker. This accident scenario is described as a forklift striking and puncturing drums on the lower tier of a stack of drums, followed by a drum on the top of a stack falling to the floor, resulting in failure of the lid seal. Such an accident would not result in exposures to underground experimental workers because of the split ventilation system between the experimental area and the TRU waste disposal area.

Handling accidents involving experimental materials would result in lower consequences than those involving TRU waste for the same reasons given for fires. It is possible that a handling accident could rupture the scintillation liquid tank, liquid nitrogen tank, or xenon-136 container, leading to unacceptable consequences. As a result, engineered safety features and controls would be implemented to prevent the occurrence of these accidents. Examples of mitigation measures would be vehicle barriers, tank design and fabrication standards, impact protection, secondary containment for liquids, split ventilation between experimental and disposal areas, and operator procedures and training.

Handling accidents could also occur during construction and assembly of the experimental apparatus, such as dropping or being struck by a lead or iron component of the OMNIS detector, a large tank, or other heavy object. Such accidents are unlikely to involve a TRU waste container due to the separation between the experimental and disposal areas. The most likely impacts would be personnel injury, fatality, or equipment damage. Standard industrial heavy lifting practices and controls would be implemented to prevent such occurrences, including periodic inspection and maintenance of lifting equipment, operator training, special lifting procedures, and, if required, redundant lifting capability.

4.2.1.3 Roof Fall

As with all underground activities, there is a risk of roof falls and cave-ins onto experimental workers and equipment. The roof fall scenario in WIPP SEIS-II was estimated to have a frequency up to once per hundred years (0.01 per year), but would result in no radiological impacts to the exposed population (0.2 latent cancer fatalities) or maximally-exposed member of the public (0.002 probability of a latent cancer fatality).

The radiological consequences of roof falls into an experimental area would be significantly lower than a roof fall in a TRU waste disposal room due to the relatively small quantities of radioactive material associated with the experiments. Releases of radioactive material from sealed sources would be unlikely due to the durability of the material form and container system.

Roof falls in the experimental area could lead to failure of experimental apparatus to contain potentially hazardous or combustible materials. Examples would include failure of the liquid nitrogen tank, xenon-136 tank, sulfuric acid tank or electroplating bath, and scintillation liquid tank. The consequences of roof falls onto this equipment are similar to failures caused by fires and handling accidents. Additional shoring and bracing or impact protection over the tanks could prevent major structural damage of the tanks, should a roof collapse occur. Secondary containment systems would also be effective in preventing uncontrolled releases of liquids from the various tanks and subsequent exposures of experimental workers. Note that roof falls are most likely to occur when panels have been open a long time. Ground control monitoring and operation in the experiment gallery would be conducted in the same fashion as the rest of the WIPP underground.

Steps would be taken to prevent roof falls and other problems related to movement of the salt. While it is difficult to generalize regarding design parameters for the various proposed experiments due to their different design lives and geometries, certain design principles can be specified. First, designs would account for excavation sizes and layout (for example, by not placing rooms too close together). Second, where necessary, rooms would be placed at somewhat different horizons to account for the influence of partings and seams on ground movement, which can be beneficial if used correctly. Third, where needed, design strategies such as shaping would be used to enhance stability. Fourth, rooms would be designed to account for creep closure (for example, by oversizing in the horizontal plane), and, if necessary, access could be provided to allow ongoing maintenance of long-lived rooms. Finally, proven ground control materials and techniques (such as bolting and cabling), which provide adequate safety, would be used.

4.2.1.4 Hoist Failure

Hoist failure, analyzed in WIPP SEIS-II, is a severe yet extremely unlikely accident. Such an event would cause serious damage to any equipment or materials and fatalities to workers directly involved in the hoist operations would be anticipated. The frequency of a hoist failure event while the hoist is fully loaded was estimated in WIPP SEIS-II to be about 5E-07 per year. This would be increased somewhat to account for the additional hoist trips needed to move equipment, materials, and personnel associated with the proposed experiments to the underground facility. The radiological impacts to the exposed population were calculated to be up to 5 latent cancer fatalities, and the impact to the maximally-exposed member of the public could be up to a 0.08 probability of a latent cancer fatality.

The radiological consequences of a hoist failure involving experimental equipment would be much less than those calculated in WIPP SEIS-II because of the relatively small quantities of radioactive materials involved in the proposed science experiments relative to TRU waste and the nondispersible form of these radionuclides. The radiological dose to the public from such a waste hoist accident would not likely result in any cancer fatalities among members of the public.

Hazardous chemical impacts from a potential hoist failure were calculated using the methods described in WIPP SEIS-II, Appendix G (DOE 1997). For hazardous chemical impacts, the intake of each hazardous chemical was compared to Emergency Response Planning Guideline (ERPG) concentrations developed by the American Industrial Hygiene Association (AIHA). Where ERPG values are not available, Temporary Emergency Exposure Levels (TEELs) (Craig 2000) were used. The ERPGs, or substitute TEELs, were compared to the air concentrations of each hazardous chemical that could be released from the hoist accident.

The ERPGs are defined for three levels of health impacts (DOE 1997):

- The ERPG-1 air concentration is the "low" health impact level. It is defined as the maximum air concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing anything other than mild transient adverse health effects or without perceiving a clearly defined objectionable odor.

- ERPG-2 air concentrations are slightly more hazardous. The ERPG-2 level is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair an individual's ability to take protective action.

- ERPG-3 air concentrations indicate a high impact from the exposure. The ERPG-3 level is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening effects. Above ERPG-3 values, an individual may experience or develop a life-threatening effect as a result of a 1-hour exposure.

Therefore, no life-threatening health effects would be anticipated unless air concentrations exceeded ERPG-3 values.

A total of three hazardous chemicals were identified (see Table 4-1) that could potentially be lowered into the underground facility in quantities significant enough to result in health impacts if they were released. These are the mineral oil and 1,2,4-trimethylbenzene in the scintillation liquid and the sulfuric acid. Lead appears to be the only potential carcinogen to be lowered into the WIPP experimental facility. However, carcinogenic risk factors for inhalation of lead are not available, so no carcinogenic effects were quantified.

The equation used to calculate the air concentrations of hazardous chemicals is as follows:

$$C = S \times \frac{E}{Q}$$

where

C = Air concentration (milligrams per cubic meter)

S = Source term release rate (milligrams per second)

E/Q = Atmospheric dispersion coefficient (seconds per cubic meter)

The atmospheric dispersion coefficient, E/Q, used in the calculations was taken from WIPP SEIS-II (DOE 1997) and amounts to 6.5E-04 seconds per cubic meter for the maximally-exposed member of the public and maximally-exposed noninvolved worker.

Because the exact quantities of hazardous chemical materials that may be loaded into the hoist are unknown, bounding assumptions were made to estimate the source term release rates. For the scintillation liquid, it was assumed that up to fourteen 210-liter (55-gallon) drums of the chemicals could be loaded onto the hoist. Only relatively small quantities of sulfuric acid would be needed for the experiments, so it was assumed that a 190-liter (50-gallon) drum of 7 percent acid could be loaded onto the hoist at a time.

A release fraction was estimated using information in the *Nuclear Fuel Cycle Accident Analysis Handbook* (NRC 1998) to calculate the quantity of the chemicals that would potentially be made airborne as a result of a hoist crash. The formula given in NRC (1998) to calculate the airborne release fraction (ARF) from a free-fall spill of liquid is as follows:

$$ARF = 8.12x10^{-10}\, Arch_a^{0.55}$$

$$Arch_a = \frac{\rho_a^2 H^3 g}{\mu^2}$$

where

$Arch_a$ = Archimedes number

ρ_a = Air density (1.185 kilograms per cubic meter)

H = Spill height (655 meters)

g = Acceleration due to gravity (9.81 m/sec^2)

μ = Solution viscosity (assumed to be similar to water, μ_{water} = 0.001 poise @ 20° C)

After substituting the above values into the formula, the calculated ARF was determined to be about 0.01 (that is, 1 percent of the liquid would become airborne). Due to the uncertainties in this estimate and the relatively large spill height, the analysis uses an increased ARF of 0.1 (that is, 10 percent of the liquid is assumed to become airborne). In addition, to ensure that the consequences are bounded, it was assumed that 100 percent of the airborne liquid would be in the form of respirable-sized droplets. Furthermore, it was assumed that no droplets would be deposited on shaft surfaces, ventilation ducts, or other surfaces. No credit was taken for reducing the quantity of material released and subsequent consequences via deposition on surfaces, filtration, or other mitigation mechanisms. It was assumed that the release would occur over a 30-minute time period.

The following calculations illustrate the process used to calculate the source term released and subsequent air concentrations at the maximum exposed individual location for the hoist accident involving sulfuric acid. The calculations for the other materials were identical, except for the quantity of material per hoist trip.

Quantity on hoist = 50 gal = 189,000 cm^3

Mass on hoist = 189,000 $cm^3 \times$ 1.834 g/cm^3 = 347,000 g

Mass airborne = 347,000 g $\times$ 0.1 = 34,700 g

Mass H_2SO_4 released = 34,700 g $\times$ 7% = 2,430 g

S = 2,430 g/1,800 sec = 1.35 g/sec

C = 1.35 g/sec $\times$ 6.5E-04 sec/m^3

= 8.8E-04 g/m^3

= 0.88 mg/m^3

ABBREVIATIONS:
cm^3 = cubic centimeter
g = gram
g/cm^3 = grams per cubic centimeter
g/m^3 = grams per cubic meter
g/sec = grams per second
gal = gallon
mg/m^3 = milligrams per cubic meter
sec = second
sec/m^3 = seconds per cubic meter

The input data and calculated air concentrations for the remaining hazardous chemicals are shown in Table 4-2. The table also presents the ERPG (or TEEL substitutes) that were used to determine health impacts. As shown, the air concentration for mineral oil exceeds the ERPG-2 concentration and some adverse, yet non-life-threatening, effects may occur. However, none of the hazardous chemical air concentrations exceeded the ERPG-3 values, so life-threatening effects are not anticipated. Note that the ERPG values assume that the individuals are exposed for 1 hour. It is unlikely that an individual would be exposed to these concentrations for a sufficient length of time to experience such severe effects.

Table 4-2. Hazardous Chemical Impacts from Hoist Failure

Hazardous Chemical	Quantity on WIPP Hoist	Specific Gravity	Air Concentration at Max Individual Location	ERPG-2[b] or TEEL-2[c]	ERPG-3[b] or TEEL-3[c]
			(milligrams per cubic meter)		
Sulfuric acid	One 50-gallon drum	1.83	0.88	10	30
1,2,4-trimethylbenzene	Fourteen 55-gallon drums	0.86[a]	9.3	180	500
Mineral oil	Fourteen 55-gallon drums	0.86[a]	83	10	500

a. Source: MSDS for scintillation liquid.
b. Source: ERPG concentrations developed by the AIHA (DOE 1997).
c. Source: Craig 2000.

4.2.1.5 Other Accident Scenarios

The accident scenarios discussed in the preceding sections were taken from WIPP SEIS-II and adapted to reflect the conditions associated with the proposed experiments. Other scenarios that represent unique hazards not examined in WIPP SEIS-II are discussed in this section.

A key element of WIPP's long-term performance is related to the historic and current absence of significant quantities of water. This absence of water indicates a lack of a pathway to transport radionuclides to the accessible environment. Several experiments propose to introduce water or other liquids into the underground environment. Some of the accidents described previously would 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.

Water would not chemically react with salt or release toxic fumes. Chemical reaction of the scintillation liquid and salt is unknown, but would be investigated prior to introducing the liquid into the underground facility to ensure that proper precautions would be taken and controls would be implemented, if needed, to prevent contact with the salt. Sulfuric acid, should it be spilled onto the salt floor, would not react violently but could emit toxic fumes. Sulfuric acid fumes 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 even be lethal. Thus, engineered and administrative controls would need to be implemented to prevent spills of sulfuric acid onto the salt. Immediately dangerous to life and health (IDLH) values for sulfuric acid (80 milligrams per cubic meter, or about 20 parts per million) or hydrogen chloride (about 150 milligrams per cubic meter, or 100 parts per million) could be reached in an underground room, but such levels are unlikely to be reached in adjacent rooms or panels or at aboveground locations due to the dilution effects of the ventilation system. With proper controls in place, and considering the low strength of the acid, the likelihood of significant impacts from accidental spillage of sulfuric acid onto the salt is judged to be extremely low. Dilution provided by the ventilation system, secondary containment systems, hazardous chemical detection and alarm systems, and respiratory protection could be implemented to mitigate liquid spills. Experimental workers would also be required to receive underground access training, including emergency evacuation procedures, as well as training about the specific hazards of each hazardous chemical.

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. The explosive force would also be small enough that there would be no impacts to the disposed TRU waste or to the WIPP facility's ability to provide long-term containment of the waste. Appropriate explosives storage systems would be provided and workers involved with explosives would be required to receive appropriate training for handling and working with explosives.

An additional hazard that would be introduced into the WIPP facility by the proposed experiments is the extremely low temperature of the liquid nitrogen. Contact between experimental workers and the liquid nitrogen could result in severe burns and even death. Direct contact between the workers and liquid nitrogen-carrying piping or other cryogenic components could also cause severe burns. The cryogenic systems proposed for WIPP are not anticipated to be significantly different than other cryogenic systems used in various industries. Consequently, there are numerous standards and safe working practices available that would mitigate the risks to experimental workers from accidental contact with liquid nitrogen or cryogenic systems. Such measures would include barriers to prevent direct contact with cryogenic components, insulation, secondary containment, protective clothing, and operator procedures and training.

Earthquakes involving the proposed experiments would result in lower radiological impacts than earthquakes involving TRU wastes for the same reasons given for fires and handling accidents. Earthquakes are potential initiating events that could lead to fires, handling accidents, roof collapse, and other potential release scenarios. For example, a strong enough earthquake could fail the support structure for the scintillation liquid tank and lead to a release of the combustible liquid. The same earthquake or an independent event could lead to an ignition source being applied to the released liquid and a subsequent fire. 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.

4.2.2 No Action Alternative

Under this alternative, no experiments would be emplaced at WIPP. Therefore, no accident impacts due to such experiments would occur.

4.3 LAND USE

4.3.1 Proposed Action

Under the Proposed Action, impacts on land use would be minimal. All project construction and operation would be consistent with the management objectives and planned actions for the use of the withdrawal area established in DOE’s Land Management Plan. Most of the activities associated with the astrophysics and basic science experiments would be restricted to the existing experiment gallery within the subsurface, which is reserved for the exclusive use of WIPP. The small additional amount of salt excavated would use existing systems and be placed on the existing salt storage area, so no additional land would be required. The small office and laboratory building proposed for the surface would be located within the fenced, innermost “Property Protection Area,” which includes existing surface facilities. The array of detectors proposed for the surface also would be buried within the Land Withdrawal Area and would be removed during decommissioning. All electricity and utilities would be provided by systems currently in place or by solar panels. The bermed area, planned once WIPP is closed, would not be enlarged due to the proposed experiments.

4.3.2 No Action Alternative

Because under this alternative, no experiments would be emplaced at WIPP, no land use impacts would occur due to such experiments.

4.4 GEOLOGY AND HYDROLOGY

4.4.1 Proposed Action

Geologic and hydrologic impacts due to the activities described in the Proposed Action would be minimal. The additional trailer-like building would be within the already disturbed, fenced, innermost "Property Protection Area" and, therefore, would not result in impacts to the regional setting or surface geology. The proposed array of surface detectors would be buried within the Land Withdrawal Area and would be removed during decommissioning. Impacts to the subsurface geology would be limited to the excavation of up to one additional panel equivalent. Though WIPP currently is planned for only 10 panel equivalents, excavation of up to 75 panel equivalents were considered in WIPP SEIS-II with no substantial impacts.

All experimental activities would occur within the Salado Formation, including any proposed excavated areas. This highly impermeable formation is essentially hydrologically isolated from overlying layers. Therefore, hydrologic impacts would be unlikely.

Because all experimental equipment and materials would be removed before ultimate WIPP closure, the experiments would not impact post-closure activities or long-term performance of the repository.

4.4.2 No Action Alternative

Under this alternative, no experiments would be emplaced at WIPP. Therefore, no geologic or hydrologic impacts due to such experiments would occur.

4.5 BIOLOGICAL RESOURCES

4.5.1 Proposed Action

The Proposed Action would result in negligible impacts to biological resources. Construction and operation of all but one of the astrophysics and other basic science experiments would occur in underground facilities located 655 meters (2,150 feet) beneath the surface where there are no biological resources. The principal surface facility proposed is a small office and laboratory building to be located within a fenced area. Construction of the building would not have adverse impacts on populations of nonsensitive plants or animals. The ground surface at the site proposed for the building is already disturbed, and the area required for construction of the building would be less than 0.4 hectare (1 acre).

The emplacement of the array of surface detectors could impact some biological resources; however, the location of the detectors would be flexible, and they could be relocated to areas where their emplacement would not greatly impact these resources. To ensure that such mitigation occurred, DOE could require those constructing the arrays to emplace them only after identifying proposed locations where they would like to have the detectors buried, then having the proposed locations reviewed by a qualified biologist.

Small amounts of additional excavated salt would be placed on the existing salt storage area.

Federally listed, threatened and endangered species, and federal candidate species as well as state-listed species occur in Eddy County. However, DOE has not observed any of these species at the WIPP site during biological surveys conducted over the past several years (DOE 1997). Should potential habitat for such species be identified at the site proposed for the building, appropriate consultation, monitoring, and mitigation measures would be undertaken.

4.5.2 No Action Alternative

No experiments would be emplaced at WIPP under the no action alternative. Therefore, no biological impacts due to such experiments would occur.

4.6 CULTURAL RESOURCES

4.6.1 Proposed Action

Many of the 60 archaeological sites recorded in the withdrawal area are eligible or potentially eligible for listing on the NRHP. The Proposed Action, though, would have minimal effects on the ground surface. The principal anticipated disturbance may be the construction of a small meeting place and laboratory from which experiment scientists from the various experiments could monitor activities below the surface. Any support buildings would be located within a fenced area already disturbed by WIPP activities. No new areas of surface disturbance would be undertaken. Consequently, impacts to cultural resource properties are not anticipated as a result of the Proposed Action. Previous research of the WIPP site cultural resources has identified and evaluated individual properties and mitigated, as necessary, potential impacts from the construction of surface features in the Property Protection Area. No Native American Traditional Cultural Properties or burial grounds have been identified to date (DOE 1997).

In addition to the construction of the meeting place and laboratory, installation on the surface of the array of detectors could impact cultural sites. This experiment, though, is in the early planning stages and the exact location and number of detectors has not been determined. In any case, impacts to cultural and historic sites could be mitigated by having a qualified archeologist review (1) the plans to emplace each detector, and (2) the means to be used to emplace each to ensure that cultural sites are not disturbed. If, in the opinion of the archeologist, the location of the activities would impact a cultural site, the detector could be moved to a different location.

Measures for ensuring the protection of known archaeological and historic resources, or others that may be inadvertently discovered during ground-disturbing activities, are discussed in the *Waste Isolation Pilot Plant Land Management Plan* (DOE 1996c). These measures include identifying, inventorying, evaluating, and treating cultural resources under the National Historic Preservation Act of 1966. DOE would avoid, to the maximum extent possible, sites found eligible for inclusion on the NRHP. Where avoidance is not possible, mitigation measures would be developed under the Joint Powers Agreement with the State of New Mexico.

4.6.2 No Action Alternative

No experiments would be emplaced at WIPP under the no action alternative; therefore, no cultural resource impacts due to such experiments would occur.

4.7 SOCIOECONOMICS

4.7.1 Proposed Action

The WIPP SEIS-II analysis indicated that the 1,095 direct employees of WIPP could result in an average annual total employment of 3,538 in the economic ROI. Using a scaling methodology, the 30 additional employees brought to the area to maintain the astrophysics and other experiments would result in an increase of about 3 percent to the annual total employment, or an increase of about 106 jobs.

Assuming that the 30 additional scientists maintaining the experiments were paid the average wage of a current WIPP employee (in 1994 dollars), though, the additional staff could increase the average annual labor income estimate from WIPP SEIS-II from \$126 million to \$130 million. Impacts to Carlsbad infrastructure, housing, schools, and other community facilities would be negligible compared to the increases from WIPP operations described in WIPP SEIS-II.

4.7.2 No Action Alternative

Under this alternative, no experiments would be emplaced at WIPP. Therefore, the socioeconomic impacts described for the Proposed Action would not occur.

4.8 NOISE

4.8.1 Proposed Action

Noise impacts due to the Proposed Action would be minimal. The majority of the activities would occur in an industrial environment within the WIPP repository. The only appreciable noise levels would occur while the experiments were being constructed. Noise levels for workers would be similar to those at other industrial sites and would be mitigated as at other industrial sites. OSHA regulations would apply and be followed.

4.8.2 No Action Alternative

Under the no action alternative, no experiments would be emplaced at WIPP. Therefore, the noise impacts would not occur.

4.9 AIR QUALITY

4.9.1 Proposed Action

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}. During any construction or modification activities, care would be taken to minimize fugitive dust emissions. No additional releases of lead or ozone would be expected. Sources would be the same as those described in WIPP SEIS-II. Xenon-136 could be released, but it is a noble gas that is radioactively stable; it is not an inhalation hazard.

Any additional excavation required for experiments could result in releases of particulates and PM_{10}. The primary sources of PM_{10} emissions would be wind erosion from the salt piles, releases of salt through the underground ventilation system, and releases from transferring salt from the repository to the salt piles. As stated in Section 2.1.3, additional excavation associated with the Proposed Action would not exceed that necessary for a standard disposal panel. WIPP SEIS-II assumed that the equivalent of 10 panels would be excavated for TRU waste disposal (DOE 1997). Thus, the source term for PM_{10} emissions of salt dust under the Proposed Action could increase by as much as 10 percent, assuming that the salt emissions increase proportionately to the amount of salt removed. This assumption is valid for the largest source of emissions, wind erosion from the salt pile, because the salt removed from excavation of the experiment gallery would increase the area of the salt pile. However, this overestimates the increase from salt handling and ventilation system releases, which are a function of the rate of salt removal from the repository. The salt excavation rate from the repository would not increase, unless additional excavation crews were employed so that excavation of the experiment gallery could proceed simultaneously with excavation of the TRU waste disposal panels. Conservatively increasing the PM_{10} emissions of salt dust by 10 percent would result in a revised maximum PM_{10} concentration of 0.72 micrograms per cubic meter (annual average) and 86 micrograms per cubic meter (24-hour average). These concentrations are 1.4 percent and 57 percent, respectively, of the regulatory limits defined in the Primary Federal Ambient Air Quality Standard (40 CFR Part 50).

The other major source of the criteria pollutants nitrogen dioxide, sulfur dioxide, carbon monoxide, and PM_{10} would be from hydrocarbon fuel combustion. Emissions from fuel combustion would occur during operation of two backup diesel generators and during operation of aboveground and underground diesel equipment. Emissions from operation of the backup diesel generators would not be affected by the activities related to the astrophysics experiments. However, emissions from operation of aboveground and underground diesel equipment would increase due to the additional excavation and salt transfer operations required to construct the experiment gallery and associated surface facilities. It was conservatively assumed that the increases in pollutant emissions would be proportional to the increase in salt removed from the repository. This would result in a 10 percent increase above the levels reported in WIPP SEIS-II (DOE 1997). The revised maximum concentrations are given for aboveground diesel equipment (Table 4-3) and for underground diesel equipment (Table 4-4). As shown, the increased maximum concentrations of gaseous criteria pollutants that would result from implementing the Proposed Action are all well below their respective regulatory limits.

As discussed in Section 4.1, use of radioactive material would be small and radionuclides released to the atmosphere would be negligible. Radionuclide releases from experiment activities would be much less than 0.1 percent of the limit specified in the National Emission Standards for Hazardous Air Pollutants (40 CFR 61, subpart H).

Table 4-3. Criteria Pollutant Air Quality Impacts from Aboveground Diesel Equipment Emissions

Pollutant	Averaging Time	Maximum Concentration (micrograms per cubic meter)	Regulatory Limit (micrograms per cubic meter)	Percent of Regulatory Limit
Nitrogen dioxide	Annual	0.055	84 [a]	0.065
	24-hour	36	168 [a]	22
Sulfur dioxide	Annual	0.0063	47 [a]	0.013
	24-hour	3.7	234 [a]	1.6
	3-hour	35	1,170 [b]	3.0
Carbon monoxide	8-hour	42	8,900 [a]	0.47
	1-hour	200	13,400 [a]	1.5
PM_{10}	Annual	0.0034	50 [c]	0.0068
	24-hour	2.3	150 [c]	1.5

a. New Mexico Ambient Air Quality Standard (ACQR 201) corrected for altitude.
b. Secondary Federal Ambient Air Quality Standard (40 CFR Part 50) corrected for altitude.
c. Primary Federal Air Quality Standard (40 CFR Part 50).

4.9.2 No Action Alternative

No experiments would be emplaced at WIPP under the no action alternative; therefore, no air quality impacts due to such experiments would occur.

Table 4-4. Criteria Pollutant Air Quality Impacts from Underground Diesel Equipment Emissions

Pollutant	Averaging Time	Maximum Concentration (micrograms per cubic meter)	Regulatory Limit (micrograms per cubic meter)	Percent of Regulatory Limit
Nitrogen dioxide	Annual	0.12	84 [a]	0.14
	24-hour	25	168 [a]	15
Sulfur dioxide	Annual	0.008	47 [a]	0.017
	24-hour	1.7	234 [a]	0.7
	3-hour	14	1,170 [b]	1.2
Carbon monoxide	8-hour	14	8,900 [a]	0.16
	1-hour	121	13,400 [a]	0.9
PM_{10}	Annual	0.0086	50 [c]	0.017
	24-hour	1.8	150 [c]	1.2

a. New Mexico Ambient Air Quality Standard (ACQR 201) corrected for altitude.
b. Secondary Federal Ambient Air Quality Standard (40 CFR Part 50) corrected for altitude.
c. Primary Federal Air Quality Standard (40 CFR Part 50).

4.10 ENVIRONMENTAL JUSTICE

4.10.1 Proposed Action

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. Except for a small building proposed for the surface and emplacement of surface detectors, activities associated with the Proposed Action would occur underground; therefore, aboveground populations would not be substantially impacted by the Proposed Action. There are no special circumstances that would result in any greater impact to minority or low-income populations than to the population as a whole. Consequently, there would be negligible effects on minority and low-income populations within an 80-kilometer (50-mile) radius of the WIPP site.

4.10.2 No Action Alternative

Under the no action alternative, no environmental justice impacts would occur because no changes to the WIPP facility or operations would occur.

4.11 CUMULATIVE IMPACTS

This section focuses on the cumulative impacts that could result once the incremental impacts of the Proposed Action are added to the impacts of other past, present, and reasonably foreseeable future actions. These actions include all those discussed in Section 5.9 of WIPP SEIS-II (DOE 1997) by reference.

The WIPP site was withdrawn in the Land Withdrawal Act for the purpose of TRU waste disposal and related activities, and DOE has no plans to dispose of other types of waste at WIPP. Currently, the only other activities being considered for the WIPP site are those described in the Proposed Action and other similar experiments.

Future mining and drilling to extract mineral resources known to exist within the Land Withdrawal Boundary in the vicinity of WIPP would be prohibited by the Land Withdrawal Act in the foreseeable future. The EPA has found that allowing activities on two existing leases that would permit drilling underneath the WIPP site would not affect WIPP performance, and one well has already been drilled pursuant to those leases. DOE is also exploring the possibility of obtaining a Toxic Substances Control Act permit to dispose of the small amount (less than 700 cubic meters [25,000 cubic feet])[5] of polychlorinated biphenyl-commingled TRU waste without treatment. This waste was included in the CH-TRU waste Additional Inventory and was analyzed in WIPP SEIS-II.

DOE is proposing to characterize up to 6,000 drum equivalents of CH-TRU waste a year within existing structures at the WIPP site. The Department analyzed the impacts of this proposal in the *Supplement Analysis and Determination for the Proposed Characterization for Disposal of Contact-Handled Transuranic Waste at the Waste Isolation Pilot Plant (WIPP)* (DOE 2000). Based on that analysis, DOE concluded in the “Revision to the Record of Decision for the Department of Energy’s Waste Management Program: Treatment and Storage of Transuranic Waste” (65 Fed. Reg. 82985, [2000]) that the proposed action “would not involve actions that are substantially different from those analyzed in prior NEPA analyses or have impacts beyond those already evaluated.”

DOE is also considering construction of a laboratory facility within Eddy County to consolidate current laboratory efforts that are spread throughout DOE facilities there. The new facility would be used to monitor air quality and groundwater samples.

The activities described in this EA, plus the current and foreseeable activities described above, could cumulatively affect biological resources, cultural resources, and socioeconomics. The most likely activities described in this EA would be located in an already disturbed area; therefore, cultural and biological resource impacts would not be expected. If the surface detector array were constructed or other biological or cultural resource impacts were identified, DOE would avoid those impacts by relocating the facilities to less sensitive areas.

Overall, socioeconomic impacts from the experimental activities, such as impacts to schools and city infrastructure, would be negligible because the number of additional personnel would be small. As noted above, the construction of a new laboratory facility would consolidate current activities, not introduce new activities. Therefore, impacts to infrastructure would be slight, while some additional labor income could be expected.

Cumulative impacts in 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.

4.12 SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

The activities discussed in the Proposed Action would result in no greater negative impact to short-term uses and long-term productivity than those described in Section 5.11 of WIPP SEIS-II. The Land Withdrawal Act already forbids extraction of mineral and hydrocarbon resources from the 41-square-kilometer (16-square-mile) Land Withdrawal Area for perpetuity. After decommissioning and permanent marking, the aboveground area of the WIPP site would be restored by contouring, grading, seeding, and other methods to return it to its natural condition.

Allowing the experiments discussed in this EA or similar experiments within an unused section of the WIPP facility would enhance the short-term uses of WIPP by enabling the facility to serve multiple needs.

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[5] As estimated in the 1996 *Transuranic Waste Baseline Inventory Report* (DOE 1996d).

4.13 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

The additional irreversible and irretrievable commitment of resources due to the Proposed Action would be negligible because all activities would occur either within the innermost fence of the WIPP site (for construction of a small building) or underground, largely in vacant and unused repository space.

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