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From: Joel D. Lusk
Date: July 23, 1998
Subject: Comments from the [redacted] DOI have been finalized and signed. fyi
Pages: 34

As requested, a final copy of DOI comments regarding numerous ecological concerns about the Los Alamos National Laboratory is now available for your review and consideration.

13209

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
Post Office Box 649
Albuquerque, New Mexico 87103

IN REPLY REFER TO:

July 17, 1998

ER 98/303

Corey Cruz
U.S. Department of Energy
Albuquerque Operations Office
PO Box 5400
Albuquerque, New Mexico 87185-5400

Dear Mr. Cruz:

The U.S. Department of the Interior (DOI) has reviewed the Draft Site-Wide Environmental Impact Statement (SWDEIS) for Continued Operation of the Los Alamos National Laboratory (LANL). Accordingly, we have the following comments for your consideration as you prepare the Final Statement. To facilitate your review, our comments are grouped into the following categories: 1) general comments; 2) comments on summary document; 3) endangered species; 4) ecology and ecological risk; 5) surface water, ground water, sediments, and soils; 6) geological processes; 7) project specific siting and construction analyses; and 8) summary comments, as follows.

GENERAL COMMENTS

The significance and effects of natural processes are inadequately addressed in the analyses for all the alternatives and for the site-specific implementation projects proposed. When addressed, these natural processes are discussed in broad terms of impacts to human health and not to regional natural and cultural resources of interest to land or resource managers. The U.S. Department of Energy (DOE) is a major land manager on the Pajarito Plateau and should not minimize the importance of natural processes in the SWDEIS decision-making process. We suggest you reevaluate your conclusions relative to the following statements from the Summary Document:

"The major contributors to environmental impacts of operating LANL are wastewater discharges and radioactive air emissions." (S-20)

"No other [than minor habitat loss, access problems, and increased potential vehicle/animal collisions] ecological impacts from operations are anticipated." (S-50)

Other major adverse effects from LANL operations, particularly if operations are expanded (the preferred alternative), include habitat fragmentation caused by widespread development of

roads, buildings (734,700 sq. m), LLW storage areas, and more; contaminant uptake by plants and animals and its effect upon reproductive capacity, behaviors, and life-span; further vegetation loss and accelerated soil erosion in the pinon-juniper zone; and interference with the frequency and benefits of natural fires. While the consequences of habitat fragmentation have little direct bearing on LANL's mission, landscape-wide, severe, accelerated erosion (at a rate of about 21" per century) in the pinon-juniper zone is cause for concern, as is the certainty of major wildfire resulting from nearly a century of unprecedented biomass accumulation. Soil erosion and a long history of inadequate forest health management threaten public health and regional natural and cultural resources. The importance and effects of natural processes should be addressed fully in the Final Statement.

We were very pleased to see that none of the alternatives call for increasing the development footprint outside of 48 acres within the currently highly developed areas (e.g., Area G). Does this mean that the public can expect no additional building in current open-space over the next 10 years? Creation of LANL and its operation for the past 50 years have fragmented wildlife habitat over an area equivalent in size to Bandelier National Monument. The cumulative effect of past, current, and proposed actions relative to fragmentation of the landscape needs to be addressed.

A fully integrated regional natural and cultural resource management plan is needed. If one were available it would be much easier to evaluate impacts to these resources. A Natural Resource Management Plan appears to be under development for LANL, but not an integrated natural and cultural resource management plan that addresses resource management needs across land management boundaries. The SWDEIS acknowledges that this kind of planning "has only begun to be considered . . ." The SWDEIS should go beyond this statement and commit to fully participate in regional resource management. We suggest that DOE and LANL participation on the recently formed East Jemez Resource Council be acknowledged and supported in the SWDEIS. This new Council was formed to discuss and make recommendations relative to conservation and preservation of the natural and cultural resources of the East Jemez Mountains.

Although the SWDEIS provides an adequate description of natural resources in and around the LANL, we find it is deficient in the quantification of direct, indirect, and cumulative impacts to these resources. We recognize that the public interest review of the SWDEIS is continuing and that the DOE has not made its final decision. We have included suggestions and recommendations for mitigation that, if incorporated in the SWDEIS, could reduce the identified deficiencies. Because the evaluation of impacts is inadequate, at this time, it is our opinion that the Reduced Operations Alternative, with the recommended modifications and additional analyses addressed below, and the incorporation of the recommended mitigation, would have a lesser impact to lands and natural resources under the management or jurisdiction of the DOI compared to the other alternatives.

COMMENTS ON SUMMARY DOCUMENT

Section 5.3.1.11 Accidents, Page 5-24:
The environmental consequences of a catastrophic wildfire should be addressed in the section on "Accidents (Other than Transportation Accidents and Worker Physical Safety Incidents/ Accidents)." The SWDEIS only examines the effects of a fire (presumably structural) to specific facilities. What would be the consequence of widespread fire? The DOE and LANL need to seriously consider implementation of a broadcast prescribed fire program in the next 10 years to address wildfire risk and forest health issues. We are very pleased to see that a Fire Protection Plan is under development, but are concerned that the plan may not address landscape level fire management needs in a timely manner. Pile burning is unlikely to fully mitigate the threat of crown fire unless it is done very soon and in large magnitude.

Section 5.3.2.2 Transportation, Page 5-52:
The proposed expansion of Plutonium Production and associated "Transportation Corridor" are likely to have the greatest adverse ecological effect of all the activities planned. It is our opinion that more detailed ecological impact analysis is needed for this project.

Section 5.3.3 Consequences of Environmental Restoration Activities, Pages 5-53 to 5-54:
More negative impacts are brought forth in the potential risk of environmental restoration activities than in the other program areas. The implication here is that the DOE sees the environmental restoration program as being more risky than the other site-specific projects and programs, such as Plutonium Production. Is this correct? If not, unintended bias against clean-up of legacy wastes could make the DOE look uncaring about contaminants issues. The DOE should provide more balance in this discussion relative to ecological risks associated with lack of considered action. The effects of contaminant uptake, for example, in biota, are not well known, but could be of critical importance to individual species and whole ecosystems. We fully support an initial focus in the environmental restoration program on mitigating human health and safety concerns, but it is also important to shift the investigations toward eco-risk and restoration over the next 10 years. The Final Statement should make this a stated goal.

This section should address potential impacts to designated wilderness areas and Class I integral vistas as defined in the Clean Air Act. What, if any, affect will any new construction have on the Bandelier National Monument and Dome Wilderness viewsheds? Impacts to the Bandelier and Dome Wildernesses can be inferred by piecing together information in the Land Resources, Air Quality, and Noise subsections, but the SWDEIS does not address the issue so that its relevance to the decision to be made is understood by the general public. Any increase in artificial lighting, such as is proposed for the new transportation corridor, or any increase in explosives testing, would adversely impact the "wilderness experience." In Bandelier, a significant increase in night sky light pollution was noted after a single, very tall and bright light was installed on Pajarito Road at the Security Office in the mid-1990s. We disagree with the conclusion made in the SWDEIS that "Indirect (reflected) light impacts from LANL

sources are very limited . . ." LANL facilities separate the Los Alamos communities from Bandelier. LANL-caused light pollution is observable by the casual observer in the Bandelier Wilderness. Reflected light from Los Alamos is also a problem, so both sources have a cumulative adverse impact on Bandelier. The "Reduced Operations" alternative could actually reduce the light pollution problem. The "Expanded Operations" alternative will worsen the problem and affect designated wilderness.

ENDANGERED SPECIES

Section 7 consultation under the Endangered Species Act is ongoing with the U.S. Fish and Wildlife Service (FWS). The FWS is concerned that the continued operations may adversely affect threatened or endangered species and their habitat. It is the desire of the FWS to work with the DOE to find ways to reduce the potential effects involving threatened and endangered species and their habitats during continued ongoing informal consultations. The FWS is concerned with the health risks posed to threatened and endangered species by continued operations for the following reasons:

1. The SWDEIS does not identify specific dates for the cleanup and restoration of threatened or endangered species habitats that may be contaminated with legacy wastes. The Final Statement should address the cleanup and restoration of listed species habitats and incorporate this schedule of cleanup and restoration as mitigation. As stated, potentially adverse effects will continue under the No Action Alternative with continued operations. Furthermore, soils contaminated with legacy wastes that are up-slope of threatened or endangered species habitat or which are cleaned up to human health and ecological action levels (above baseline concentrations) have the potential to indirectly and cumulatively add contamination to threatened or endangered species habitats during runoff events under continued operations.

2. The location of the LANL, an industrial facility with an extensive legacy of wastes in a forested landscape, results in unusual conditions that may affect threatened or endangered species in New Mexico. Environmental contaminants may pose health risks to the peregrine falcon and Mexican spotted owl (Gonzales et al. 1997). Risks to the southwestern willow flycatcher are unknown. We agree that the hazard indices for these species demonstrate low health risks on average. However, the maximum hazard indices and other conservative endpoints demonstrate substantial adverse health risks. We also contend that not all the contaminants are known or can be modeled accurately. These models and our understanding could benefit from additional empirical data.

3. Although cumulative impacts of the preferred alternative were identified for the habitats on the LANL as a whole, it is unclear whether the indirect and cumulative effects on threatened and endangered species habitat were quantified in the

SWDEIS for each species' territory. Furthermore, new information has been provided that has the potential to substantially alter the evaluation of indirect and cumulative effects on threatened or endangered species and their habitats. A Notice of Intent for Proposed Conveyance and Transfer of Certain Land Tracts Located at LANL was published in the Federal Register on May 6, 1998, by the DOE. Any transfer of land would likely reduce the size of the LANL and may increase other disturbances and thereby alter the amount of direct, indirect, and cumulative impacts to wildlife habitat.

4. The FWS believes that the potential for adverse effects to threatened or endangered species and their habitats may be ongoing during the continued operations. The FWS believes that the DOE was not in compliance with Section 7 of the Endangered Species Act on two occasions. The FWS did not concur with the DOE's finding that operation of the Radioactive Liquid Waste Treatment Facility would be "unlikely to adversely affect any endangered or threatened species" on March 16, 1995, and although modified, the project continues. The FWS also did not believe sufficient information was available to concur with the DOE's finding that Effluent Reduction would have "no impacts" to threatened or endangered species on August 8, 1996. Furthermore, the FWS believed that significant environmental effects would occur without mitigation of wetland loss.

It is our opinion that adverse effects to threatened or endangered species and their habitats may occur under all alternatives and therefore the FWS does not concur that continued operations may affect, but is not likely to adversely affect, threatened or endangered species without additional analyses, information, and continued consultation. We recognize that the FWS and DOE are still in consultation and that the DOE has not made its final decision. We urge this consultation process to continue.

ECOLOGY AND ECOLOGICAL RISK

Section 4.1.1.2 LANL Land Use, Pages 4-4 to 4-6:

Please describe and quantify the land used for structures, roads, unpaved roads, parking lots, utility corridors, firing sites, and potential release sites on a watershed basis, on a vegetation basis, and on a topographical basis. In this way, the direct, indirect, and cumulative effects of structures and their impervious surroundings can be evaluated by calculations involving watershed and stream corridor dynamics. Similarly, the SWDEIS should evaluate the direct, indirect, and cumulative impacts of structures and other similar land uses on vegetative communities. Also, describe and quantify those areas in the watershed and in each vegetative community that have slopes greater than 20%. Finally, north-facing slopes tend to contain more moisture-dependent plants and animals. Please quantify and describe the north-facing slopes by watershed, vegetative community, and the extent to which structures and similar land use has directly, indirectly, or cumulatively affected these areas.

Section 4.1.1.2 LANL Land Use, Page 4-7, ¶1:
Please identify which or describe how each of the six land use categories contains the National Environmental Research Park.

Section 4.1.1.4 Potential Land Transfers and Related Land-Use Issues, Page 4-9:
A Notice of Intent for Proposed Conveyance and Transfer of Certain Land Tracts Located at LANL was published in the Federal Register on May 6, 1998, by the DOE. Any transfer of land would likely reduce the size of the LANL and thereby change the amount of wildlife habitat considered under the cumulative effects analysis. Should the amount of land transferred and its disposition not be included in the Final Statement for site-wide operations, a supplemental environmental impact statement on the continued operation of the LANL considering the cumulative effects including the transfer of land and effects of spin-off development in Los Alamos and Santa Fe counties may be necessary. Similarly, the effects on threatened and endangered species and their habitats is confounded by the separation of analyses in the SWDEIS and for the transfer of land. The results of your endangered species coordination with the FWS on both of these proposals should be included with your final effects analysis and Statement or included in a supplemental Statement following the decision of the transfer of land. Please note that should the Lease of Land for the Development of a Research Park (DOE 1997a) or the Transfer of the DP Road Tract (DOE 1997b) change from their original formulation, re-consultation with the FWS regarding the effects to endangered species will be necessary.

Section 4.1.1.6 Bandelier National Monument Land Use, Pages 4-11 through 4-13:
It is inappropriate to exclude 18 of the 19 recognized American Indian tribes of Puebloan ancestry from ancestral association with the main unit of Bandelier National Monument. The Pueblo of Cochiti is not the only tribe affiliated with Bandelier, or claiming it as an ancestral home. The same can be said for the Tsankawi Unit. San Ildefonso Pueblo can certainly claim ancestral affiliation to Tsankawi, but so can Tesuque, Pojoaque, Nambe, Santa Clara, and other pueblos.

The latest visitor attendance record available is for 1997. There were 410,143 visitors recorded for that year. The Tsankawi Mesa trail is 1.5 miles long, not 2 miles long.

The "current plan-. . . approved in 1995 (DOI 1995)" is not a plan for the management of all of Bandelier National Monument. It was a development concept plan to manage visitor use and facilities in the main headquarters area of the park and in a small portion of Tsankawi. The National Park Service has never developed a General Management Plan for Bandelier National Monument, although the 1977 "Final Master Plan" is considered a close compromise. The 1997 plan, however, is out-of-date and is no longer a reasonable guide.

Section 4.1.2.2 Air Quality and Light Pollution Within the Visual Environment, Page 4-16, ¶2:
It is unclear how different light sources and spectrums might affect plants and animals. Some

plants use diurnal light cycles to align their reproductive and metabolic activities. Some animals shun bright lights while others take advantage of the insects that are attracted to these light sources. If the amount of artificial light that directly, indirectly or cumulatively has been added to each watershed and each vegetative community is quantified, trends may be observed. By conducting this type of research, the effects to plants and animals can be monitored and compared to reference areas with normal diurnal patterns of light.

Section 4.1.3 Noise, Air Blasts, and Vibration Environment, Page 4-17, ¶1:
Nocturnal predators such as owls can fly past a person and not make any perceivable sound. This ability in conjunction with the ability of an owl to hear the barely-perceivable sounds of a small mammal under leaf litter allows the owl to function properly in its niche and forest habitat. Obviously, a continuous source of noise that impairs this function will reduce the habitat suitability for owls. Currently, the LANL is studying the effects of sounds on owls and is finding them remarkably tolerant to air blasts and sudden noises. However, the cumulative noise impacts to owls, or any other sensitive species of wildlife (bats, other nocturnal predators, birds communicating by song, etc.) are generally unknown. Not all species have been evaluated to determine their sensitivity to direct and indirect sources of noise, let alone their cumulative threshold. Furthermore, not all species of wildlife are being exposed to uniform noise on the Pajarito Plateau and each species has not been evaluated for its sensitivity to noise. Additionally, the abundance and diversity of animals of the region may mask the impacts of noise. Noise-sensitive species could be declining locally but their populations may not have declined sufficiently to be observed during monitoring.

If baseline information about the amount of noise that has been directly, indirectly or cumulatively added to each watershed is established, then any potential adverse effects can be determined through monitoring and research. As an area becomes increasingly inundated with noise, the impacts to plants and animals could be monitored and compared to reference areas with normal noise levels for the various vegetative communities and watersheds. Certain conditions, such as thinned forest stands and flatter topography, might not attenuate sound as well as other areas and, therefore, these areas might be more affected by direct, indirect and cumulatively noises. Consequently, these areas might be candidates for noise abatement.

Section 4.5.1.2 Wetlands, Page 4-107, ¶1:
Please describe and quantify any and all environmental contaminants that have been found in or are suspected in the water, plants, animals, sediments, or soils of wetlands. Please identify and map the number and type of potential release sites that could influence these wetlands by runoff or direct discharge. By evaluating the direct, indirect, and cumulative impacts of environmental contamination on wetlands, information regarding their function and value can be determined for wildlife and other natural resources.

Section 5.2.5 Ecological Resources, Biodiversity, and Ecological Risk, Pages 5-49 to 5-54:
Tremendous environmental benefits would be gained from the planning and management of federally-listed species through the LANL Threatened and Endangered Species Habitat

Management Plan and through the Natural Resources Management Plan. Additional long-term benefits will likely be gained through the remediation and restoration of contaminated soils and injured natural resources and services. However, there could likely be some short-term adverse effects to natural resources and their services from the cleanup process that may need additional mitigation. The DOI recognizes that the restoration of areas of environmental contamination is a significant component of comprehensive natural resources management. We commend the DOE for demonstrating a responsibility for cleanup, restoration, and stewardship of natural resources at the LANL.

The addition of better waste water treatment facilities, the increase of recycling with reduced consumption and amount of contaminated discharges are also commendable. However, the Outfall Reduction Program Environmental Assessment (EA; DOE 1996) may have overstated the benefits, understated the potential adverse effects, and precluded alternatives offered during scoping and consultation with the FWS. A summary of FWS concerns and recommendations from the August 8, 1996, response follows:

> The EA does not present alternatives that mitigate adverse environmental impacts. The FWS believes that a range of alternatives that address any ongoing pollution could be developed in conjunction with a comprehensive wetlands management plan, which would protect, restore, or enhance the wetlands at LANL. The Proposed Action alternative would result in the irreversible and irretrievable commitment of natural resources such as: the loss of 25 wetlands (≈13 acres; page ii), the death of numerous wetland-dependant fauna (amphibians, mammals, macro invertebrates; page 29), a decrease of species diversity (page ii), the generation of additional regulated wastes (page 33), and the decrease of aesthetic values (page 32), without adequate mitigation measures. The No Action alternative also describes adverse impacts to wetlands and wildlife via historical and future industrial effluent discharges to wetlands, which might exceed the water quality limits permitted under the National Pollutant Discharge Elimination System (NPDES). Given that both alternatives might significantly impact the human environment, the FWS recommends that the DOE develop additional alternatives through scoping that would protect, restore, and enhance the biological and physical environment prior to the release of this EA as the National Environmental Policy Act (NEPA) document.
>
> A comprehensive wetlands management plan developed on a watershed basis could address the inter-relationships among wetlands, scheduled LANL development, LANL facilities, NPDES and storm water discharges, wildlife habitat, stream side protection, aesthetics, and water quality in a balanced way. A comprehensive wetlands plan considers how up gradient uses may affect wetlands, how wetlands can be buffered from adjacent incompatible uses, and protects the wetlands values for downstream users or remediation purposes (e.g., flood storage and sediment trapping capacity). A comprehensive

wetlands management plan would allow for the best available information to be integrated, providing an opportunity to protect valuable wetlands on LANL through a systems approach rather than through an incremental, fragmented EA process.

New information has emerged that identifies an additional impact that should be immediately mitigated. Cross (1995) reported 216 individual *Pisidium* clams at Outfalls 05A072 and 04A157. However, in Chapter 5 (in Foxx et al. 1995), Cross identified this species of pea clam as *Pisidium compressa* and noted that they were only found on the LANL in the high explosives wastewater stream. The FWS then searched for this clam species in the National Heritage Central Database (Nature Conservancy 1998), the New Mexico Species List (BISON-M, version 9/97, maintained by the New Mexico Department of Game and Fish [NMDGF]), and conversations with the Natural Heritage Program, and we did not locate this pea clam species anywhere else in New Mexico. This pea clam might exist elsewhere in New Mexico, but has not been reported to date.

Two other pea clam species were reported by the NMDGF, *Pisidium sanguinichristi* and *Pisidium lilljeborgi*; both are listed as threatened and are each known to inhabit only one location in New Mexico. We submit that the available records indicate that the pea clam (*Pisidium compressa*) associated with the Outfalls 05A072 and 04A157 contain the only account of this species and the DOE's decision to desiccate this wetland may likely extirpate this species in New Mexico. Mitigation, therefore, should include emergency reconnaissance of the wetland, capture and propagation of this unique species, and relocation to prevent its loss. Additional mitigation should include detailed aquatic surveys of all outfalls scheduled or undergoing reduction, wetlands, springs, and headwater streams on the LANL. When only a few aquatic species live only in New Mexico, they contribute uniquely to the global biodiversity in stable high elevation streams and isolated spring-fed habitats.

<u>Section 5.6.1.4 Ecological Resources, Page 5-191, ¶2:</u>
The SWDEIS suggests that the LANL, for the most part, only has direct effects on ecological resources within the perimeter. It appears that this conclusion was made on qualitative information and is not supported by cited studies or a quantitative evaluation. An evaluation of direct, indirect and cumulative environmental impacts would be most valued if they were studied over an entire watershed or ecosystem. Since the fate of environmental contaminants is likely widespread (contaminated runoff from the LANL made its way to the Rio Grande and Cochiti Reservoir [Graf 1994], air dispersal, etc.), the impacts of these pollutants must be measured over a more encompassing scale. In a number of cases, contaminants appear to have adverse effects on a relatively small area but may impact areas far from the release through chemical transformation and transport. Pesticides in runoff have long been recognized, but Spencer and Cliath (1990) found that up to 90% of pesticides can volatilize and be transported through the atmosphere. Also, what appear to be small scale environmental impacts can become an ecosystem stress when similar or interactive events, which are individually minor, become collectively significant over a large area (Odum 1982). Although a contaminant may

only directly affect one region, it may indirectly affect another, resulting in a landscape scale effect. Organisms that are capable of concentrating heavy metals may move from a contaminated to an uncontaminated ecosystem, thereby introducing the contaminant into the food web (such as elk, migratory birds, emergent invertebrates, etc.). Alternatively, decreased primary production in a stressed ecosystem could cause migration of mobile organisms to a healthier system, resulting in increased competition for resources (Holl and Cairns 1995). Environmental contaminants may have immediate measurable effects on the rate of decomposition of organic matter at the contaminated site, but the indirect effects brought about by a change in composition of the decomposer community may increase gradually and are hard to quantify (Beyer and Linder 1995).

Ecological resources (which were not defined in the SWDEIS, but may include living organisms and all the materials in their habitats throughout their lifespan) may be affected directly, indirectly, and cumulatively by ongoing operations both on and off the LANL through site exposure and subsequent migration (elk, migratory birds), through transport of contaminants (e.g., mercury, organic contaminants and other chemicals) in permitted discharges, stormwater, suspended sediment, and in groundwater, by physical habitat alteration of the stream corridors and other habitat disturbances. Many of these stressors and disturbances may indeed be a cumulation of past and current resource management and land use practices in the region and that will continue to require the coordination, planning, flexible management and commitment to the conservation, enhancement, and sustainable use of resources by all regional federal, state, tribal, and private entities. The natural resource plans and coordination with others have clearly demonstrated leadership and a dedication to long-term natural and cultural resources management of the LANL by the DOE.

For these reasons, we recommend that direct, indirect, and cumulative additions of chemicals to each watershed be described and their effects on natural resources evaluated. The watershed might function as a useful discreet landform to evaluate the response of stresses in a landscape. Slope, gradient, elevation, and aspect affect the spread of disturbance through the environment. Physical, chemical, and biological factors affect the impact of contaminants. Natural processes must also be observed over extended time frames in order to fully assess the impact of environmental contaminants. Changes in the amount and spatial distribution of plant and animal communities may be indicators of landscape scale stress. Some stress indicators used at the watershed or ecosystem level, such as primary production and indigenous species diversity or richness, can be measured over the entire landscape. It is also important to view ecological processes over extended periods of time.

Certain taxonomic groups have been suggested as regional indicators of environmental health because of their large scale distribution and sensitivity to stress. The DOI recommends that birds be considered as taxa for regional monitoring because of their widespread distribution on the Pajarito ("little bird") Plateau, their sensitivity to various toxicants directly (Newman 1979), through the food chain (Blancher 1989), or through habitat alteration (Morrison and Menslow 1983), and the large database of information that already exists (Johnson 1996b).

Johnson (1996b) has found declines in ground nesting birds and foliage nesting and foliage insectivore birds that could be ameliorated by natural resources management on the LANL. The DOI strongly encourages the DOE to consult with the FWS informally to ensure that it minimizes "take" caused by any of its ongoing operations, thus protecting the migratory bird resource and complying with obligations of the United States under various conventions. Mitigating activities such as leaving brush piles of cleared trees instead of mulching, enhancing wetlands and riparian areas, and revegetation with native forbs are just some of the activities that might improve migratory bird populations and diversity at the LANL and on the Pajarito Plateau.

Section 3.6.2.5 Ecological and Biological Resources, Page 3-53, ¶2:
Describe how the "significant adverse impacts" were quantified and evaluated. Describe the results of any quantitative studies that evaluated the effects of contaminants on biota and ecological processes that would support this conclusion. The assessment of risk was qualitative and not quantitative. Identify all the species and pathways that were modeled for ecological risk and their input parameters, uncertainties, and assumptions. Describe the direct, indirect, and cumulative effects of environmental contamination and any probable accident scenarios to the environment, biota and ecological integrity.

Sections 4.5.2.5 and 4.5.3 Pollution and Ecological Risk Considerations, Pages 4-122 to 4-123:
No studies were cited that support the lack of biological injuries and alterations to ecological processes suggested in the conclusions stated here. Please identify all the species and pathways that were modeled for ecological risk and their input parameters, uncertainties, and assumptions. Describe the direct, indirect, and cumulative effects of environmental contamination and probable accident scenarios to the environment, biota and ecological integrity. In some cases, contaminants could volatize into the air and redeposit into aquatic systems and thereby provide a pathway to ecological receptors. Organic and other contaminants that bioaccumulate (e.g., mercury, Polychlorinated biphenyls [PCBs], Dibenzofurans, Dioxins, DDT, and selenium are identified as concentrated in soils in Appendix C) at potential release sites can be introduced to the environment through accident, via stormwater runoff, cumulatively after cleanup, through permitted discharges, or to the air (e.g., exposing PCB contaminated sediments to air [Chiarenzelli et al. 1998]).

Eaton and Murphy (1992) determined that tritium concentrations in aquatic animal flesh reach equilibrium with stream water concentrations. Therefore, aquatic species (amphibians and invertebrates) at the Mortandad wetlands and stream corridor could have upwards of 311,200 pCi/g (SWDEIS; page 5-42) of tritium in their tissues. These direct effects were not quantified nor evaluated. Additionally, the improved treatment technologies of the Radioactive Liquid Waste Treatment Facility will not decrease tritium in the discharges under the ongoing operations. The direct, indirect (armoring of watershed with the proposed road), and the cumulative impacts (transport of contaminants downstream) to the natural resources in Mortandad canyon were not quantified nor evaluated.

Once diluted in the environment, radioactivity is attenuated only by physical decay. Furthermore, the amount of each daughter present in each decay series was likely not accounted for in any risk assessment model. Please account for the dose contribution of each member of a decay series of radionuclides. For instance, the hazards of plutonium 241 increase in the first few decades of decay due to formation of the daughter product Americium 241. This additional isotope increases the hazard 25-65 times more than plutonium 241 alone (Heindel et al. 1995). No information was presented on plutonium 241 to make a quantitative determination.

Please model the effects of inhaled actinides and beta-emitting radionuclides on the incidence of disease, death, cancer, or physiological malfunctions for a variety of wildlife including migratory birds (e.g., hummingbirds, raptors, songbirds), small mammals, amphibians and reptiles. The severity of the radiation dose and the organs that are irradiated depend primarily on the quantity of plutonium taken into the body and on the route by which it enters the body. In general, plutonium that is inhaled is far more hazardous than plutonium that is ingested, because it is more readily absorbed into the blood stream via the lung structures than via the gastrointestinal tract. From either of these entry points, plutonium may migrate via the blood stream and selectively concentrate in the bones and liver of selected animals (Sutcliffe et al. 1995).

All chemical toxicants challenge biological systems. It is likely that responses to contaminants are costly for the organism in terms of metabolic resources and energy (Calow 1989). While the responses of organisms to high contaminant exposure may have been evaluated in the SWDEIS and are fairly obvious (e.g., gross morphological changes or mortality), responses to low level exposure may be less easily discernible, involving more subtle responses, such as the induction of catabolic enzymes or protective proteins. However, according to the metabolic cost hypothesis, these responses are likely to have consequences for an individual animal's energy budget that could be ecologically important (Forbes and Calow 1996). Moreover, we have limited abilities to predict how chemicals in a mixture interact with each other or biological systems. Additionally, dynamic growth and development make younger animals especially susceptible to environmental contaminants. Their cells are multiplying and organ systems are maturing so rapidly (e.g., a hummingbird can fledge in one day) that exposure to contaminants at such critical stages can lead to permanent and irreversible damage in both DNA and tissues (Haynes 1998).

The LANL is a Hazard Category 2 facility; that is, it has the potential for significant on-site consequences. The DOI has concerns about the DOE's efforts to reduce the risks (to natural resources) from the legacy of wastes at the LANL. It is our opinion that the direct, indirect, and cumulative impacts to natural resources from environmental contamination were not sufficiently or quantitatively addressed by the analyses in the SWDEIS. Compared with other statements made, the SWDEIS more accurately summarized the ecological risks on page 5-11, ¶2 as, "Environmental pollution generated from past and present LANL operations and

projected discharges from the four alternatives identified for continued operation of LANL could potentially pose a risk to biotic communities and ecological processes."

SURFACE WATER, GROUND WATER, SEDIMENT, AND SOILS

Surface water quality is an integral part of the supporting ecosystems for migratory birds, endangered species, and other natural resources for which the DOI shares trusteeship with the DOE, the State of New Mexico and Indian Tribes (40 CFR 300). In general, the sections on water/sediment sampling and monitoring mention a much needed comprehensive hydrogeologic plan that should provide new and continuing, good quality data, if completed (see LANL, 1996). In addition, because the LANL proper is a potential source of contamination to water resources and specifically ground-water supplies, the current monitoring program is very necessary and should be upgraded to obtain missing information. Information that is lacking includes: 1) the source of local recharge to the main aquifer; 2) the source of springs in the area; 3) the nature and extent of groundwater bodies in this region; 4) the source and pathways of contaminants to the main aquifer, soils, sediments, and springs; and 5) the interaction of these ground-water components, addressed in a local ground-water model.

Section 3.6.2.3 Water Resources, Page 3-52, ¶1:
Please describe and quantify the cumulative drop in water levels in DOE or other well fields for all past, present, or foreseeable future conditions and activities. Alterations in ground water levels have the cumulative potential to impact springs that support unique assemblages of wildlife.

Section 3.6.2.3 Water Resources, Page 3-53, ¶1:
Please quantify the expected change in surface water area for each canyon for the range of outfall flows under each alternative. Describe the decision process used to evaluate when and how often an exceedance of a NPDES-permitted discharge limit or an existing ambient stream quality would not result in the downstream transport of substantial surface contamination under the range of outfall flows under each alternative. The statement that ongoing operations will likely improve the quality of water is not supported by figure 7.5.1.1-1. In this figure, the number of exceedances increased over the time period evaluated from 21 exceedances in 1991 to 36 exceedances in 1996. Using a regression equation on the data presented, the expected number of exceedances increases to 55 by the year 2006 under the no action alternative with all conditions remaining the same. Therefore, the cumulative impact to natural resources is likely to increase with ongoing operations.

Section 4.2.3.1 Soil Monitoring, Page 4-34:
To determine whether soil contains "high or unusual" quantities of a specific element, it would be necessary to determine what quantity is "normal or usual." If several samples of soil are collected and analyzed, and most of them have concentrations of elements outside of the expected 95-percent range for soils that are representative of the general area, then there is a

good chance that these are unusual samples, perhaps representing some type of environmental contamination. A baseline is often computed as two deviations about a mean. We were perplexed by reports from the LANL that identified varying background concentrations of fallout radionuclides in the environment. Note that for some radionuclides, the upper tolerance limits (UTLs) have increased nearly 20 times in as many years (Table 1). Please explain why the UTLs for background soils has increased over time. This determination is critical, as clean up criteria and injury determinations can be based on UTLs. Due to the controversial nature over what is background and the lack of consistency by LANL scientists, we recommend that a group of independent scientists (e.g., the National Academy of Sciences) be tasked with determining the UTLs for this region given existing or additional data.

Table 1. Background Upper Tolerance Limits for Selected Radionuclides in Northern New Mexico reported by LANL Scientists. All values in pCi/g.

Radionuclides	Purtymun et al. 1987	Fresquez et al. 1996	Campbell 1998.
Strontium (90 Sr)	0.88	0.82	1.31
Cesium (137 Cs)	1.09	1.13	1.65
Plutonium (238 Pu)	0.005	0.008	0.023
Plutonium (239+240 Pu)	0.025	0.028	0.054

Section 4.2.3.1 Soil Monitoring, Page 4-37, ¶1:
LANL screening action levels (SALs) are derived from a risk assessment pathway using a 10 mrem per year dose limit. A brief description of the assumptions used for this assessment should be included. Also, an analysis of how changes in the assumptions would change the SAL would add clarity.

The 10 mrem per year dose limit seems to apply to each nuclide. If this is true, then the seven nuclides listed could each be at the SAL, giving a total of 70 mrem per year dose to current inhabitants.

How were the soil sampling locations determined? Are the locations of pathways related to possible releases from lab activities?

Section 4.2.3.2 Soil Erosion, Pages 38-39:
On page 4-38, the DOE acknowledges that "Soil erosion can have serious consequences to the maintenance of biological communities and may also be a mechanism for moving contaminants across LANL and off site. Soil erosion rates vary considerably on the mesa tops at LANL ..." Severe, accelerated soil erosion is a major problem on Bandelier National Monument and is undoubtedly a major problem on DOE lands. It is well known that historic grazing throughout

the Pajarito Plateau has had, and continues to have, profound adverse effects on soil stability (Gottfried et al. 1995). We have been conducting investigations on the rate of vegetation and soils recovery after grazing in the pinon-juniper zone and have found that healing is not occurring. A critical threshold has been crossed and all indicators point toward a continuing erosion problem, particularly on mesa tops. What exactly can we expect if soil erosion in the pinon-juniper zone is not addressed on a landscape (not just site-specific) scale by DOE/LANL? The Final Statement should answer this question. The authors reference two studies being conducted in Bandelier National Monument relative to characterizing soil erosion rates. The first citation ("Miller and Wigland 1994") does not belong in this discussion and in fact is a citation for work done in Oregon. Please use the following citations in its place: Davenport et al. 1998, Wilcox et al. 1996a, Wilcox et al. 1996b, and Gottfried et al. 1995. The citation for the reference to the "light summer rain storms in 1993 resulted in erosion of more than 12 tons per acre" is Wilcox et al. 1996b, which is identified in full above.

Chapter 4.3 Water Resources, Pages 4-42 and 4-70:
The SWDEIS states that "the source of recharge to the main aquifer is presently unknown." The Proposed Hydrogeologic Workplan (LANL 1996) proposes to address some of the issues from our General Comment on the lack of information on the source of recharge to the main aquifer. This investigation is very beneficial in light of the fact that there exist: (1) higher than normal concentrations of metals, such as selenium, and radionuclides, such as Plutonium-239 and -240 in soils and sediments; (2) effluents from sanitary sewage, industrial water treatment, and cooling-tower blow down; (3) the presence of faults that might control local recharge; (4) many NPDES exceedences; and (5) a rift-basin environment where faults may control local recharge to springs, shallow aquifers, and main aquifers that supply public drinking water.

Section 4.3.1 Surface Water, Page 4-47, ¶1:
Please note that Los Alamos Reservoir has outstanding water quality and is used for recreation, swimming, fishing, as well as providing foraging habitat for bald eagles and peregrine falcons (Johnson 1996a).

Section 4.3.1 Surface Water, Page 4-47, ¶2:
Table 4.3-1 - Summary of Water Resources and Sampling Locations by Watershed, Row 1) Surface Water Flow Category, Column "Pueblo" and Column "Sandia" should be changed to "P/E" to reflect the text on Page 4-47 that states, "[w]ithin LANL boundaries, only Los Alamos, Pajarito, Water, Ancho, *Sandia, Pueblo*, and Chaquehui Canyons contain reaches of streams with sections that have continuous flow."

Section 4.3.1.1 Surface Water Monitoring, Page 4-47, ¶1:
Please note that a surveillance and compliance program in and of itself will not *ensure* that operations do not adversely affect the environment. Furthermore, even the best monitoring programs do not collect data on a continuous basis which allows gaps in the understanding of environmental fate, transport, and potential impacts. The gaps in our knowledge are the result

of several factors: 1) ecosystem interactions and response to natural and anthropogenic stress are much more complex than originally thought; 2) many monitoring efforts focus on a single media and not interactions between them; and 3) much of the monitoring data was collected primarily to satisfy regulatory requirements (Breckenridge and Olson 1995). For instance, water quality data for NPDES-permitted discharges was provided for 1994-1996 in the SWDEIS, and that only in 1996 were automated water sampling devices deployed to evaluate storm events. No stormwater data was presented in the SWDEIS. Additionally, the monitoring and compliance program was not designed to provide direct evidence for any adverse effects to wildlife such as mortality, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions, and physical deformations that would result in long-term changes in regional biodiversity or ecological integrity. The lack of water quality information can result in substantial uncertainty about the direct, indirect, and cumulative impact analysis of the alternatives. Additionally, a list or reference to a list of the "surface water chemistry" parameters is needed here.

Section 4.3.1.2 Surface Water Quality Standards, Page 4-50, ¶1:
A Table of the NMWQCC stream standards is needed here.

Section 4.3.1.2 Surface Water Quality Standards, Page 4-50, ¶2:
The use of "magnitude greater than" concerning the radiation levels is unclear. Does "radiation levels" mean standards? Does "greater than" mean less-restrictive or more restrictive?

Page 4-50, Footnote:
This reads as ingestion of 772 quarts of water per day. The definition needs to be rewritten to remove that implication.

Section 4.3.1.3 National Pollutant Discharge Elimination System Permitted Outfalls, Page 4-57, Figure 4.3.1.3-1:
Please update this figure with information provided by the New Mexico Environment Department (Dale 1998) that identifies additional perennial reaches. Also, please identify the Rio Grande as a perennial reach in this figure.

Section 4.3.1.3 National Pollutant Discharge Elimination System Regulatory Compliance, Pages 4-58 through 4-62:
Mercury is missing from the discussion of NPDES exceedances at outfalls. Although only NPDES data for 1994-1996 was presented in the SWDEIS for evaluation (Appendix C, Table C-1), concentrations of mercury in these effluents appear to be above those protective of aquatic life (EPA 1993), or wildlife habitat (0.012 μg/L; NMWQCC 1995) in Mortandad (0.6 μg/L), Pajarito (0.4 μg/L), Sandia (1.7 μg/L), and Water (0.3 μg/L) Canyons. Canyons identified as having received NPDES-permitted discharges were also elevated in mercury.

Symptoms of acute methyl mercury poisoning in birds include reduced food intake leading to weight loss, progressive weakness in wings and legs, difficulty flying, walking, and standing, and an inability to coordinate muscle movements (Scheuhammer 1987). In addition to well-identified acute effects of mercury at high concentrations, there are also significant adverse effects at lower tissue-mercury concentrations representing chronic mercury exposures. The DOI is concerned about the discharge of mercury to these canyons and any direct, indirect, or cumulative impacts to fish and wildlife in these canyons and in the Rio Grande. Please evaluate the potential impacts of mercury to downstream natural resources including the health of amphibians, reptiles, migratory birds, mammals and fish from any expected exceedances of NPDES limits under each alternative.

In a new approach to the problem of mercury contamination, scientists at the DOE Pacific Northwest National Laboratory have been working on an absorbing technology that may provide the ability to remove and concentrate mercury from a liquid waste stream. The team developed a method of coating mesoporous silica with monolayers of a compound that bonds with heavy metals which can then be removed with an acid wash (Holton 1998).

Section 4.3.1.3 National Pollutant Discharge Elimination System Permitted Outfalls, Stormwater Effluents, Page 4-62:

The DOI is of the understanding that all the solid waste management units are eligible for the Multi-Sector General Permit. We are uncertain how many of the 2,120 potential release sites at the LANL would also be considered solid waste management units. According to the U.S. Environmental Protection Agency Region 6 (62 Fed. Reg. 37447-37475, July 11, 1997):

> Any discernible waste management unit from which hazardous constituents may migrate, irrespective of whether the unit was intended for management of solid or hazardous wastes. The types of units considered SWMUs are landfills, surface impoundments, waste piles, land treatment units, incinerators, injection wells, tanks, container storage areas, waste water treatment system, and transfer stations. In addition, areas associated with production processes at facilities that have become contaminated as a result of routine, systematic, and deliberate releases of wastes (which may include abandoned or discarded product), or hazardous constituents from wastes, are considered SWMUs.

Solid waste management units usually meet the definition of industrial activity in 40 CFR 122.26(b)(14)(iv-v), thereby requiring an NPDES storm water permit. Please describe if the LANL will develop stormwater pollution and monitoring plans for each potential release site. Please describe the expected frequency of inspection and the structural, vegetative, or stabilization measures that will be developed to prevent contaminated stormwater from entering and affecting natural resources in the canyons. Please discuss the compliance schedule as an ongoing operation under each alternative, if applicable.

Section 4.3.1.3 National Pollutant Discharge Elimination System Permitted Outfalls, Sediment Quality, Page 4-64:

Organic contaminants are monitored as part of the surveillance and compliance program. However, the SWDEIS does not present the data for organic contaminants in sediments, nor do any of the alternatives evaluate direct, indirect, or cumulative impacts of these chemicals in sediments, soils, and biota. As an indication of contaminants likely to either be associated with the potential release sites or runoff into stream sediments, we reviewed Appendix C, Table C-8 - Soil Detection Statistics by Watershed and by Analyte (ER Risk Database [LANL 1998]--Organics). Many of these chemicals (PCBs, DDT, Dioxins, solvents, semi-volatile chemicals, etc.) can bioaccumulate in aquatic systems and wildlife and can cause adverse effects. There is also an increasing recognition that conventional best management practices (BMPs) such as structural, vegetative, or stabilization measures (including retention fences, hay bales, detention basins, filters, etc.) are not real BMPs for controlling water quality use impairments in water bodies receiving chemicals that bioaccumulate or that are dissolved in stormwater runoff (Lee and Jones-Lee 1994). Without a commitment to stormwater pollution plans at all potential release sites and monitoring at the LANL, cumulative adverse effects to fish and wildlife resources could increase.

The DOI recommends an alternative for monitoring and BMP development under the approach of "Evaluation Monitoring" (Lee and Jones-Lee 1994). Evaluation monitoring assesses the impact of site-specific or watershed-specific stressors from a water quality use impairment perspective. Conventional monitoring of a suite of chemicals by sampling and analysis tries, with little or no success, to extrapolate effects to the receiving water. Evaluation monitoring is a watershed-based comprehensive water quality evaluation (already required under multi-sector general stormwater permits) and a management program in which the stakeholders that are concerned about water quality (the DOE, LANL, NMED, trustees, and tribes downstream) work together to define the water quality use impairments that are occurring in a watershed and their cause. They then work to develop control programs to limit the amounts of constituents responsible for use impairment. In order to relate biological and ecological effects to stormwater runoff quality, we also recommend the measurement of toxicity in the runoff using EPA standard ambient water toxicity tests. When significant toxicity is encountered, studies are conducted to determine its magnitude and duration. If necessary, toxicity investigation evaluations have been indicated as successful identifiers of the constituents responsible for the toxicity. Rather than assuming that conventional stormwater runoff controls and BMPs are effective (for the continued operations) in controlling water quality use impairments in the receiving waters for stormwater runoff, site specific BMPs are developed to control real water quality use impairments to the maximum extent possible. Typically, these BMPs focus on source controls that manage and quantify the input of the chemicals of concern. In order to manage bioaccumulative chemicals, the focus is on determining whether excessive concentrations of these chemicals are found in the receiving water biota. Where significant receiving water use impairment occurs, the water body stakeholders work together to define, through forensic analyses (such as hydrologic fingerprinting), the sources of stressors responsible for the impairment to the maximum extent possible. The DOI also

believes that an approach to stormwater pollution control such as this furthers the purposes of the Clean Water Action Plan (Browner and Glickman 1998).

Section 4.3.1.4 Sediments, Sediment Quality, Page 4-62:
Are there any plans to examine the geochemistry and hydrologic characteristics of subsurface sediments obtained from the drilling of new wells (section 4.3.2)? In addition to the basic geochemistry needed for subsurface sediment composition, the core sediments would also be valuable in determining aquifer parameters. It would be useful to analyze the subsurface sediments for the same entities as the surface sediments, both for comparative and "background" purposes. Also, an understanding of subsurface-sediment physical properties would help determine the groundwater flow regimes in the area.

Section 4.3.1.4 Sediments, Sediment Quality, Pages 4-64 to 4-65, including Figure 4.3.1.4-2.- Plutonium Concentrations and Likely Sources:
In addition to the physical factors that affect the distribution of plutonium-contaminated sediment, the SWDEIS could include a discussion of the chemical (pH, clay, calcium carbonate, manganese, iron, and organic content) and biological (tree roots) factors discussed by Graf (1994) because these can also affect the distribution of radionuclides. Graf (1994; page 133) also reported that the maximum plutonium 239 and 240 concentration in sediments in 1988 of 35.5 pCi/g was found in Mortandad Canyon. Additionally, although the isotope ratio was not mentioned, Graf (1994; page 170) reported the highest plutonium concentrations of 0.017 pCi/g in sediment off-site were in the vicinity of Buckman, New Mexico, in a slough near the Santa Fe well field. The discussion and figure should be updated to include this information if it is current and correct. The upper limit background concentrations of plutonium 239 and 240 in stream sediments have been reported differently by several researchers: Purtymun et al. (1987) reported 0.023 pCi/g, Graf (1994) reported 0.0063 pCi/g, and the SWDEIS reported 0.003 pCi/g. The DOI recommends that an independent and credible entity be tasked with determining the baseline range of concentrations for radionuclides in canyon stream and Rio Grande sediment to resolve these differing results.

Section 4.3.1.5 Surface Water Quality, Page 4-67, ¶4:
Missing from the discussion of surface water quality impairment for on- and off-LANL sites are the parameters of mercury and gross alpha. Gross alpha was reported in the SWDEIS (Appendix C) above the New Mexico Water Quality Standard for Livestock Watering (NMWQCC 1995) in Ancho, Los Alamos, Mortandad, and Sandia Canyons, at perimeter locations, and to a lesser extent at regional locations. Mercury was also reported in the SWDEIS (Appendix C) above the New Mexico Water Quality Standard for Wildlife Habitat (NMWQCC 1995) in Cañada del Buey, Los Alamos, Mortandad, Pajarito, Sandia and Water Canyons, as well as at perimeter locations and to a lesser extent at regional locations. If these parameters were not considered, then the discussion of surface water quality impacts and statistics for exceedances (Figure 7.5.1.1-1 on page 7-14) should be revised to include information on mercury and gross alpha and evaluate any differences by each alternative for these parameters on a cumulative basis. Additionally, although the SWDEIS reported that

selenium frequently exceeded the New Mexico Water Quality Standard for Wildlife Habitat, only five incidences out of 109 analyses reported (<5%) were greater than the standard of 2 μg/L. Other researchers (Blake et al. 1995, Dale 1998, and unpublished data of the FWS) do not indicate a regionally elevated background condition for selenium. The discharge limit for selenium in NPDES-permitted outfalls is actually much higher, 5 μg/L. Also, please discuss any adverse impacts expected to aquatic invertebrate communities and other wildlife exposed to high explosives in the surface waters of Water, Beta, and Frijoles Canyons.

Section 4.3.2 Ground-Water Resources, Page 4-68:
The SWDEIS states that "the nature and extent of ground-water bodies in this region have not been fully characterized." The interacting elements and components of the ground-water system, i.e., effluent discharges, recharge, and springs in the LANL area can only be addressed using a site-specific ground-water flow model for area. Because of the extent and nature of the DOE/LANL ground-water supply system and potential contamination, does the proposed hydrogeologic work plan (see LANL, 1996c) include such a model to better understand the ground-water system and local hydrologic budgets?

Section 4.3.2 Groundwater Resources, Page 4-70, ¶5
Springs are an important resource to unique species of wildlife and in times of drought provide refugia for many aquatic and semi-aquatic species. A unique species of clam has been identified in the Water Canyon watershed indicating a communication with other streams in the past. Please cite or describe the geologic and hydrological evidence that supports the determination that springs in Pajarito and Water Canyons are associated with LANL NPDES-permitted discharges.

Section 4.3.2.3 Transport of Radionuclides and Chemicals, Page 4-78, ¶3 :
Are there other types of wells in addition to monitoring wells under consideration? For example, a mix of pumping wells (for drawdown tests), monitoring wells (for water quality studies), and piezometers (for head measurements) are needed to accomplish some of the tasks stated in the text.

Section 4.4.3 Radiological Air Quality, Page 4-90, ¶2:
What is the source of the radon gas data? Is radon currently being monitored? Was radon 222 the only isotope measured or were other radon isotopes also measured? A description of the radon monitoring sites, procedures, mrem conversion assumptions, and a table of the data are needed in this Section. A natural background of 200 mrem per year should be more prominently discussed and related to any additional radiation from the LANL.

Section 4.5.3.1 Background on Contamination at LANL, Surface Water, Page 4-124:
We do not believe, for the reasons listed above, that the effects on water resources receiving effluents from outfalls and stormwater events were sufficiently analyzed to support the conclusions in this section. In particular, only 2 years of data from NPDES-permitted discharges *from point sources* were reviewed for this SWDEIS and conclusions were based on

a 1996 summary; stormwater effluent quality and the cumulative impacts of organic chemicals to stream sediments across the LANL were not sufficiently evaluated. Mercury and uranium were released from a waste site in Los Alamos Canyon (NMED 1996). The AIP Group also noted that there was a lack of adequate studies or data regarding radioactive and hazardous chemicals leaving the LANL during snowmelt and storm water runoff events (NMED 1996).

Section 5.2.3.1 Surface Water Impacts, Page 5-40:
The cumulative impact of the increases in the quantity of water discharged to Los Alamos and Sandia Canyons was not evaluated for the physical and biological quality of these stream corridors. The following assessment was largely taken from USDA 1998. Either individually or in combination, disturbances place stresses on the stream corridor that have the potential to alter its structure and impair its ability to perform key ecological functions. A disturbance occurring within or adjacent to a corridor typically produces a causal chain of effects, which may permanently alter one or more characteristics of a stable system. Cumulative changes in land or stream corridor use induce changes in geomorphology and hydrology that cause changes in stream hydraulics, can induce changes in function, such as sediment transport and storage, and can result in changes to wildlife populations, such as composition and distribution, as well as cause eutrophication and lower water tables. Physical disturbance effects occur at any scale from landscape and stream corridor to stream and reach where they can cause impacts locally or at locations far removed from the site of origin.

Activities such as road building and maintenance as well as urban encroachment can have dramatic effects on the geomorphology and hydrology of a watershed and the stream corridor morphology within it. By altering the structure of upslope plant communities and soils, these and other activities can affect the infiltration and movement of water, thereby altering the timing and magnitude of runoff events. The modification of stream hydraulics, for example, by adding 27.7 million gallons per year (MGY) proposed by the SWDEIS, may directly affect the system, causing an increase in the intensity of disturbances caused by floods. Additional discharges of 28 MGY may not seem to have a significant impact given natural floods, but the proposed action does not occur in isolation; these canyons are also being urbanized. In some regions of the country, armoring as little as 10 percent of a watershed with impervious cover has been linked to stream degradation (Schueler 1995). The peak discharge associated with the bankfull flow (i.e., the 1.5- to 2-year return storm) increases sharply in magnitude in developed watersheds. In addition, channels experience more bank-full flood events each year and are exposed to critical erosive velocities for longer intervals (Hollis 1975, MacRae 1996, Booth et al. 1997). Since impervious cover prevents rainfall from infiltrating into the soil, less flow is available to recharge ground water. Consequently, during droughts, base flows would likely be reduced in these canyons as has been found for urban streams (Simmons and Reynolds 1982).

The hydrological regime that had defined the geometry of the pre-development and pre-discharge stream channel irreversibly changes toward higher flow rates on a more frequent basis. The higher flow events of urban streams are capable of performing more

"effective work" in moving sediment than they had done before (Wolman 1964). The customary response of affected streams is to increase their cross-sectional area to accommodate the higher flows. This is done by streambed down cutting or streambanks widening, or a combination of both. The DOI has already observed this phenomenon in Sandia Canyon. Stream channels often enlarge their cross-sectional areas by a factor of 2 to 5, depending on the degree of impervious cover in the upland watershed and the age of development (Arnold et al. 1982, Gregory et al. 1992, and MacRae 1996). Stream channels react to urbanization not only by adjusting their widths and depths, but also by changing their gradients and meanders (Riley, 1998).

The wetted perimeter of a stream is the proportion of the total cross-sectional area of the channel that is covered by flowing water during dry-weather periods. It is an important indicator of habitat degradation in developed watersheds and streams. Given that developed watersheds with their resultant streams becoming a larger channel cross section at the same time that their baseflow rates decline, it necessarily follows that the wetted perimeter will become smaller. Thus, for many urban streams, this results in a very shallow low-flow channel that wanders across a very wide streambed, often changing its lateral position in response to storms.

The prodigious rate of channel erosion in urban streams, coupled with sediment erosion from active construction sites, increases sediment discharge to urbanized watershed and streams. Researchers have documented that channel erosion constitutes as much as 75 percent the total sediment budget of urban streams (Crawford and Lenat 1989, Trimble 1997). Urban streams also tend to have a higher sediment discharge than nonurban streams, at least during the initial period of active channel enlargement. During this period, depending on the location of the discharge in relation to potential release sites, contaminated soils and sediments near the stream will be washed downstream to the Rio Grande. The water quality of such streams during storm events would likely be consistently poor. Storm water runoff would likely contain increased loads and concentrations of sediment, carbon, nutrients, trace metals, hydrocarbons, chlorides, and bacteria (Schueler 1987). On the Pajarito Plateau, canyon drainages from the LANL may also contain radionuclides. Although considerable debate exists as to whether storm water pollutant concentrations are actually toxic to aquatic organisms, researchers agree that pollutants deposited in streambeds exert undesirable impacts on stream communities (USDA 1998).

It is likely that the canyon streams that are most urbanized and have additional discharges added to them will eventually be scored as having poor stream habitat quality, regardless of the specific metric or method employed. Habitat degradation is often exemplified by loss of pool and riffle structure, embedding of streambed sediments, shallow depths of flow, eroding and unstable banks, frequent streambed turnover, and loss of riparian vegetation. Even when riparian buffer strips are reserved, encroachment often reduces their effective width and native species are supplanted by exotic, weedy, or nuisance plants. Poor riparian cover can increase mean summer stream temperatures and since temperature plays an important role in the rate

and timing of biotic and abiotic reactions in a stream, such increases can have adverse impacts. Some of these conditions may already be beginning to manifest themselves in upper portion of Sandia Canyon.

The cumulative physical impacts to the watersheds and their stream corridors, including Los Alamos and Sandia Canyons, should be evaluated including past, present, and foreseeable future (e.g., land transfer-induced development and other planned development) actions. These actions, considered cumulatively, would significantly modify the waters of Los Alamos and Sandia Canyons. Under the Fish and Wildlife Coordination Act (FWCA; 16 U.S.C. §§661-666c) all federal agencies and federal permittees must consult with the FWS and the head of the New Mexico Department of Game and Fish before such action to prevent the loss or damage to wildlife resources. The purpose of the FWCA is to provide that wildlife conservation shall receive equal consideration and be coordinated with other features of water-resource development programs through effectual and harmonious planning, development, maintenance and coordination of wildlife conservation and rehabilitation. This process is not intended to be separate from NEPA and should be enacted before the Final Statement, or a supplemental EIS should be prepared upon its completion and in conjunction with the completion of the land transfer EIS. The FWCA should also be added to the SWDEIS section 7.2. Federal agencies shall, to the fullest extent possible, interpret and administer the policies, regulations and public laws and use all practicable means to restore and enhance the quality of the human environment and avoid or minimize any possible adverse effects of their actions upon the quality of the human environment.

GEOLOGICAL PROCESSES

Section 4.2.2.1 Volcanism, Page 4-28, ¶2:

Because the existence of a magma source implies the potential for future eruptions, recent information should be included on the existence of a low velocity zone beneath the Valles Caldera, which is probably a lens-shaped body of partially molten magma at a depth of 10-13 km (Roberts, Aki, and Fehler 1991, JGR vol. 96 no. B13, pp. 21,583-21,596). Information on the thermal activity or high heat flow within the caldera, supporting a heat source at depth, should also be included. Recent identification of post -50 to -60 ka volcanism in the region also bears significantly on reinterpretation of the volcanic hazard. Additional instrumentation to monitor the Valles Caldera region is critical.

The statement, "However it is also possible that seismic signals are partially absorbed deep in the subsurface due to elevated temperature and high heat flow," is not rigorously correct. Which waves are being defined as "seismic signals?" Elevated temperatures in the upper crust do not result in seismic signals being "absorbed." In areas of elevated crustal temperatures and high heat flow, the brittle crust is relatively thin. Because the strain needed to produce the energy for slip on faults correlates to the thickness of the brittle crust, faulting in the thinner brittle crust is somewhat reduced.

Section 4.2.2.2 Seismic Activity, Page 4-28, ¶5:
The statements, "Estimates of the most recent movements along the faults are based on trench studies where the faults are not buried. Therefore, it is possible that the most recent movements along the faults are younger than those presented in Table 4.2.2.2-1," need further clarification. The "recent movements" only applies to earthquakes large enough to leave a clear geological record at the surface. In the Western U.S., the threshold for such quakes is quite high (about M=6-6.5), based on historical data. Therefore, a great number of "recent movements" could be missing from the Table.

Section 4.2.2.2 Seismic Activity, Page 4-30, ¶1:
"Geological mapping and fault trenching studies" are nearly concluded and some useful information was presented at the 1998 Seismological Society of America National Meeting in Boulder, Colorado (McAlpin 1998). The phrase "may need to be addressed" in the statement, "Location of active faults also may need to be addressed as part of facility siting decisions," should be changed to "must be addressed."

Section 4.2.2.2 Seismic Activity, Page 4-30, ¶2:
The statement, "A historical catalog has been compiled of earthquakes of estimated Richter magnitude greater than zero that have occurred in the LANL area from 1873-1991 (Wong et al., 1995)," is misleading. Historical records could not possibly detect earthquakes in the M=0 range; this is only possible using sensitive modern seismographs in areas that have limited cultural noise. The current seismic network at LANL may be able to detect M=0 range events, but the magnitude detection threshold in the past in northern New Mexico was probably in the M=3-4 range at best.

Section 4.2.2.2 Seismic Activity, Page 4-30, ¶3:
The report indicates that Richter magnitude and peak ground acceleration (Table 4.2.2.2-2) can provide "a frame of reference that is important in understanding earthquakes and the impacts of earthquakes on structures." Peak ground acceleration is not the only parameter to use in relating ground motion to structural damage. Earthquake damage to structures can also depend on the duration of shaking and frequency content of earthquake waves. Different structures respond uniquely to each of these types of ground motion.

Section 4.2.2.2 Seismic Activity, Page 4-30, ¶4:
What is the source of these data on recurrence intervals? What are the recurrence intervals for the other fault systems in Table 4.2.2.2-1?

Section 4.2.2.3 Slope Stability, Subsidence, and Soil Liquefaction, Page 4-32, ¶2:
Hazards from debris flows (fast-moving mixtures of water, sediment, and entrained debris) should be included in this discussion. In recent years, major forest fires in northern New Mexico have denuded slopes, which could now generate debris flows. Facilities in canyon bottoms (such as the Omega West reactor) could be exposed to debris-flow hazards under

certain conditions. Facilities that could be threatened by debris flows should be identified in the Final Statement.

Section 4.2.2.3 Slope Stability, Subsidence, and Soil Liquefaction, Page 4-32, ¶3:
The U.S. Geological Survey (USGS) has recently completed a 1:100,000 landslide map for the region (Los Alamos Sheet), including all of the LANL facility. This document should form the regional basis upon which site-stability studies could be conducted for significant expansion of LANL infrastructure or activities.

PROJECT SPECIFIC SITING AND CONSTRUCTION ANALYSES

Volume II, Section 1.2.1.1 Location Description, Page 1-9:
Please describe the cumulative loss of habitat on a watershed and vegetative community basis. Please identify any animals that might potentially use the tuff as habitat in this region. Describe any direct, indirect, or cumulative impacts to burrowing biota that might be exposed to the volatile organic carbon plume.

Volume II, Section 1.2.2.2 Development, Page 1-11:
The DOI is concerned about the ponding of waters in the disposal cells that may provide a pathway of exposure to small mammals and birds. Biggs et al. (1997) found that rodents were accessing open pits and tritium shafts. Concentrations of radionuclides on the pelts of rodents from open active pits were ~30 times higher than those concentrations in rodent pelts from control sites. Please describe the fencing used, its mesh size, and the probability that small mammals and migratory birds are prevented access to these sites. Please describe the direct, indirect, and cumulative effects to biota that may access these disposal pits. We recommend that domes be considered that might reduce animal access to these disposal pits.

Volume II, Section 1.2.3.2 Development, Page 1-13, ¶1:
Birds of prey (eagles, hawks, and owls) frequently use powerlines and support structures for perching and nesting. Raptors can be electrocuted while using powerlines, thus contributing to the cumulative mortality factors affecting these biologically important and environmentally sensitive birds. Electric distribution lines carrying voltages of 12kV to 69kV present the greatest threat of electrocution, particularly in areas supporting high concentrations and diversity of raptors, i.e., southwest region of the United States. Standard techniques have been developed to prevent raptor electrocutions at electric distribution lines. General powerline construction recommendations the DOI supports for eliminating raptor electrocutions are found in the publication Suggested Practices for Raptor Protection on Power Lines - The State of the Art in 1996 by the Avian Power Line Interaction Committee. The document may be requested from the Raptor Research Foundation at 12805 St. Croix Trail, Hastings, Minnesota 55033, phone (612) 437-4359 or JMFITZPTRK@aol.com.

Section 7.2 Laws, Regulations and Executive Orders Related to Environmental Planning and Consultation, Page 7-4:
Please describe how the DOE will comply with Executive Order 12962 of June 7, 1995: Recreation Fisheries. Please include this Executive Order in this section as well as the Migratory Bird Treaty Act (16 U.S.C §§703-712).

APPENDIX A
A potentiometric map for the main aquifer in the LANL area is needed to determine flow directions. A water table contour map for shallow aquifers is also needed.

SUMMARY COMMENTS

This SWDEIS represents a considerable effort and contains much valuable information useful for making natural resources-based decisions in and around the LANL area. However, there are also some deficiencies which the DOI views as significant, especially including those pertaining to: 1) calculation of contaminant-related risks to the southwest willow flycatcher; 2) the use qualitative risk assessment models used to calculate contaminant-related risks to wildlife; 3) the effect(s) of the proposed transfer of LANL property upon the impact analyses contained in the SWDEIS; 4) how NPDES-permitted wastewater outfalls throughout the LANL facility will be consolidated; and 5) incomplete treatment of the significance and effects of natural processes such as potential earthquakes, volcanism, and erosion. These deficiencies should be addressed and resolved in the Final Statement.

Thank you for the opportunity to review the subject SWDEIS. We trust the above comments will be of use during development of the Final Statement. If you have question about any of the above comments or need additional information, please feel free to contact us at the above address or telephone (505) 766-3565.

Sincerely,

Glenn B. Sekavec
Regional Environmental Officer

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