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DOE/EIS-0111F

United States Department of Energy

Final Environmental Impact Statement

REMEDIAL ACTIONS AT THE FORMER VANADIUM CORPORATION OF AMERICA URANIUM MILL SITE DURANGO, LA PLATA COUNTY, COLORADO

VOLUME I - TEXT

OCTOBER, 1985

Uranium Mill Tailings Remedial Action Project UMTRA

Department of Energy
Albuquerque Operations Office
P. O. Box 5400
Albuquerque, New Mexico 87115

NOV 1 1985

Dear Friend:

Enclosed is a copy of the Department of Energy (DOE-0111F) final Environmental Impact Statement, Remedial Actions at the Former Vanadium Corporation of America Mill Site, Durango, La Plata County, Colorado (DOE/EIS, October, 1985).

In November, 1978, Congress enacted Public Law 95-604, the "Uranium Mill Tailings Radiation Control Act of 1978." The Act authorizes the DOE to enter into cooperative agreements with the affected states and Indian tribes in order to establish remedial action programs at inactive uranium mill tailings sites. The Act stipulates that the DOE will meet the applicable standards promulgated by the Environmental Protection Agency. It further states that the Nuclear Regulatory Commission (NRC) is to concur in all major decisions and to license the maintenance and monitoring of the final disposal sites.

Twenty-two sites including Durango, Colorado, have been designated as eligible for remedial action. A cooperative agreement covering the guidelines, responsibilities and conditions for remedial actions at Durango and other Colorado sites was signed by Colorado and the DOE, was concurred in by the NRC, and became effective on January 30, 1981.

The final statement has been prepared in compliance with the National Environmental Policy Act of 1969 to assess the environmental impacts of a proposed DOE action to reduce the radiation levels existing at the Durango site. DOE's preferred alternative, as identified in the final EIS, is to decontaminate the Durango site and dispose of the material at a site in Bodo Canyon.

Copies of the final EIS are being provided to agencies, organizations, and persons who commented on the draft or who requested a copy of the final statement. A Record of Decision will be issued not less than 30 days after availability of the final EIS is announced in the Federal Register.

Sincerely,

John E. Themelis

John Themelis, Manager
Uranium Mill Tailings Project Office

Enclosure

Cover Sheet

Final Environmental Impact Statement

Remedial Actions at the

Former Vanadium Corporation of America Uranium Mill Site

Durango, La Plata County

Colorado

(a) Lead Agency: U.S. Department of Energy (DOE)
Cooperating Agency: U.S. Nuclear Regulatory Commission (NRC)

(b) Proposed Action: Remedial action at the Durango, Colorado, site under the Uranium Mill Tailings Radiation Control Act of 1978. The preferred alternative is relocation of the radioactively-contaminated material from a site in Durango, Colorado, to a site in Bodo Canyon.

(c) For Further Information Contact: (1) Mr. John G. Themelis, Project Manager, Uranium Mill Tailings Remedial Action Project Office, U.S. Department of Energy, Albuquerque Operations Office, 5301 Central Avenue, NE, Suite 1700, Albuquerque, New Mexico 87108, Ph: (505) 844-3941; (2) Dr. Robert J. Stern, Director, Office of Environmental Compliance, U.S. Department of Energy, Office of the Assistant Secretary for Environment, Safety, and Health, Room 3G-092, Forrestal Building, 1000 Independence Avenue SW, Washington, D.C. 20585, Ph: (202) 252-4600; (3) Mr. Henry Garson Esq., Assistant General Counsel for Environment, U.S. Department of Energy, Room 6A-113, Forrestal Building, 1000 Independence Avenue SW, Washington, D.C. 20585, Ph: (202) 252-6947.

For Copies of the FEIS, Contact: Project Manager at the above address.

(d) Designation: Final EIS (FEIS).

(e) Abstract: This statement evaluates the environmental impacts associated with the remedial actions for the residual radioactive materials remaining at the inactive uranium processing site located in Durango, La Plata County, Colorado. The site is a 126-acre tract of privately owned land which contains approximately 1.6 million cubic yards of contaminated materials including 1.2 million cubic yards of uranium and vanadium tailings. The tailings were produced by the former United States Vanadium Corporation from 1943 to 1946 and by the Vanadium Corporation of America from 1949 to 1963. Vanadium tailings and uranium ore were processed and sold to the U.S. Atomic Energy Commission until the mill was closed in 1963.

Five alternatives are considered in this statement. These alternatives are (1) no action, (2) stabilize the contaminated materials on the Durango site, (3) transport the contaminated materials by either truck or conveyor to the Bodo Canyon site for disposal and decontaminate the Durango site, (4) transport the contaminated materials to the Long Hollow site for dispos-

al and decontaminate the Durango site, and (5) transport, reprocess, and dispose of the tailings at the Long Hollow site and decontaminate the Durango site. Alternative 3 is the DOE's preferred alternative.

All of the action alternatives are designed to meet the requirements of the EPA standards (40 CFR Part 192). An assessment of the impacts of these five alternatives was made in terms of effects on radiation levels, air quality, soils and mineral resources, surface- and ground-water resources, vegetation and wildlife, population and employment, economic structures, and transportation networks. The impacts of the five alternatives are summarized and compared in Table 1.3 and discussed in more detail in Section 5.0.

The major impact of Alternative 1, no action, would be the continued presence of the tailings piles adjacent to the southwestern city limits of Durango. Radiation levels and radon fluxes and concentrations would remain above the EPA standards on and near the site. The general population living out to 80 kilometers (50 miles) during any 100-year period would receive excess bronchial doses expected to cause 1.32 excess lung cancer deaths over the 100-year period. Impacts would continue at this rate for tens of thousands of years.

These projections for the no-action alternative are based on the current conditions of the tailings piles, including vegetation cover and irrigation. However, without remedial action, the DOE cannot assure that the tailings would not be dispersed by wind or water. Without permanent stabilization, tailings disposal or unauthorized removal could occur, and the resulting health effects (cancer deaths) could be considerably higher than those described in this EIS for the no action alternative.

Alternatives 2, 3, 4, and 5 are designed to meet the EPA standards. The radon flux standard of 20 picocuries per square meter per second would be met by covering the contaminated materials with five feet of clay soils (six feet for Alternative 5) so that by the time radon gas has diffused through it, most of it would have decayed into solid daughter products that would move no further. The longevity of the cover in Alternatives 2, 3, 4, and 5 would be ensured by armoring its surface with coarse granular materials to minimize wind and water erosion. Alternative 2 would involve a commitment to a substantial level of ongoing maintenance to achieve the project's 1000-year design life.

Following any of the action alternatives, the projected level of excess lung cancer deaths due to the stabilized tailings would be approximately 0.01 per hundred-year period (more than a 100-fold reduction over no action). The estimated additional impacts due to conducting any remedial action would be smaller than the impacts of five years of no action.

In Alternatives 1 and 2, contaminated ground water beneath the tailings piles at the Durango site would continue to migrate to the Animas River. In Alternatives 3 and 4, a clay liner would reduce seepage at the alternate site and by sorption, retard movement of radium and other contaminants. In Alternative 5, a clay and synthetic liner system would retard seepage of contaminated water out of the stabilized tailings. In Alternatives 3, 4, and 5, the contaminated ground water at the Durango site would be diluted to background levels by mixing with clean ground water and by seepage into the Animas River.

Among the nonradiological impacts, the most important would be the impacts on the transportation corridor between the Durango site and the Bodo Canyon borrow area (Alternative 2) and between the Durango site and the Bodo Canyon site (Alternative 3) or the Long Hollow site (Alternatives 4 and 5). The work required for the action alternatives is very much like any moderate, short-term earthmoving project. There would be typical construction noises, dust, and additional traffic. The remedial action work for the four action alternatives would have a low to moderate, short-term impact on the economy and social infrastructure of Durango or La Plata County. Plans are being developed to mitigate projected impacts to wildlife and to several archaeological sites eligible for listing on the National Register of Historic Places.

Under Alternative 5, the tailings would be reprocessed at the Long Hollow site. The tailings were purchased by private industry in 1977 for the express purpose of reprocessing the tailings to recover the mineral resources remaining in the tailings. However, these plans to reprocess the tailings were made under market conditions that were much more favorable than presently exist.

(f) This FEIS contains several changes from the Draft Environmental Impact Statement (DEIS) issued by the DOE in October, 1984. These changes include the following:

- Addition of Section 6.0 which contains summaries of all public comments, the DOE's responses, and photocopies of public comments.

- Inclusion of a new transportation mode as an option with Alternative 3, stabilization of the contaminated materials at Bodo Canyon. Alternative 3a uses truck transportation and Alternative 3b addresses conveyor transportation (see Sections 1.3.3, 3.2.4, and the Addendum to Appendix A).

- Identification of Alternative 3 as the DOE's preferred alternative. In the DEIS, Alternative 5 was preferred; however, since the DEIS was issued, the owner of the tailings has determined that reprocessing would not be economically viable.

- Revision of the projections of cancer health effects (Section 5.2) which would be attributed to the remedial action. Estimated doses have not been changed; however, based on a reevaluation of risk factors, a different (more conservative) health-effect conversion factor has been used (see Section 6.10.2).

- Inclusion of new data and evaluation regarding ground-water impacts in Sections 5.6.2, 6.4.2, 6.5.2, 6.6.2, 6.7.2, 6.8.2, and in the Addendum to Appendix F.

- Inclusion of a new analysis of air pollution dispersion in the Addendum to Appendix D.

- Addition of Appendix L containing a draft wildlife mitigation plan.

- Addition of Appendix M presenting a new seismic evaluation of the Durango Area.

- Inclusion of Appendix N containing additional tourism data and evaluation of the potential impacts to Durango's tourism industry.

- Addition of Appendix O, summarizing the permits and licenses which would be required for the remedial action.

- Reevaluation of engineering design alternatives for stabilization in place and transporting the tailings to the Bodo Canyon alternate disposal site in Sections 6.3, 6.4.1, and 6.5.1.

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Final Environmental Impact Statement

REMEDIAL ACTIONS AT THE FORMER VANADIUM CORPORATION OF AMERICA URANIUM MILL SITE DURANGO, LA PLATA COUNTY COLORADO

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OCTOBER, 1985

U.S. DEPARTMENT OF ENERGY

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1.0 SUMMARY

1.1 PROJECT BACKGROUND

The Durango site is a 126-acre property just southwest of the city limits of Durango, La Plata County, in southwest Colorado (Figure 1.1). The site is owned by Hecla Mining Company.

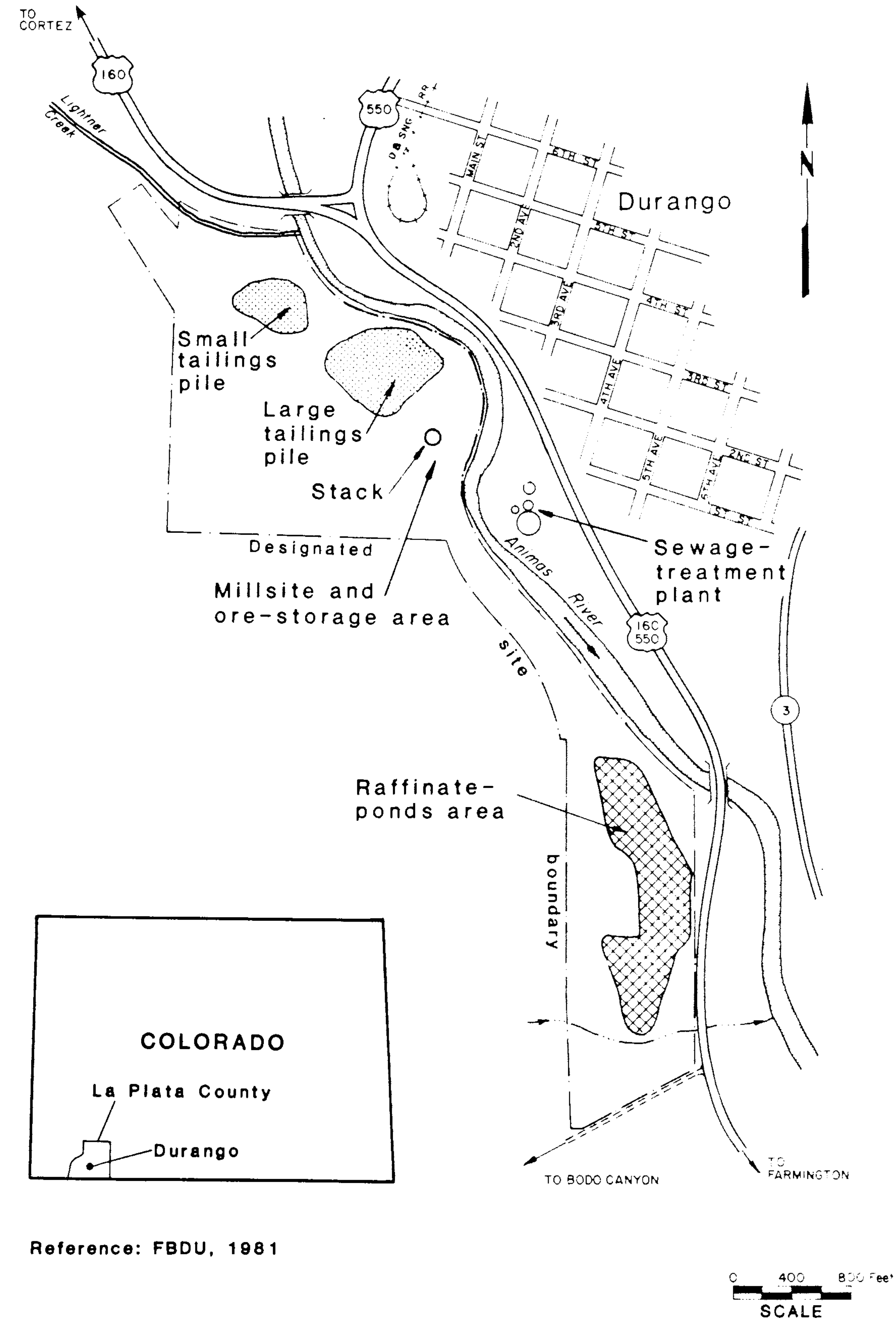
In general, the site is bordered on the east by the Animas River near the tailings piles and by U.S. Highways 160 and 550 near the raffinate ponds area, on the north by Lightner Creek, and on the southwest by Smelter Mountain.

The former mill was built in 1942 on the site of an old lead smelter by the United States Vanadium Corporation (USV), a corporation established by the Federal government for the purchase of strategic materials needed during World War II (FBDU, 1981). In 1943, USV began reprocessing vanadium tailings for the recovery of uranium for sale to the Manhattan Project and operated the mill until 1946 when the mill was shut down. In 1949, the Vanadium Corporation of America (VCA) leased and subsequently purchased the site. VCA operated the mill and sold uranium to the U.S. Atomic Energy Commission (AEC) until March, 1963, when the mill was shut down permanently. The site was purchased by Ranchers Exploration and Development Corporation in 1977, which was subsequently acquired by Hecla Mining Company in 1984.

The Durango site includes two tailings piles against the side of Smelter Mountain resulting from the USV and VCA milling activities. The larger pile contains about 1,230,000 tons, covers 14 acres, and is about 230 feet high. The smaller pile contains about 325,000 tons, covers seven acres, and is about 90 feet high. Other contaminated materials are present on the mill site, ore storage area, and raffinate ponds area. In addition to the on-site contamination, 137 off-site properties in the vicinity may be contaminated by tailings that have been windblown or otherwise removed from the Durango site.

In 1978, Congress passed Public Law 95-604, the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), expressly finding that uranium mill tailings may pose a potential health hazard to the public. The Environmental Protection Agency (EPA) was charged with the responsibility for promulgating radiological and nonradiological standards for remedial action at inactive uranium milling sites. The final standards for inactive milling sites were promulgated by the EPA, effective in March, 1983. The U.S. Department of Energy (DOE) was authorized to enter into cooperative agreements with affected states or Indian tribal governments to perform remedial actions to bring the radiation levels at sites under their jurisdiction within the EPA standards. The Nuclear Regulatory Commission (NRC) is to concur in the selection and performance of the remedial actions, and at the conclusion of the remedial actions, will issue licenses for long-term surveillance and maintenance of the disposal sites.

On November 8, 1979, the DOE designated the Durango site as eligible for remedial action under UMTRCA. The DOE and the State of Colorado en-



Reference: FBDU, 1981

FIGURE 1.1 GENERAL DURANGO SITE AREA

tered into an agreement in 1981 to perform remedial action at this site and other sites in Colorado.

In 1980, the State of Colorado identified nine potential off-site disposal areas for consideration if the Durango site were to be cleaned up and contaminated materials moved elsewhere. Colorado recommended four areas for further evaluation by the DOE, all of which are in La Plata County (Figure 1.2). Subsequently, on the basis of additional information, the Rabbit Mountain site was eliminated from further consideration. The DOE made an independent evaluation of the three remaining sites, picked the Bodo Canyon and Long Hollow sites as the best alternatives to on-site disposal, and eliminated the Pine Ridge site with the concurrence of the State of Colorado (Appendix C, in the DEIS, Alternatives That Were Considered But Rejected). The Bodo Canyon site is on the opposite side of Smelter Mountain from Durango, about 1.5 air miles southwest of the Durango site, and is owned by the State of Colorado. The Long Hollow area is eight air miles southwest of the Durango site and is privately owned.

1.2 DATA COLLECTION

Following the DOE's selection of Bodo Canyon and Long Hollow as alternate disposal sites for the Durango tailings and other contaminated materials, it was necessary to gather information on each of the sites. This task included the review of readily available existing published and unpublished information and collecting new site-specific data. Compilation of the existing information was accomplished by researching government, public, and private sources, by contacting governmental agencies, and by site reconnaissance.

The literature review, governmental agency contact, and site visits led directly to the planning and initiation of the field and laboratory programs to collect the necessary additional information for each site. The types of information collected range from observations of wildlife species inhabiting the alternate sites to the determination of concentrations of radioactive elements in ground water. The appendices published in the DEIS and in this FEIS present the programs used by each of the technical disciplines to conduct these studies, which include geotechnical engineering, geology, surface- and ground-water hydrology, meteorology and air quality, soils, ecology, radiology, socioeconomics, land use, and cultural resources.

1.3 DESCRIPTION OF ALTERNATIVES

During the same period of time that baseline information was being collected, various conceptual engineering designs were evaluated to determine the feasibility of stabilizing or of reprocessing and stabilizing the contaminated materials at each of the alternate sites. All of the action alternatives were designed to meet the EPA standards (40 CFR Part 192) and thereby reduce the potential health hazard by stabilizing the radioactively contaminated materials located at the Durango site and at off-site vicinity properties.

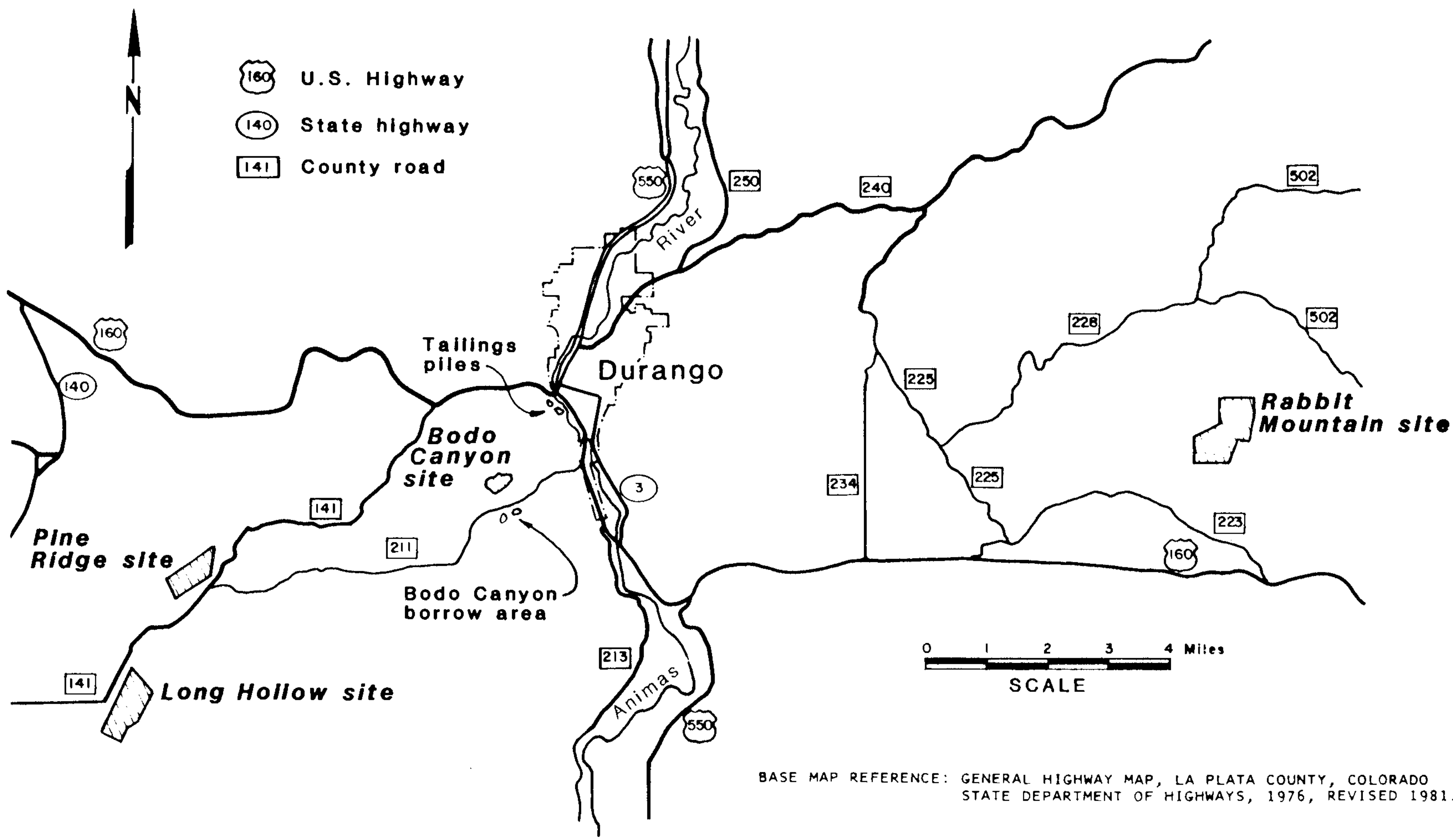


FIGURE 1.2 LOCATIONS OF STATE-NOMINATED AREAS RECOMMENDED FOR FURTHER EVALUATION BY THE DOE

Five alternatives have been identified for the remedial action at the Durango site. They are the following:

1. No action.

2. Stabilization of all contaminated materials on the Durango site.

3. Decontamination of the Durango site and stabilization of all contaminated materials at a site in Bodo Canyon (the preferred alternative).

4. Decontamination of the Durango site and stabilization of all contaminated materials at a site in Long Hollow.

5. Decontamination of the Durango site and reprocessing and stabilization of the contaminated materials at the Long Hollow site.

The specific actions associated with each alternative are summarized in Table 1.1. The estimated volumes of materials, manpower, duration, and costs for each alternative are listed in Table 1.2.

Several conceivable types of alternatives are not considered in this document since the DOE determined that they would not be reasonable alternatives. These include stabilization at other state-nominated locations and transportation of the contaminated materials by aerial tram and slurry pipeline. These alternatives were determined to be unreasonable because of high environmental and economic impacts (see Appendix C, Alternatives That Were Considered But Rejected, and Section 3.2.7 in this FEIS).

1.3.1 Alternative 1 - no action

This alternative would consist of performing no remedial action, thereby allowing the present conditions at the Durango site to continue. The analysis of the impacts of the no-action alternative assumes that the present partial cover and vegetation are maintained on the tailings piles (requiring continued irrigation and fertilization) and that the piles remain structurally intact. Although the impacts assessed in the EIS are based on the current conditions of the piles, there is no assurance that the current level of maintenance would continue under the no action alternative. Without permanent stabilization, the tailings may be dispersed by water, wind, or by human misuse.

1.3.2 Alternative 2 - stabilization on the Durango site

In this alternative, all on-site tailings and other contaminated materials plus those relocated from the off-site vicinity properties would be stabilized above grade on a 38-acre area at the north end of the Durango site, which would be acquired from Hecla Mining Company by the State of Colorado. All tailings and other contaminated materials would be recontoured into one continuous smoothly contoured pile against Smelter Mountain. The tailings and other contaminated materials would be covered by a five-foot-thick layer of compacted clay that would reduce the release

Table 1.1 Summary of specific actions associated with the alternatives

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Alternative 1 - No action:

1. No remedial action would be taken.

Alternative 2 - Stabilization on the Durango site:

1. Acquisition of private property (the Durango site).
2. Installation of temporary fencing, gates, signs, and other security measures at the Durango site.
3. Demolition of structures on the site, including the smelter stack.
4. Construction of on-site haul roads; widening and improving County Road 211 from the on-site haul road to the borrow area in Bodo Canyon.
5. Excavation and relocation of contaminated materials from the raffinate ponds area and off-site locations to the stabilization area.
6. Construction of diversion ditches above the tailings piles.
7. Flattening and recontouring of the slopes of the tailings piles.
8. Placement of stabilization cover over the tailings and contaminated materials.
9. Grading of stream banks on Lightner Creek and the Animas River and construction of a grouted riprap erosion barrier along stream banks.
10. Restoration of areas excavated to remove contaminated materials on and off the Durango site by backfilling with imported soils and recontouring.
11. Recontouring of the Bodo Canyon borrow area.
12. Revegetation of backfilled and recontoured areas on and off the Durango site and the recontoured slopes at the Bodo Canyon borrow area.
13. Installation of a permanent access barrier consisting of three-foot-high concrete posts connected by steel cable with gates, signs, and the like, at the Durango site.
14. Release of the remainder of the Durango site for unrestricted use.

Alternative 3a - Stabilization at the Bodo Canyon site by truck transport:[b]

1. Acquisition of private land (Durango site) and state land (Bodo Canyon site).

Table 1.1 Summary of specific actions associated with the alternatives[a] (Continued)

Alternative 3a - Stabilization at the Bodo Canyon site by truck transport:[b] (Continued)

2. Installation of temporary security fences, gates, and signs at both sites.

3. Construction of on-site haul roads at the Durango and Bodo Canyon sites; widening and improving County Roads 211 and 212 between the two sites.

4. Construction of diversion ditches upslope from the stabilization area at the Bodo Canyon site, construction of erosion protection for arroyo head cutting, topslopes and sideslopes of existing drainage channel, and new diversion ditches.

5. Stripping and stockpiling of topsoil at the Bodo Canyon site and at the Bodo Canyon borrow area for restoration of disturbed areas.

6. Construction of four tailings retention embankments at the Bodo Canyon site.

7. Construction of a clay liner over the interior of the Bodo Canyon site.

8. Demolition or decontamination of structures on the Durango site, including the smelter stack.

9. Relocation of contaminated materials from the Durango site to the Bodo Canyon site.

10. Placement of a stabilization cover over the disposal area and erosion-protection covers over the disposal area and downstream faces of the embankments.

11. Restoration of areas excavated to remove contaminated materials at the Durango site by backfilling with imported soils, recontouring, and revegetating.

12. Backfilling and recontouring excavated areas adjacent to Smelter Mountain to provide slope stability.

13. Release of the Durango site for unrestricted use.

14. Recontouring of the Bodo Canyon borrow area.

15. Revegetation of recontoured slopes at the Bodo Canyon borrow area.

16. Installation of a permanent access barrier consisting of three-foot-high concrete posts connected by steel cable with gates, signs, and the like, at the Bodo Canyon site.

Table 1.1 Summary of specific actions associated with the alternatives[a] (Continued)

Alternative 3b - Stabilization at the Bodo Canyon site by conveyor transport:[b]

1. Acquisition of private land (Durango site) and state land (Bodo Canyon site).

2. Installation of temporary security fences, gates, and signs at both sites.

3. Construction of on-site haul roads at the Durango and Bodo Canyon sites; improving County Roads 211 and 212 between the two sites.

4. Construction of approximately 14,300 feet of pipe conveyor and maintenance road for the conveyor.

5. Construction of diversion ditches upslope from the stabilization area at the Bodo Canyon site; construction of erosion protection for arroyo head cutting, topslopes and sideslopes of existing drainage channel, and new diversion ditches.

6. Stripping and stockpiling of topsoil at the Bodo Canyon site and at the Bodo Canyon borrow area for restoration of disturbed areas.

7. Construction of four tailings retention embankments at the Bodo Canyon site.

8. Construction of a clay liner over the interior of the Bodo Canyon site.

9. Demolition or decontamination of structures on the Durango site, including the smelter stack.

10. Relocation of contaminated materials from the Durango site to the Bodo Canyon site by conveyor.

11. Placement of a stabilization cover over the disposal area and erosion-protection covers over the disposal area and downstream faces of the embankments.

12. Restoration of areas excavated to remove contaminated materials at the Durango site by backfilling with imported soils, recontouring, and revegetating.

13. Backfilling and recontouring excavated areas adjacent to Smelter Mountain to provide slope stability.

14. Dismantling and either salvage or disposal of the conveyor.

15. Release of the Durango site for unrestricted use.

16. Recontouring of the Bodo Canyon borrow area.

Table 1.1 Summary of specific actions associated with the alternatives[a] (Continued)

Alternative 3b - Stabilization at the Bodo Canyon site by conveyor transport:[b] (Continued)

17. Revegetation of recontoured slopes at the Bodo Canyon borrow area.

18. Installation of a permanent access barrier consisting of three-foot-high concrete posts connected by steel cable with gates, signs, and the like, at the Bodo Canyon site.

Alternative 4 - Stabilization at the Long Hollow site:[b,c]

1. Acquisition of private lands (Durango and Long Hollow sites).

2. Installation of temporary security fences, gates, and signs, at both sites.

3. Construction of on-site haul roads at the Durango and Long Hollow sites; widening and improving of County Road 211; construction of a haul road parallel to County Road 141 between County Road 211 and the Long Hollow site.

4. Construction of diversion ditches upslope of the Long Hollow site.

5. Stripping and stockpiling of topsoil at the Long Hollow site and the Bodo Canyon borrow area for restoration of disturbed areas.

6. Stripping and stockpiling of soil from the bottom of the disposal area at the Long Hollow site.

7. Construction of a sand and gravel underdrain.

8. Construction of a clay liner over the underdrain.

9. Construction of a tailings retention embankment.

10. Demolition or decontamination of structures on the Durango site, including the smelter stack.

11. Relocation of contaminated materials from the Durango site to the Long Hollow site.

12. Placement of a stabilization cover over the disposal area and erosion protection covers over the disposal area and downstream faces of the embankments.

13. Restoration of areas excavated to remove contaminated materials at the Durango site by backfilling with imported soils and recontouring.

Table 1.1 Summary of specific actions associated with the alternatives[a] (Continued)

Alternative 4 - Stabilization at the Long Hollow site:[b,c], (Continued)

14. Backfilling and recontouring of excavated areas adjacent to Smelter Mountain to provide slope stability.

15. Release of the Durango site for unrestricted use.

16. Revegetation of the backfilled and recontoured areas at the Durango site and the borrow areas.

17. Installation of a permanent access barrier consisting of three-foot-high concrete posts connected by steel cable with gates, signs, and the like, at the Long Hollow site.

Alternative 5 - Reprocessing and stabilization at the Long Hollow site:[b,c]

1. Acquisition of private lands (Durango and Long Hollow sites).

2. Installation of temporary security fences, gates, and signs, at both sites.

3. Construction of on-site haul roads at the Durango and Long Hollow sites; widening and improving County Road 211; construction of a haul road parallel to County Road 141 between County Road 211 and the Long Hollow site.

4. Site preparation at the Long Hollow site including the construction of diversion ditches upslope of the site, a clay and synthetic liner system on the bottom of the site, a ground-water interceptor trench on the northwest side of the site, and the leach and evaporation ponds.

5. Dismantling, shipment, and installation of the Naturita processing plant at the Long Hollow site.

6. Relocation of the mill tailings from the Durango site to the Long Hollow site.

7. Reprocessing of mill tailings at the Long Hollow site and shipment of plant products to other facilities for refining.

8. Stripping and stockpiling of topsoil at the Long Hollow area and at the Bodo Canyon borrow area for restoration of disturbed areas.

9. Partial placement of a stabilization cover at the Long Hollow site as leaching tanks become filled with reprocessed tailings.

10. Demolition or decontamination of structures on the Durango site, including the smelter stack.

Table 1.1 Summary of specific actions associated with the alternatives[a] (Concluded)

Alternative 5 - Reprocessing and stabilization at the Long Hollow site:[b,c] (Continued)

11. Relocation and placement of contaminated materials not suitable for reprocessing at the Long Hollow site.

12. Dismantling and disposal of the reprocessing plant at the Long Hollow site.

13. Final placement of a stabilization cover and a two-foot-thick rock erosion-protection cover.

14. Restoration of areas excavated to remove contaminated materials at the Durango site by backfilling with imported soils and recontouring.

15. Backfilling and recontouring of excavated areas adjacent to Smelter Mountain to provide slope stability.

16. Revegetation of the backfilled and recontoured areas at the Durango site and the borrow areas.

17. Release of the Durango site for unrestricted use.

18. Installation of a permanent access barrier consisting of three-foot-high concrete posts connected by steel cable with gates, signs, and the like, at the Long Hollow site.

[a]All of the action alternatives include remedial action of the estimated 137 vicinity properties. Appendix B, in the DEIS, Vicinity-Property Remedial Actions, Durango Site, contains a description of the procedures and impacts of remedial action at the vicinity properties.
[b]Preliminary designs indicate that the various haul roads can be widened and upgraded with a balanced cut and fill so that borrow materials for the road will not be required.
[c]Alternatives 4 and 5 are located at the same site but incorporate different measures to protect ground water.

Table 1.2 Estimated volumes of materials[a], manpower[b], duration, and cost[c,d,e,f,g] for each alternative

Alternative 1 - No action:	
Quantities, staffing, duration, and costs not applicable[h]	
Alternative 2 - Stabilization on the Durango site:	
Total volume of contaminated material	1,617,000 cu yds
Excavated tailings placed in reshaped pile	488,000 cu yds
Contaminated materials moved from other areas onto 38-acre stabilization area	264,000 cu yds
Stabilization cover materials	418,000 cu yds
Imported erosion-protection riprap for drainage channels	15,000 cu yds
Grouted riprap for stream bank erosion protection	88,000 cu yds
Excavation of diversion ditches	44,000 cu yds
Restoration grading imported fill	215,000 cu yds
Estimated peak number of construction personnel	56
Estimated project duration	12 months
Maintenance costs for river erosion control	26.4 million
Estimated total cost[d]	21.0 million
Alternative 3 - Stabilization at the Bodo Canyon site: (the preferred alternative)	
Alternative 3a - Transportation by truck:	
Total contaminated materials excavated and trucked to Bodo Canyon site	1,617,000 cu yds
Restoration grading imported fill at Durango site	187,000 cu yds
Embankment construction at Bodo Canyon site	522,000 cu yds
Material excavated from disposal area and placed as liner and cover material	529,000 cu yds
Imported riprap for diversion channels	29,000 cu yds
Imported erosion-protection riprap on embankments	44,000 cu yds
Imported erosion-protection gravel and bedding for stabilization cover	72,000 cu yds
Imported riprap for gully erosion protection	40,000 cu yds
Excavation of diversion ditches	19,000 cu yds
Estimated peak number of construction personnel	71
Estimated project duration	18 months
Estimated total cost	$26.3 million
Alternative 3b - Transportation by conveyor:	
Total contaminated materials excavated and trucked to Bodo Canyon site	1,617,000 cu yds

Table 1.2 Estimated volumes of materials[a], manpower[b], duration, and cost[c,d,e,f,h] for each alternative (Continued)

Alternative 3b - Transportation by conveyor: (Continued)

Restoration grading imported fill at Durango site	187,000 cu yds
Embankment construction at Bodo Canyon site	522,000 cu yds
Material excavated from disposal area and placed as liner and cover material	529,000 cu yds
Imported riprap for diversion channels	29,000 cu yds
Imported erosion-protection riprap on embankments	44,000 cu yds
Imported erosion-protection gravel and bedding for stabilization cover	72,000 cu yds
Imported riprap for gully erosion protection	40,000 cu yds
Excavation of cutoff trenches and diversion ditches	19,000 cu yds
Estimated peak number of construction personnel	64
Estimated project duration	22 months
Estimated total cost[i]	$24.1 million

Alternative 4 - Stabilization at the Long Hollow site[e]:

Total contaminated materials excavated and trucked to Long Hollow site	1,617,000 cu yds
Restoration grading imported fill at Durango site	187,000 cu yds
Embankment construction at Long Hollow site	90,000 cu yds
Excavation of diversion channels	256,000 cu yds
Imported sand and gravel for underdrain	351,000 cu yds
Material excavated at Long Hollow site and placed as liner and cover material	1,028,000 cu yds
Imported riprap for diversion channels	77,000 cu yds
Imported erosion-protection gravel and bedding for stabilization cover	241,000 cu yds
Gravel, prepared subgrade, excavation, and grading for haul road parallel to County Road 141	120,000 cu yds
Estimated peak number of construction personnel	79
Estimated project duration	28 months
Estimated total cost	$41.8 million

Alternative 5 - Reprocessing and stabilization at the Long Hollow site[e]:

Total contaminated materials excavated and trucked to Long Hollow site	1,617,000 cu yds
Restoration grading imported fill at Durango site	187,000 cu yds
Embankment construction at Long Hollow site	900,000 cu yds
Excavation of diversion channels and retention ponds	300,000 cu yds
Material excavated at Long Hollow site and placed as liner and cover material	1,527,000 cu yds
Imported erosion-protection gravel for stabilization cover	335,000 cu yds

Table 1.2 Estimated volumes of materials[a], manpower[b], duration, and cost[c] for each alternative (Concluded)

Alternative 5 - Reprocessing and stabilization at the Long Hollow site:[e] (Continued)

Imported riprap for diversion channels	77,000 cu yds
Gravel, prepared subgrade, excavation, and grading for haul road parallel to County Road 141	120,000 cu yds
Estimated average number of reprocessing phase personnel	64
Estimated project duration	82 months
Estimated net cost[f]	$34.5 million

[a]See Tables A-8, A-13, A-18, A-22, A-23, and A-24, in Appendix A of the DEIS and Table A.32 of the Addendum to Appendix A in this FEIS.

[b]See Tables A-6, A-11, A-16, A-19, A-20, and A-21, in Appendix A of the DEIS and Table A.31 of the Addendum to Appendix A in this FEIS.

[c]Does not include land-acquisition costs, finance and interest costs, legal and administrative fees, vicinity-property cleanup costs, or the costs of long-term maintenance for miscellaneous items such as fence and warning signs. Does not include costs for haul roads. Because the cost of long-term maintenance for river erosion control for Alternative 2 is substantial and not an item for Alternatives 3, 4, or 5, this cost has been included in the table.

[d]For Alternative 2, maintenance costs required for river erosion control (i.e., replacing grout) for 1000 years would be $26.4 million in present day dollars. This cost is based on replacing 25 percent of the grout every 25 years for 1000 years and for construction only. This cost was not included in the project cost shown in Table 1.2

[e]The total costs of Alternatives 4 and 5 are dependent on the type of ground-water mitigative measures required.

[f]The net cost of Alternative 5 is the total cost ($61.2 million) minus the value of the uranium and vanadium produced ($26.7 million). These estimates are based on a selling price for uranium and vanadium of $21 and $2 per pound, respectively.

[g]Costs for each of the alternatives have been adjusted since the DEIS was published to reflect more accurate unit costs based on remedial action at other UMTRA Project sites. The unit costs in Alternative 3b were developed using unit costs comparable to those used to adjust the costs for the other alternatives.

[h]The cost to maintain the vegetation cover with Alternative 1 (approximately $300,000) would be incurred by Hecla Mining Company rather than the DOE and State of Colorado.

[i]The capital cost for the conveyor is estimated to be $3.9 million. The operating and maintenance cost is estimated to be $.69 million.

of radon into the air above the pile to EPA standards. Material for the clay cover and general backfilling of excavations elsewhere at the site would be obtained from borrow areas in Bodo Canyon. This material would be transported to the Durango site by 25-ton-capacity trucks over a widened and improved County Road 211 and a newly constructed on-site haul road on the Durango site. The surface of the stabilized pile would be protected from wind and water erosion by a one-foot-thick layer of sand and gravel overlain by another two-foot-thick layer of gravel, cobbles, and boulders up to 14 inches in diameter. These granular materials would be obtained from the quarry located west of the raffinate ponds area. The final stabilized pile would have a maximum height of about 250 feet and slopes of 3 horizontal to 1 vertical. The toe of the stabilized pile would be protected from stream-bank erosion and flood waters from a Probable Maximum Flood (PMF) by placement of a five-foot-thick grouted riprap erosion barrier along the south bank of Lightner Creek and the west bank of the Animas River. The grouted riprap would require repeated maintenance over the life of the embankment. The pieces of quarried rock, up to 42 inches in diameter, would be bonded together by a grout mixture of cement and sand. Finally, ownership of the stabilization area would be transferred from the state to the DOE, and the NRC would issue a license for its long-term surveillance and maintenance. A permanent access barrier would be erected around the 38-acre stabilized site; access to and use of the property would be restricted. Depending on NRC's licensing requirements, it may be necessary to install monitoring wells, air samplers, or other devices around the site. The remainder of the site would be released for any use consistent with local land-use controls.

1.3.3 Alternative 3 - decontamination of the Durango site and stabilization of the contaminated material at a site in Bodo Canyon -- the preferred alternative

In this alternative all tailings and other contaminated materials, including those temporarily stored at the Durango site from cleanup of vicinity properties, would be stabilized on state-owned land, partially below grade in Bodo Canyon. The Durango site would be acquired by the State of Colorado prior to commencement of remedial-action activities. Alternative 3 would utilize transportation either by truck (Alternative 3a) or by conveyor (Alternative 3b). The Bodo Canyon site, a shallow drainage basin approximately 3.5 road miles from the Durango tailings piles, is owned and managed by the Colorado Division of Wildlife (CDW) as part of the Bodo Wildlife Area. The CDW purchased the property from the Nature Conservancy subject to deed restrictions which limit the use of the property to management as "wildlife habitat." The basin would be enclosed by constructing four embankments and covering the 3 horizontal to 1 vertical slopes of the embankments with three feet of erosion-protection riprap materials obtained from the quarry west of the raffinate ponds area. Additional measures would be taken to protect against erosion from the existing drainages.

With Alternative 3a, contaminated materials would be hauled to the alternate disposal site by a fleet of 25-ton-capacity trucks traveling over a newly constructed haul road on the Durango site and on County Roads 211 and 212 which would be upgraded. Upgrading would include the widening of the road to 35 feet and other improvements to accommodate the haul trucks.

With Alternative 3b, contaminated materials would be hauled to the alternate disposal site by a 12,300-foot-long conveyor system. The conveyor route would be constructed from the tailings ponds area to the raffinate ponds. From the raffinate ponds the conveyor would turn west, traverse a ridge, and eventually connect with the Bodo Canyon disposal site. Bulky demolition rubble and riprap would be hauled to the Bodo Canyon site in haul trucks using County Roads 211 and 212. The roads would be improved by adding turnouts; however, extensive widening would not be needed. The conveyor and maintenance road would occupy an area approximately 20 feet wide along the conveyor route. A 2000-foot-long conveyor would also be constructed between the Bodo Canyon borrow area and the Bodo Canyon disposal site to transport restoration fill to the tailings site.

Placement of the contaminated materials with either transport option would be conducted in a phased sequence of excavating 100-foot-wide benches, compacting a two-foot-thick liner on the bottom of the excavation, backfilling with contaminated materials, and covering these materials with five feet of on-site clayey soils derived from the excavations. The liner materials would also consist of on-site clayey soils. Following the completion of the stabilized cover, its surface would be graded to provide drainage. Two feet of rock including filter layers (one inch $\leq D_{50} \leq$ two inches) would be placed on the topslopes and a two-foot rock layer including filter material (D_{50} = one foot) would be placed on the sideslopes to protect the site from erosion. A wildlife mitigation plan would be implemented to mitigate the impacts on the Bodo Wildlife Area. Following stabilization in Bodo Canyon, the state would transfer ownership of the 41-acre disposal area to the DOE, and the NRC would issue a license for long-term surveillance and maintenance at the site. Depending on NRC's licensing requirements, it might be necessary to install monitoring devices (e.g., water-sampling wells) around the site. A permanent access barrier would be erected around the 41-acre stabilization area, and access to and use of the site would be restricted. Excavated areas of the Durango site would be backfilled and recontoured to a level compatible with the surrounding terrain with materials imported from the borrow area in Bodo Canyon, and revegetated. The excavated areas adjacent to Smelter Mountain would be backfilled and recontoured to provide for the stability of the Smelter Mountain slopes. The Durango site would then be released for any use consistent with local land-use controls.

1.3.4 Alternative 4 - decontamination of the Durango site and stabilization of the contaminated material at a site in Long Hollow

In this alternative all tailings and contaminated materials, including those temporarily stored at the Durango site from cleanup of vicinity properties, would be stabilized in a partially below-grade stabilization area in Long Hollow, which would be acquired by the State of Colorado. The state would also acquire the Durango site. The Long Hollow site is located in a shallow, gently sloped, U-shaped valley approximately 11 road miles southwest of the Durango site. Six feet of natural material would be excavated from within the stabilization area and a sand and gravel underdrain would be placed on the bottom of the excavation to provide an avenue for ground-water movement away from the stabilized pile and thereby eliminate the potential for ground-water mounding beneath the stabilized pile. A compacted clay liner, three feet thick, would be placed over the underdrain, covering the entire disposal area. The stabilization area would be enclosed by constructing an earthen embankment across the valley using materials excavated from surface-water diversion ditches. The downstream slope of the embankment would be 5 horizontal to 1 vertical. A fleet of 25-ton-capacity trucks would be used to haul the contaminated materials to the Long Hollow site over County Road 211, and a two-mile haul road constructed parallel to County Road 141. County Road 211 would be widened to 35 feet and improved through gravelling the surface, providing improved drainage, and eliminating blind curves. The contaminated materials would be deposited over the lined section of the disposal area in 100-foot-wide increments. The contaminated materials would be covered with five feet of clayey soils obtained from the excavation of the surface water diversion ditches, the bottom of the stabilization area, and a borrow area downslope from the embankment. Following the construction of the stabilized cover, its surface would be graded to provide drainage. Two feet of rock including filter layers (one inch $\leq D_{50} \leq$ two inches) would be placed on the topslopes and two feet of rock including the filter layers (D_{50} = 14 inches) on the sideslopes to protect the site from erosion. Finally, ownership of the 80-acre disposal area would be transferred from the state to the DOE. The NRC would issue a license for long-term surveillance and maintenance at the Long Hollow site. A permanent access barrier would be erected around the 80-acre tract, and depending on NRC's licensing requirements, environmental monitoring devices (wells, air samplers, radiation detectors) might have to be installed around the site, which would be restricted from access and use. The Durango site would be backfilled and recontoured to a level compatible with the surrounding terrain with materials imported from the borrow areas in Bodo Canyon and revegetated. The excavated areas adjacent to Smelter Mountain would be backfilled and recontoured to provide for the stability of the Smelter Mountain slopes. The Durango site would then be released for any use consistent with local land-use controls.

1.3.5 Alternative 5 - decontamination of the Durango site and reprocessing and stabilization of the contaminated materials at a site in Long Hollow

In this alternative, all of the tailings at the Durango site would be transported to the Long Hollow site over a period of 51 months and reprocessed by a modified heap leach process to recover most of the uranium and vanadium resources which exist in the tailings. Following reprocessing of the tailings, the other contaminated materials from the Durango site, including those temporarily stored at the Durango site from the cleanup of vicinity properties, would be stabilized in a partially below-grade embankment at the Long Hollow site. As in Alternative 4, the State of Colorado would acquire both the Durango and Long Hollow sites. All activities associated with decontamination of the Durango site, transport and reprocessing of the tailings, and construction of the tailings embankment would be performed by a private company. The heap leaching facilities at Naturita, Colorado, would be transported to the Long Hollow site, and a clay and synthetic liner system would be constructed to prevent the leakage of leach solutions. A ground-water interceptor trench filled with sand would be constructed on the northwest side of the site to provide an avenue for the movement of shallow ground water away from the site. The tailings would be transported to Long Hollow by a fleet of 25-ton-capacity trucks over County Road 211 and a two-mile haul road constructed parallel to County Road 141. County Road 211 would be upgraded as described for Alternative 4. The tailings would be spread over the liner system in leach vats and acid would be spread over the tailings to remove the uranium and vanadium resources.

The uranium- and vanadium-rich solution would be collected in lined retention ponds adjacent to the leach tanks. The solution would be periodically transported by tanker truck to an existing milling operation for final processing. Following the completion of reprocessing operations, the lesser contaminated soils and other materials would be transported to the Long Hollow site and used to fill in the retention ponds. All of the contaminated material at Long Hollow would then be contoured into a gently sloping embankment and covered with six feet of compacted clayey soils and two feet of rock to protect the site from erosion. The entire process for reprocessing and stabilizing the tailings would require 82 months to complete. Finally, ownership of the 195-acre site would be transferred from the state to the DOE. The NRC would issue a license for long-term surveillance and maintenance at the Long Hollow site. A permanent access barrier would be erected around the site, and, depending on the NRC's licensing requirements, environmental monitoring devices (wells, air samplers, radiation detectors) might be installed around the site. The Durango site would be backfilled and recontoured to a level compatible with the surrounding terrain with materials imported from the borrow areas in Bodo Canyon and revegetated. The excavated areas adjacent to Smelter Mountain would be backfilled and recontoured to provide for stability of the Smelter Mountain slopes. The Durango site would then be released for any use consistent with local land-use controls.

Although Alternatives 4 and 5 include stabilizing the tailings at the same location, these alternatives incorporate different measures to protect the shallow ground water. Alternative 4 includes an underdrain and clay liner while Alternative 5 includes an interceptor ditch and a clay and synthetic liner system. The underdrain in Alternative 4 may have some plugging over the long term but would still maintain its integrity.

1.4 AFFECTED ENVIRONMENTS

The region potentially affected by the alternatives under consideration is the central part of La Plata County in southwestern Colorado. The Durango, Bodo Canyon, and Long Hollow sites are all within about eight air miles of one another southwest of the city of Durango, the primary population center in the region. Durango is located on the northern rim of the San Juan Basin in an area of geologic, topographic, and land-use transition. North of the rim are the high, mountainous crystalline-rock complexes where base and precious metals were once extensively mined and which are now used primarily for outdoor recreation. South of the rim is a broad basin of sedimentary rocks characterized by mesas, plateaus, and flatlands where agriculture, livestock grazing, coal mining, and oil and natural-gas production are dominant.

The climate in the Durango region is semiarid, characterized by warm summers, cool springs and autumns, and moderately cold winters. Temperatures range from an average daily maximum of 87°F during July to an average daily minimum of 11°F in January. Annual precipitation averages about 18 inches. Air quality in the Durango region meets all of the National Ambient Air Quality Standards.

1.4.1 <u>Durango site</u>

The Durango site covers an area of about 126 acres just outside of the southwestern city limits of Durango at an elevation of approximately 6500 feet. The site is bordered on the north by Lightner Creek and U.S. Highway 160, on the east by the Animas River and U.S. Highways 160 and 550, and on the southwest by the slopes of Smelter Mountain. Hecla Mining Company currently owns the site.

The original topography of the site has been altered by construction activities and the placement of two tailings piles against the side of Smelter Mountain. The small tailings pile is about 90 feet high and contains about 325,000 tons of tailings. The large pile, just south of the small pile, is about 230 feet high and contains an estimated 1,230,000 tons of tailings (FBDU, 1981). All surface water from the tailings piles ultimately drains into the Animas River.

Ground water at the Durango site occurs in the unconsolidated river gravels beneath the tailings piles, mill site, and part of the raffinate ponds area. The shallow ground-water system discharges to the Animas River during periods of low flow and is recharged during periods of high flow. The ground waters beneath both the mill site-tailings piles area and the raffinate ponds area contain concentrations of uranium, vanadium, and selenium above background levels (BFEC, 1983).

The Durango site contains contaminated materials including the uranium and vanadium tailings, old lead-smelter slag, smelter stack, building materials and rubble, and soils. It is estimated that more than 400,000 cubic yards of contaminated materials (other than tailings) remain on the Durango site (FBDU, 1981).

Revegetation through seeding and regular irrigation on the slopes of the tailings piles has been only partially successful. Wind and water erosion of the piles continues to occur. A relatively good stand of grasses has been established in the raffinate ponds area. Because of sparse forage and cover for wildlife, the area has only marginal value as wildlife habitat.

1.4.2 Bodo Canyon site

The Bodo Canyon site is located approximately 1.5 air miles southwest of the Durango site. Bodo Canyon is an ephemeral drainage basin of about 4.5 square miles bordered by Smelter Mountain on the north, Carbon Mountain on the south, the Animas River on the east, and the drainage divide between Ridges Basin and Bodo Canyon on the west. The upper slopes on the north and south sides of the Bodo Canyon drainage area have gradients up to 20 percent and drain into small canyons and subbasins; the Bodo Canyon site is one of these small, gently sloping subbasins near the upper west end of the Bodo Canyon drainage area at an elevation of about 7100 feet. Almost all of the Bodo Canyon site's surface area slopes gently toward a gully at the north-central part of the site. Maximum topographic relief from the highest point on the site to the bottom of the gully is about 100 feet.

Ground-water flow systems at the Bodo Canyon site exist both within the surficial alluvium/colluvium and upper portion of the bedrock and entirely within the bedrock. Recharge to the bedrock aquifer is from infiltration in outcrop areas and by leakage from the shallow alluvial aquifer system. The ground water from these systems does not meet, without treatment, the EPA primary or secondary drinking water standards for public water supplies (see Table F-25, Appendix F, Water Resources Information, in the DEIS). The only surface water at the Bodo Canyon site occurs from site drainage.

The Bodo Canyon area is part of a land parcel deeded to the Division of Wildlife by the Nature Conservancy for use as wildlife habitat. Natural vegetation in Bodo Canyon ranges from grasslands to sagebrush on bottomlands to foothills covered with scrub oak, rabbitbrush, and other shrubs. Scattered ponderosa pine, pinyon pine, and juniper occur throughout the area but are especially prevalent on the upper slopes. The Bodo Wildlife Area provides excellent habitat for deer, elk, small game animals, and raptors.

Numerous prehistoric sites and artifacts of early-American cultures are known to exist in the Bodo Canyon-Ridges Basin area. Thirty sites have been identified in the vicinity of the Bodo Canyon site.

1.4.3 Long Hollow site

The Long Hollow alternate disposal site is located approximately eight air miles southwest of the Durango site in a gently sloping, slightly concave valley bottom at an elevation of about 7400 feet that forms the headwaters for the Long Hollow drainage system, which is an ephemeral tributary of the La Plata River. Maximum topographic relief across the proposed stabilization area is approximately 35 feet.

There is only one ground-water system of primary interest at the Long Hollow site. This is a shallow system which occurs in the unconsolidated surficial deposits and upper bedrock (fractured Lewis Shale). Potential deeper water-bearing strata occur in the Cliff House Sandstone, at least 600 to 800 feet below the surface at Long Hollow. It is unlikely that the deeper system is in any way influenced by the shallow system. The shallow aquifer system discharges through seepage into the Long Hollow drainage channel or the La Plata River. Surface water at the Long Hollow site consists of two stock watering ponds that capture surface-water runoff and water from several intermittent springs within the valley bottom and on the hillsides above the valley floor. A small irrigation system also drains to the ponds.

Vegetation at the site consists primarily of grassland with scattered sagebrush on the valley floor. Slopes to the east support mountain mahogany and scrub oak communities while those to the west are occupied by pinyon-juniper woodlands with intervening areas of sagebrush and rabbitbrush. Deer and elk range in the area.

All of the site is privately owned and is currently used in the spring and fall as a gathering, lambing, and grazing area for sheep. Three historic sites and two isolated artifact finds were identified in the vicinity of the Long Hollow site.

1.4.4 Bodo Canyon borrow area

Two adjacent borrow sites in Bodo Canyon, herein referred to as the Bodo Canyon borrow area, are located approximately 0.3 mile south of the Bodo Canyon site at the base of Carbon Mountain's north slope. Elevations in the vicinity of the borrow area range from 6900 to 6975 feet, and topographic relief across each of the borrow sites ranges from 30 to 50 feet.

Like the Bodo Canyon site, the borrow area is located in the Bodo Wildlife Area, which is owned by the Colorado Division of Wildlife (CDW). Natural vegetation in the borrow area consists primarily of sagebrush with scattered patches of wheatgrass. Isolated pinyon pine and juniper trees occur on the low ridges to the east and west of the borrow area. The habitat is used by deer, elk, and non-game wildlife.

Neither prehistoric sites nor artifacts have been identified within the borrow area.

An abandoned sandstone rock quarry owned by the CDW is located 0.25 mile west of the raffinate ponds at the Durango site and could be used as a source of large-sized rock. Other sources of large-sized rock are located between Trimble Bridge and Bakers Bridge, north of Durango, and on Florida Mesa, south of Durango.

1.5 ENVIRONMENTAL IMPACTS

The impacts of the five alternatives are summarized and compared in Table 1.3 and discussed in more detail in Section 5.0.

The major impact of Alternative 1, no action, would be the continued presence of the tailings piles adjacent to the southwestern city limits of Durango. Radiation levels and radon fluxes and concentrations would remain above the EPA standards on and near the site. The general population living out to 80 kilometers (50 miles) during any 100-year period would receive excess bronchial doses expected to cause 1.32 excess lung cancer deaths over the 100-year period. Impacts would continue at this rate for tens of thousands of years. These projections for the no action alternative are based on the current conditions of the tailings piles, including vegetation cover and irrigation. However, without remedial action, the DOE cannot assure that the tailings would not be misused, or that the tailings would not be dispersed by wind or water. Without permanent stabilization, tailings dispersal or unauthorized removal could occur, and the resulting health effects (cancer deaths) could be considerably higher than those described in this EIS for the no action alternative. Alternatives 2, 3, 4, and 5 are designed to meet the EPA standards (40 CFR Part 192). The radon flux standard of 20 picocuries per square meter per second would be met by covering the contaminated materials with five feet of clay soils (six feet for Alternative 5) so that by the time radon gas has diffused through it, most of it would have decayed into solid daughter products that would move no further. The longevity of the cover in Alternatives 2, 3, 4, and 5 would be ensured by armoring its surface with coarse granular materials to minimize wind and water erosion. Alternative 2 would involve a commitment to a substantial level of ongoing maintenance to achieve the Project's 1000-year design life. Following any of the action alternatives, the projected level of excess lung cancer deaths due to the stabilized tailings would be approximately 0.01 per hundred-year period (more than a 100-fold reduction over no action). The estimated additional impacts due to conducting any remedial action would be smaller than the impacts of five years of no action.

The radiation dose for Alternative 3b is based in part on dust emission factors for open conveyors because emission factors for pipe conveyors have not been developed. This probably results in overestimation of the radiological impacts.

Table 1.3 Comparison of the impacts of the alternatives

	Alternative 1[a]	Alternative 2[b]	Alternative 3[b] Truck option	Alternative 3[b] Conveyor option[c]	Alternative 4[b]	Alternative 5[b]
Radiological 100-year term (incl. remedial action)						
Excess whole-body dose (man-rem):						
Population (<80 km)	191/100 years	25/100 years	47/100 years	172/100 years	29/100 years	93/100 years
Work force[d]	--	108/year	263/1.5 years	362/1.8 years	310/1.4 years	909/4.3 years
Excess bronchial dose (man-rem):						
Population (<80 km)	66000/100 years	969/100 years	1050/100 years	1050/100 years	996/100 years	2620/100 years
Work force[d]	--	333/year	840/1.5 years	1120/1.8 years	987/1.4 years	2800/4.3 years
Excess lung cancer deaths:						
Population (<80 km)	1.32/100 years	0.019/100 years	0.021/100 years	0.021/100 years	0.020/100 years	0.053/100 years
Work force[d]	--	0.0067/year	0.017/1.5 years	0.022/1.8 years	0.020/1.4 years	0.056/4.3 years
Excess cancer deaths:						
Population (<80 km)	1.34/100 years	0.022/100 years	0.027/100 years	0.042/100 years	0.023/100 years	0.064/100 years
(Ref. Tables 5.1 & 5.2)						
Radiological input per year after initial 10-year term						
Excess whole-body dose[e] (man-rem):						
Population (<80 km)	1.92/year	0.23/year	0.43/year	1.57/year	0.27/year	0.86/year
Excess bronchial dose[e] (man-rem):						
Population (<80 km)	660/year	4.74/year	4.98/year	4.98/year	4.74/year	5.88/year
Excess lung cancer deaths:						
Population (<80 km)	0.013/year	0.00009/year	0.0001/year	0.0001/year	0.00009/year	0.0001/year

Table 1.3 Comparison of the impacts of the alternatives (Continued)

	Alternative 1[a]	Alternative 2[b]	Alternative 3[b] Truck option		Alternative 3[b] Conveyor option[c]		Alternative 4[b]		Alternative 5[b]	
			Durango	Bodo Canyon	Durango	Bodo Canyon	Durango	Long Hollow	Durango	Long Hollow
Air quality, short-term[f]	No effect.									
Emissions in tons/yr										
TSP		97.8	137.2	98.9	33.9	129.6	136.4	168.4	59.5	82.2
SO_2		2.00	0.73	3.39	1.0	2.1	1.07	3.99	1.67	5.02
CO		6.11	2.12	10.25	3.0	6.3	3.12	12.04	5.23	15.70
NO_x		26.41	9.08	44.29[g]	12.6	26.9	13.58	52.36[g]	22.42	67.15[g]
HC		2.42	0.66	3.88	1.2	2.3	1.01	4.70	1.46	5.11
Exhaust particulates		1.72	0.64	2.91	0.8	1.8	0.96	3.37	1.34	4.15
(Ref. Section 5.3, Appendix D in the DEIS, addendum to Appendix D in this FEIS)										
Maximum expected TSP concentrations (ug/m^3)										
24-hour	142	275	270	310	188	341	267	278[h]	200	120
Annual	41	74	70	56	52	68	70	64	52	29
Topography, long-term (Ref. Section 5.4.1)	No effect.	Smoothly contoured slope of 3 horizontal to 1 vertical over 38 acres.	At Durango: Site recontoured to be compatible with surrounding terrain. At Bodo Canyon: Change 41 acres from shallow basin to gently undulating mound surface over 38 acres with 3 horizontal to 1 vertical slopes over 3 acres.		At Durango: Same as truck option. At Bodo Canyon: Same as truck option.		At Durango: Same as Alternative 3. At Long Hollow: Change 80 acres from shallow concave valley to gently undulating mound surface over 76 acres with 5 horizontal to 1 vertical slope over 4 acres at south end.		At Durango: Same as Alternative 3. At Long Hollow: Change 195 acres from shallow concave valley to gently undulating mound surface with maximum slopes of 5 horizontal to 1 vertical.	

Table 1.3 Comparison of the impacts of the alternatives (Continued)

	Alternative 1[a]	Alternative 2[b]	Alternative 3[b] Truck option	Alternative 3[b] Conveyor option[c]	Alternative 4[b]	Alternative 5[b]
Soils (Ref. Section 5.4.2)	No effect.	Import 484,000 cu yds clayey soil from Bodo Canyon; import 222,000 cu yds sand, gravel, and riprap materials from quarry site.	At Durango Import 187,000 cu yds clayey soil. At Bodo Canyon Import 185,000 cu yds sand, gravel and ripap material from quarry site.	At Durango Same as truck option. At Bodo Canyon Same as truck option.	At Durango Same as Alternative 3. At Long Hollow Import 789,000 cu yds sand, gravel, and riprap materials from commercial sources.	At Durango Same as Alternative 3. At Long Hollow Import 709,000 cu yds gravel riprap materials from quarry site.
Mineral resources, short- and long-term (Ref. Section 5.5)	No effect.	No effect.	Coal: 400,000 tons of indicated resources potentially lost.	Coal: same as truck option.	No effect.	Recovery of 869,000 lbs of uranium and 4,198,500 lbs of vanadium.
Surface water Short-term (Ref. Section 5.6.1)	Continued slow erosion. Potential for unstable pile to slide into Animas River.	Withdrawal of 13,500 gallons per work day from Animas River: not measurable quantity. Runoff and erosion controlled by diversion ditches. Riverbank erosion controlled by grouted riprap barrier. No further contamination of Animas River.	At Durango Withdrawal of 22,500 gallons per work day from Animas River: not detectable quantity. Runoff and erosion controlled by diversion ditches. No further contamination of Animas River. At Bodo Canyon No effect.	At Durango Same as truck option. Runoff and erosion controlled by diversion ditches No further contamination of Animas River. At Bodo Canyon No effect.	At Durango Same as Alternative 3. At Long Hollow Withdrawal of 35,000 gallons per work day for 11, months then 22,500 gallons per work day for 17 months. Runoff and erosion controlled by diversion channels. No further contamination of Animas River.	At Durango Same as Alternative 3, except that withdrawal from river would be 10,000 gallons per work day for 82 months. At Long Hollow Same as Alternative 4 except that 125,000 gallons per work day for 82 months would be required. No further contamination of Animas River.

Table 1.3 Comparison of the impacts of the alternatives (Continued)

	Alternative 1[a]	Alternative 2[b]	Alternative 3[b] Truck option	Alternative 3[b] Conveyor option[c]	Alternative 4[b]	Alternative 5[b]
Surface water (continued) Long-term	Same as short-term.	Reduced potential for contaminants entering Animas River. Long-term maintenance required to ensure integrity of pile.	At Durango Stop potential for contaminants entering Animas River.	At Durango Same as truck option.	At Durango Same as Alternative 3.	At Durango Same as Alternative 3.
			At Bodo Canyon Minimum potential for contamination of surface water.	At Bodo Canyon Same as truck option.	At Long Hollow Low potential for contamination of surface waters.	At Long Hollow Same as Alternative 4.
Ground water Short-term	Contaminated ground water under tailings piles and raffinate-ponds area.	Same as Alternative 1.	At Durango Reduce leaching of contaminants into ground water.	At Durango Same as truck option.	At Durango Same as Alternative 3.	At Durango Same as Alternative 3.
			At Bodo Canyon Minimum potential for contamination of ground water.	At Bodo Canyon Same as truck option.	At Long Hollow Same as Alternative 3.	At Long Hollow Same as Alternative 3.
Long-term	Same as short-term.	Reduce leaching of contaminants into ground water.	At Durango Stop leaching of contaminants into ground water.	At Durango Same as truck option.	At Durango Same as Alternative 3.	At Durango Same as Alternative 3.
			At Bodo Canyon Moisture redistribution and leachate generation within the tailings would contribute small quantities of contaminants to ground water.	At Bodo Canyon Same as truck option.	At Long Hollow Moisture redistribution and leachate generation within the tailings would contribute low concentrations of contaminants to ground-water discharge and surface waters.	At Long Hollow Same as Alternative 4.
(Ref. Section 5.6.2)						

Table 1.3 Comparison of the impacts of the alternatives (Continued)

	Alternative 1[a]	Alternative 2[b]	Alternative 3[b] Truck option	Alternative 3[b] Conveyor option[c]	Alternative 4[b]	Alternative 5[b]
Ecosystems Terrestrial Short-term	No effect.	Increase in big game - vehicle collisions; loss of forage from fugitive dust.	Same as Alternative 2.	Fewer big game-vehicle collisions than with the truck option; less loss of forage from fugitive dust.	Same as Alternative 2.	Same as Alternative 2.
		At Durango CR 211, Bodo Canyon, and Quarry Same as Alternative 2.	At Durango CR 211, Bodo Canyon, and Quarry Same as Alternative 2.	At Durango CR 211, Bodo Canyon, and Quarry Same as Alternative 2.	At Durango CR 211, Bodo Canyon, and Quarry Same as Alternative 2.	At Durango CR 211, Bodo Canyon, and Quarry Same as Alternative 2.
Terrestrial Long-term	No effect.	At Bodo Borrow Areas 24 acres of excellent wildlife habitat permanently altered.	At Bodo Borrow Areas 16 acres of excellent wildlife habitat permanently altered.	At Bodo Borrow Areas Same as truck option.	At Bodo Borrow Areas Same as Alternative 3.	At Bodo Borrow Areas Same as Alternative 3.
(Ref. Section 5.7, Appendix L in the DEIS)			County Road 211 3 acres of wildlife habitat lost from road widening.	County Road 211 No loss of wildlife habitat.	County Road 211 10 acres of wildlife habitat lost from road widening.	County Road 211 Same as Alternative 4.
			At Bodo Canyon 41 acres of excellent wildlife habitat permanently altered.	At Bodo Canyon Same as truck option.	New Road 9.8 acres of wildlife habitat lost due to construction of new road.	New Road Same as Alternative 4.

Table 1.3 Comparison of the impacts of the alternatives (Continued)

	Alternative 1[a]	Alternative 2[b]	Alternative 3[b] Truck option	Alternative 3[b] Conveyor option[c]	Alternative 4[b]	Alternative 5[b]
Ecosystems Terrestrial Long-term (Cont.) (Ref. Section 5.7, Appendix L in the DEIS)					At Long Hollow Site 80 acres of pastureland habitat permanently lost.	At Long Hollow Site 195 acres of pastureland habitat permanently lost.
Aquatic (Ref. Section 5.7, Appendix G in the DEIS)	No effect.	No effect.	No effect.	No effect.	Two ponds lost.	Two ponds lost.
Land Use Short-term	No effect.	Site closed for 1 year.	Sites closed for 18 months.	Sites closed for 22 months.	At Durango Site closed for 28 months. At Long Hollow Site closed for 28 months.	Sites closed for 82 months.
Long-term (Ref. Section 5.8, Appendix I, in the DEIS)	No effect.	88 acres released for use in accordance with land-use controls. 38 acres permanently restricted.	At Durango 126 acres released for use in accordance with land-use controls. At Bodo Canyon 41 acres permanently restricted.	At Durango Same as truck option. At Bodo Canyon Same as truck option.	At Durango Same as Alternative 3. At Long Hollow 80 acres permanently restricted.	At Durango Same as Alternative 3. At Long Hollow 195 acres permanently restricted.

Table 1.3 Comparison of the impacts of the alternatives (Continued)

	Alternative 1[a]	Alternative 2[b]	Alternative 3[b] Truck option	Alternative 3[b] Conveyor option[c]	Alternative 4[b]	Alternative 5[b]
Population and Employment	No effect.					
Peak Number of short-term jobs[b]		56	71	64	79	64
Number of long-term jobs[i]		6	6	6	6	6
Maximum population increase for project						
Durango		142	180	208	251	195
La Plata County		210	266	309	282	219
Maximum housing requirements in Durango		103	131	151	190	148
(Ref. Sections 5.11 and 5.12, Appendix I, in the DEIS)						
Transportation, short-term; no effects on long-term	No effect.	U.S. Hwy 550 2.5% maximum increase; 4.1% increase at peak hours.	U.S. Hwy 550 7.1% maximum increase; 5.3% increase at peak hours.	U.S. Highway 550 2.7% maximum increase; 4.7% increase at peak hours.	U.S. Hwy 550 2.8% maximum increase; 5.6% increase at peak hours.	U.S. Hwy 550 2.6% maximum increase; 4.7% increase at peak hours.
		County Rd 211 280 truck trips/day for 5 months.	County Rd 211 544 truck trips/day for 16 months.	County Rd 211 14 truck trips/day for 22 months.	U.S. Hwy 160 4.0% maximum increase; 8.7% increase at peak hours.	U.S. Hwy 160 3.8% maximum increase; 7.4% increase at peak hours.
(Ref. Section 5.14, Appendix I in the DEIS)					County Rd 211 460 truck trips/day for 5 months and 540 trips/day for 15 months.	County Rd 211 144 truck trips/day for 51 months.
					County Rd 141 Not affected.	County Rd 141 Not affected.

Table 1.3 Comparison of the impacts of the alternatives (Continued)

	Alternative 1[a]	Alternative 2[b]	Alternative 3[b] Truck option	Alternative 3[b] Conveyor option[c]	Alternative 4[b]	Alternative 5[b]
Noise, short-term; no effects on long-term	No effect.	At Durango Minimum effect.	At Durango Same as Alternative 2.	At Durango Same as Alternative 2.	At Durango Same as Alternative 2.	At Durango Same as Alternative 2.
		At Bodo Canyon Disturbance to wildlife during daytime.	At Bodo Canyon Disturbance to wildlife during daytime.	At Bodo Canyon Same as Alternative 3a.	At Long Hollow Same as Alternative 3.	At Long Hollow Same as Alternative 2.
(Ref. Section 5.9)						
Cultural Resources	No effect.	At Durango Smelter stack dismantled.	At Durango Same as Alternative 2.	At Durango Same as Alternative 2.	At Durango Same as Alternative 2.	At Durango Same as Alternative 2.
			At Bodo Canyon 9 archaeological sites affected.	At Bodo Canyon 9 archaeological sites affected.	At Long Hollow 5 archaeological sites affected.	At Long Hollow 5 archaeological sites affected.
Use of energy						
Electricity (kilowatt-hours)	None.	33,600	79,200	4,044,000	88,000	2,567,400
Engine fuel (gallons)		369,000	1,069,000	936,000	1,618,000	2,975,000
Occupational accidents[j]						
Expected fatalities	None.	0.014	0.025	0.018	0.040	0.098
Expected number of disabling injuries		1.99	4.23	1.65	9.13	14.57

Table 1.3 Comparison of the impacts of the alternatives (Concluded)

	Alternative 1[a]	Alternative 2[b]	Alternative 3[b] Truck option	Alternative 3[b] Conveyor option[c]	Alternative 4[b]	Alternative 5[b]
Cost of Project[k] In millions of 1983 dollars	0[l]	21.0[m]	26.3	24.1	41.8	61.2 (cost) 26.7 (value of uranium and vanadium produced).
(Ref. Appendix A in the DEIS)						

[a] Impacts under Alternative 1, No Action, the current condition of the tailings is assumed to continue into the future.
[b] Duration of projects: Alternative 2, 12 months; Alternative 3, truck option 18 months, conveyor option 22 months; Alternative 4, 28 months; Alternative 5, 82 months: all time estimates take into account adverse weather conditions and work stoppage during the winter.
[c] Dust emission factors for open conveyors were used in calculating air emissions and bronchial radiaiton dose. Emission factors for pipe conveyors have not been developed. This approach probably results in overestimation of the air quality and radiological impacts.
[d] Dosages to workers during time required to move tailings.
[e] Results of MILDOS analysis for post-remediation years.
[f] For duration of projects only; generally zero effect after project completion.
[g] Exceeds EPA's significant emissions levels; however, does not exceed National Ambient Air Quality Standards.
[h] Exceeds Colorado and National Ambient Air Quality Standards.
[i] Alternatives 2, 3a, 3b, 4, and 5 would contribute to 6 long-term jobs for environmental surveillance for all UMTRA Project sites combined.
[j] Among construction workers only.
[k] Does not include the costs of land acquisition, finance and interest, legal and administrative services, vicinity property cleanup, or long-term surveillance and maintenance.
[l] The owner of the Durango tailings piles, not the DOE, would continue to maintain the vegetative cover at an estimated cost of $300,000 (1985 dollars).
[m] The long-term maintenance for Alternative 2 would be $26 million over 1000 years, substantially greater than for Alternatives 3a, 3b, 4, or 5.

Among the nonradiological impacts, the most important would be the impacts on the transportation corridor between the Durango site and the Bodo Canyon borrow area (Alternative 2) and between the Durango site and the Bodo Canyon site (Alternative 3) or the Long Hollow site (Alternatives 4 and 5). Alternatives 4 and 5 would both require approximately 7.5 additional miles of road improvements than required for Alternatives 2 and 3a. Alternative 3b would require the construction of only three road turnouts as opposed to widening County Road 211 with Alternative 3a. The average daily traffic volume for Alternative 4 would be almost twice that of Alternative 5; however, the duration of Alternative 5 would be three to four times longer than the other action alternatives.

In Alternatives 1 and 2, contaminated ground water beneath the tailings piles at the Durango site would continue to migrate to the Animas River. In Alternatives 3 and 4, a clay liner would reduce seepage at the alternate site and, by sorption, retard movement of radium and other contaminants. In Alternative 5, a clay and synthetic liner system would retard seepage of contaminated water out of the stabilized tailings. In Alternatives 3, 4, and 5, the contaminated ground water at the Durango site would be diluted to background levels by mixing with clean ground water and seepage into the Animas River.

In Alternative 2, surface water (Animas River) would indirectly be protected by the stabilization cover which would keep runoff from percolating into the tailings and other contaminated materials. There are no perennial surface waters requiring protection at either the Bodo Canyon or Long Hollow sites, Alternatives 3, 4, and 5.

The work required for the action alternatives is very much like any moderate, short-term earthmoving project. There would be typical construction noises, dust, and additional traffic. However, these impacts would be no greater than those experienced from other construction projects such as building an earth dam or an interstate highway. All of these impacts would be manageable, and appropriate mitigating actions such as fugitive dust and erosion control, using adequate mufflers on engine-driven equipment, and scheduling work for daytime hours would be taken to lessen their severity. Also, as on any large construction project, there would be the potential for occupational accidents occurring among the remedial action workers.

The remedial action work for the four action alternatives would have a low to moderate, short-term impact on the economy or social infrastructure of Durango or La Plata County. At most, for the construction workers, there would be 41 full-time equivalent jobs during one year for Alternative 2, 50 full-time equivalent jobs for 18 months under Alternative 3a, 58 equivalent full-time jobs for Alternative 3b, 53 full-time equivalent jobs for 28 months under Alternative 4, and 40 full-time equivalent jobs for 82 months for Alternative 5. The peak work force for Alternatives 2, 3a, 3b, 4, and 5 would be 56, 71, 64, 79, and 64 employees, respectively.

Finally, there is a large difference in monetary costs among the five alternatives. Alternative 1 would not involve any cost to the DOE. Alternative 2 would cost about $21.0 million, Alternative 3a would cost $26.3 million, Alternative 3b would cost $24.1 million, and the cost for Alternative 4 would be $41.8 million. Alternative 5 would cost $61.2 million, but these costs would be partially offset by the sale of the uranium and vanadium recovered during reprocessing ($26.7 million) based on a selling price for uranium and vanadium of $21 and $2 per pound, respectively. Therefore, the net cost of Alternative 5 would be $34.5 million. The engineering designs for Alternative 5 are based on conserv- ative assumptions and the actual costs may increase or decrease as a re- sult of the final engineering designs or by site-acquisition costs. The cost distribution between the DOE and the company performing the repro- cessing would be negotiated between these two parties. The costs of Alternatives 4 and 5 are heavily dependent on the type of ground-water mitigation measures that would be selected. The three mitigative measures presently under consideration are the use of an underdrain, interceptor trench, or an upslope shift in the location of the stabilized pile.

These estimated costs do not include site acquisition and right-of-way costs, legal and administrative costs, finance and interest charges, costs for vicinity-properties cleanup, or the costs of long-term surveillance and maintenance.

All of the four action alternatives have been designed to remain effective for up to 1000 years to the extent reasonably achievable and, in any case, for at least 200 years. Alternatives 3, 4, and 5 would meet this design standard with very limited maintenance. However, Alternative 2, stabilization at the Durango site, would require a much greater level of maintenance over the project's design life because of the potential for meandering of the Animas River channel, the design's dependence on grouted riprap for erosion protection, and the use of surface-water diversion channels to direct surface-water flow from Smelter Mountain around the north and south ends of the stabilized pile. The greater level of maintenance required for Alternative 2 would increase the costs of this alternative.

As discussed in Section 5.21, various mitigative measures are under consideration to reduce the potential environmental impacts from each of the remedial-action alternatives. Among those measures under consideration are: (1) the implementation of wildlife and archaeological mitigation plans; (2) placement of rock to protect against erosion at existing drainages for Alternatives 3a, and 3b; and (3) the construction of an underdrain or interceptor trench, or the upslope relocation of the disposal site away from the ground-water discharge area, to protect against contamination of surface and ground water for Alternatives 4 and 5.

1.6 REMEDIAL ACTIONS

The actual work would be done on the site(s) during this phase of the program. Remedial actions would be performed by the DOE's Remedial Action Contractor (RAC) and its subcontractors. The RAC would competitively award firm, fixed-price subcontracts for the building demolition, earthmoving, construction, and material-handling activities required at each site. The construction would follow a predetermined schedule in which major activities have been planned and a time period for each step developed. Tables 1.1 and 1.2 indicate the basic remedial action activities and the materials handling and resource volumes, manpower requirements, duration, and cost for each alternative.

During the construction period, a set of safety and contamination controls would be followed to ensure that no workers are exposed to radiation levels beyond acceptable limits, and that no significant amount of radioactive material escapes into the surrounding areas.

Additional and more detailed information on the proposed remedial action activities will be published as indicated in Table 1.4.

Table 1.4 Document publication schedule -- Durango remedial action project

Document type	Scheduled publication date
<u>Final site documents</u>	
Remedial Action Plan (including Health and Safety Plan and Radiological Support Plan)	Fall 1985
Site Conceptual Design	Fall 1985
Site Characterization Report	Fall 1985
Final Design and Specifications	Spring 1986
Site Licensing Plan	1987[a]
Site Surveillance and Maintenance Plan	1987[a]

[a]The Site Surveillance and Maintenance Plan and the site licensing plan for Alternative 5 would be issued in 1993.

1.7 POST-PROJECT SURVEILLANCE AND MAINTENANCE

Title I of the UMTRCA defines the authority and roles of the Department of Energy (DOE), the Nuclear Regulatory Commission ("Commission"), and the intent of licensing regarding inactive tailings sites in the various states. In part, Section 104(f)(2) of the UMTRCA reads:

> "...upon completion of the remedial action program ...(the site) shall be maintained pursuant to a license issued by the Commission in such a manner as will protect the public health, safety, and the environment. The Commission may, pursuant to such license or rule or order, require ...monitoring, maintenance, and emergency measures necessary to protect public health and safety and other actions that the Commission deems necessary to comply with the standards (EPA) of Section 275 ..."

Accordingly, the remedial action must demonstrate compliance with the EPA standards (40 CFR Part 192) and thus, the prime objective of licensing is to ensure continued compliance with the EPA standards via a post-remedial-action surveillance and maintenance program.

The DOE will conduct the maintenance and monitoring pursuant to the requirements of the Commission's license until March 7, 1990, under Section 104(f)(2) of UMTRCA. At that time, the DOE or another agency to be designated by the President will maintain the site as required by the Commission.

A detailed custodial surveillance and maintenance program would be defined jointly by the DOE and the NRC during the NRC license application and approval process. The basic elements of this program as proposed by the DOE at this time are discussed in Section 5.22.

All of the action alternatives have been designed to remain effective for up to 1000 years to the extent reasonably achievable and, in any case, for at least 200 years. Alternatives 3, 4, and 5 would meet this design standard with very limited maintenance. However, it is anticipated that Alternative 2, stabilization at the Durango site, would require a greater level of maintenance because of the potential for meandering of the Animas River channel, the design's dependence on grouted riprap for erosion protection, and the use of surface-water diversion channels to direct surface-water flow from Smelter Mountain around the north and south ends of the stabilized pile.

REFERENCES FOR SECTION 1.0

BFEC (Bendix Field Engineering Corporation), 1983. Preliminary Hydrogeochemical Characterization of the Durango, Colorado Tailings and Raffinate Ponds Areas, GJ-03(83), prepared by BFEC, Grand Junction, Colorado, for the U.S. Department of Energy, Uranium Mill Tailings Remedial Action Project, Technology Development, Grand Junction, Colorado.

FBDU (Ford, Bacon & Davis, Utah, Inc.), 1981. Engineering Assessment of Inactive Uranium Mill Tailings, Durango Site, Durango, Colorado, DOE/UMT-0103, prepared by FBDU, Salt Lake City, Utah, for the U.S. Department of Energy, UMTRA Project Office, Albuquerque Operations Office, Albuquerque, New Mexico.

2.0 PURPOSE AND NEED

The remedial action alternatives (except no action) presented in this Durango Final Environmental Impact Statement (FEIS) are possible strategies for reducing the radioactivity levels at the Durango site to meet the EPA standards (40 CFR Part 192). The purpose of these standards is to protect the public health and safety and the environment from potential radiological and nonradiological hazards associated with residual radioactive wastes and other contaminated materials at the sites. The remedial-action project would accomplish one major goal: removing a potential public health hazard, i.e., that potential hazard associated with these wastes.

2.1 THE URANIUM MILL TAILINGS RADIATION CONTROL ACT OF 1978

In 1978, Congress passed Public Law 95-604, the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), expressly finding that uranium mill tailings located at inactive (and active) mill sites may pose a potential health hazard to the public. The UMTRCA charged the EPA with the responsibility for promulgating remedial action standards for inactive uranium milling sites. Under the UMTRCA the DOE is authorized to enter into cooperative agreements with affected states or Indian tribal governments to perform remedial actions to bring the radiation levels at the sites in their jurisdictions to within the EPA standards (40 CFR Part 192). The DOE will fund 90 percent of the remedial action cleanup costs (except on Indian land where DOE will fund 100 percent); the affected state will provide the remaining 10 percent. All remedial actions performed under the UMTRCA must be done in accordance with the EPA standards (40 CFR Part 192) and with the concurrence of the NRC, which will issue a license for the long-term maintenance and monitoring of the disposal site after the cleanup work is complete.

Title I to the UMTRCA identified 22 inactive processing sites to be designated by the Secretary of the DOE for remedial action, including the Durango site. Effective October 19, 1981, the DOE and the State of Colorado entered into a cooperative agreement under UMTRCA, setting forth the terms and conditions for the DOE and the state cooperative remedial action effort, including 90 percent (DOE), 10 percent (state) cost-sharing, the state's real estate acquisition responsibilities, the state's responsibility for nominating potential alternate disposal sites, and provision for the DOE's development of a remedial action plan after publication of the Durango Final Environmental Impact Statement (FEIS). (The remedial action plan will be concurred in by the state and the NRC.)

2.2 EPA STANDARDS

2.2.1 General

Pursuant to the requirements of UMTRCA, the EPA has promulgated health and environmental standards to govern cleanup, stabilization, and control of residual radioactive materials at inactive uranium milling sites. The promulgated standards establish requirements for long-term stability and radiation protection and provide procedures for ensuring the protection of ground-water quality.

In developing the standards, the EPA determined "that the primary objective for control of tailings should be isolation and stabilization to prevent their misuse by man and dispersal by natural forces such as wind, rain, and flood waters" and that "a secondary objective should be to reduce radon emissions from tailings piles." A third objective should be "the elimination of significant exposure to gamma radiation from tailings piles" (EPA, 1983). These conclusions were based on a determination that the most significant public health risks were posed by exposure of people living and working in structures contaminated by relocated tailings. The EPA further concluded that the potential for contamination of ground water and surface water should be evaluated on a site-specific basis.

The EPA standards are discussed in the following paragraphs and are summarized in Table 2.1.

2.2.2 Long-term stability

Isolation and stabilization of tailings in order to prevent misuse by man and dispersal by natural forces is the primary objective of the EPA standards. Accordingly, long-term stability was emphasized in the development and promulgation of the standards. This is consistent with the guidance provided by the legislative history of UMTRCA which stresses the importance of avoiding remedial actions which would be effective only for a short period of time and which would require future Congressional considerations.

The EPA standard-setting process distinguished "passive controls," such as thick earthen covers, below-ground disposal, rock covers, and massive earth and rock dikes, from "active controls" such as semi-permanent covers, fences, warning signs, and restrictions on land use. Active control covers could be expected to need frequent replacement or other major repairs requiring the appropriation and expenditure of public funds. In setting the standards, the EPA called for designs which rely primarily on passive controls.

The Standard is framed as a longevity requirement which recognizes the difficulty in predicting very long-term performance with a very high degree of confidence. In establishing the longevity requirement, the EPA concluded that existing knowledge permits the design of control systems that have a good expectation of lasting at least 1000 years. Therefore, a design objective of 1000 years was established to be satisfied whenever reasonably achievable, but in any case with a minimum performance period of 200 years.

The Standard recognizes the need for institutional controls such as custodial maintenance, monitoring, and contingency response measures. In its preamble to the standards, the EPA calls for such controls to be provided as an essential backup to the primary passive controls.

PART 192 - HEALTH AND ENVIRONMENTAL PROTECTION STANDARDS FOR URANIUM MILL TAILINGS

SUBPART A - Standards for the Control of Residual Radioactive Materials from Inactive Processing Sites

192.02 Standards

Control shall be designed to:

(a) Be effective for up to one thousand years, to the extent reasonably achievable, and, in any case, for at least 200 years, and,

(b) Provide reasonable assurance that releases of radon-222 from residual radioactive material to the atmosphere will not:

(1) Exceed an average release rate of 20 picocuries per square meter per second, or
(2) Increase the annual average concentration of radon-222 in air at or above any location outside the disposal site by more than one-half picocurie per liter.

SUBPART B - Standards for Cleanup of Land and Buildings Contaminated with Residual Radioactive Materials from Inactive Uranium Processing Sites

192.12 Standards

Remedial actions shall be conducted so as to provide reasonable assurance that, as a result of residual radioactive materials from any designated processing site:

(a) The concentration of radium-226 in land averaged over any area of 100 square meters shall not exceed the background level by more than -

(1) 5 pCi/g, averaged over the first 15 cm of soil below the surface, and
(2) 15 pCi/g, averaged over 15 cm thick layers of soil more than 15 cm below the surface.

(b) In any occupied or habitable building -

(1) The objective of remedial action shall be, and reasonable effort shall be made to achieve, an annual average (or equivalent) radon decay product concentration (including background) not to exceed 0.02 WL. In any case, the radon decay product concentration (including background) shall not exceed 0.03 WL, and
(2) The level of gamma radiation shall not exceed the background level by more than 20 microroentgens per hour.

SUBPART C - Implementation (condensed)

192.20 Guidance for Implementation

Remedial action will be performed with the "concurrence of the Nuclear Regulatory Commission and the full participation of any state that pays part of the cost" and in consultation as appropriate with other government agencies.

192.21 Criteria for Applying Supplemental Standards

The implementing agencies may apply standards in lieu of the standards of Subparts A or B if certain circumstances exist, as defined in 192.21.

192.22 Supplemental Standards

"Federal agencies implementing Subparts A and B may in lieu thereof proceed pursuant to this section with respect to generic or individual situations meeting the eligibility requirements of 192.21."

(a) ". . .the implementing agencies shall select and perform remedial actions that come as close to meeting the otherwise applicable standards as is reasonable under the circumstances."

(b) ". . .remedial actions shall, in addition to satisfying the standards of Subparts A and B, reduce other residual radioactivity to levels that are as low as is reasonably achievable."

(c) "The implementing agencies may make general determinations concerning remedial actions under this Section that will apply to all locations with specified characteristics, or they may make a determination for a specific location. When remedial actions are proposed under this Section for a specific location, the Department of Energy shall inform any private owners and occupants of the affected location and solicit their comments. The Department of Energy shall provide any such comments to the other implementing agencies [and] shall also periodically inform the Environmental Protection Agency of both general and individual determinations under the provisions of this section."

Ref: Federal Register, Volume 48, No. 3, January 5, 1983, 40 CFR Part 192.

TABLE 2.1 EPA STANDARDS

2.2.3 Radon emissions control

The EPA identified a reduction of radon emissions from tailings piles as the second objective in its standards for the control of tailings. In developing the standards, it considered several alternative approaches and selected an emission limitation as the primary form of the standard. In addition, it established a concentration limit as an alternative form of the standard for use in cases where the DOE determined that the alternative was appropriate.

In establishing the emission limitation for tailings piles, the EPA sought to reduce both the maximum risk to individuals living very near the sites and the risk to the population as a whole. With regard to individuals very near to disposal sites, the EPA estimates that exposure to radon emissions will be reduced by more than 96 percent. The radon standard of 20 pCi/m^2s on the disposal site or 0.5 pCi/l outside the disposal site will limit the increase in radon concentration attributable to a pile to a small increase above the background radon level near the disposal site. Both standards are design standards with compliance to be determined on the basis of predicted rather than measured emission rates and concentrations. The EPA states that "post-remediation monitoring will not be required to show compliance, but may serve a useful role in determining whether the anticipated performance of the control system is achieved."

In establishing the radon standard, the EPA determined that the emission limitation could be achieved by well-designed thick earthen covers and that such control techniques would be compatible with the requirements of the EPA longevity standard.

2.2.4 Water-quality protection

The EPA reviewed available water-quality data at inactive tailings sites and determined that there was little evidence of recent movement of contaminants into ground water. They also determined that any degradation of ground-water quality should be evaluated in the context of potential beneficial uses of the ground water as determined by background water quality and the available quantity of ground water.

Rather than establish specific numerical limitations for contaminant discharges or ground-water quality, the EPA determined that the most appropriate course of action would be to require site-specific analyses of potential future contaminant discharge and a case-by-case evaluation of the significance of such a discharge. The implementation guidelines for the EPA standards call for adequate hydrological and geochemical surveys at each site as a basis for determining whether specific water-protection measures should be applied.

Specific site assessments must include monitoring programs sufficient to establish background ground-water quality through one or more upgradient wells and to identify the present movement and extent of contaminant plumes associated with the tailings piles. They further call for judgments of the need for restoration or prevention, or both, to be guided by the EPA's hazardous waste management system and relevant state and Federal water-quality criteria. Decisions on specific actions to protect or restore water quality are to be guided by such factors as the technical feasibility of improving the aquifer, the cost of applicable restorative or protective programs, the present and future value of the aquifer as a water source, the availability of alternative water supplies, and the degree to which human exposure is likely to occur.

UMTRCA requires that the standards promulgated by the EPA "...to the maximum extent practicable, be consistent with the requirements of the Solid Waste Disposal Act, as amended." In setting the standard, the EPA determined that the statutory requirement for the NRC to concur with the selection and performance of remedial actions and to issue licenses encompassing "monitoring, maintenance, or emergency measures necessary to protect public health and safety" was consistent with the EPA regulations implementing the Solid Waste Disposal Act (47 FR 32274, July 26, 1982) (EPA, 1982). Accordingly, the EPA established the implementation procedures requiring case-by-case evaluations of potential contamination at sites. Decisions regarding monitoring or remedial actions will be guided by relevant considerations in the hazardous waste management systems.

2.2.5 Cleanup of lands and buildings

The EPA evaluated the risk associated with the dispersal of tailings off the site and concluded that the principal risk to man was the exposure to radon daughter products inside buildings. The EPA, therefore, stated that the objective of the cleanup of tailings from around existing structures was to achieve an indoor radon-daughter concentration (RDC) of less than 0.02 WL (working level). For open lands, the purpose of removing the contamination is to remove the potential for excessive indoor radon-daughter concentrations that might arise from new construction on contaminated land. The 5 pCi/g and 15 pCi/g radium-226 concentration limits for 15-cm surface and subsurface layers were considered adequate to limit indoor RDCs to below 0.02 WL. A secondary concern was to limit exposure of people to gamma radiation.

The standard requires that residual radioactive materials be removed from buildings exceeding 0.03 WL. In cases where levels are between 0.02 and 0.03 WL, the Federal government will have the flexibility to decide if any measures should be taken. Measures such as sealants, filtration devices, or ventilation devices may be used to provide reasonable assurance of reductions to below 0.02 WL.

2.3 NRC CONCURRENCE

The NRC has not issued and does not intend to issue regulations that apply to the cleanup and disposal of residual radioactive materials at inactive uranium processing sites. The DOE will select and execute a plan of remedial action that will satisfy the EPA standards (40 CFR Part 192). In conformance with Section 104(f)(2) of the UMTRCA, the required NRC concurrence with the proposed remedial actions and the NRC licensing of disposal sites will be for the purpose of ensuring compliance with these EPA standards (40 CFR Part 192).

Section 104(f)(2) further states that "upon completion of the remedial-action program... such property and minerals shall be maintained pursuant to a license issued by the Commission (the NRC) in such manner as will protect the public health, safety, and the environment. The Commission may... require the Secretary (of the DOE) or other Federal agency having custody of such property and minerals to undertake such monitoring, maintenance, and emergency measures as necessary to protect public health and safety and other actions as the Commission deems necessary ..."

2.4 COLORADO STANDARDS

Under Alternative 5, a private party would transport and reprocess the tailings, and these activities would, therefore, be subject to the regulations of the State of Colorado.

The State of Colorado, as an "Agreement State" with the NRC, has issued rules and regulations applying "...to all persons who receive, possess, use, transfer, own, or acquire any source of radiation, provided, however, that nothing in these regulations shall apply to any person to the extent such person is subject to regulation by the NRC" (CDH, 1984). Under these regulations, private party transport and reprocessing of uranium mill tailings would be subject to specific State of Colorado licensing and operating requirements. Final decommissioning and stabilization of reprocessed tailings materials would be subject only to Federal UMTRCA requirements under the assumption of transfer of ownership to DOE.

Licensing requirements are set forth in Part III - Licensing of Radioactive Materials (Sections RH 3.7 - Intrastate Transportation of Radioactive Material; RH 3.8 - Filing Application for Specific Licenses; and RH 3.9 - General Requirements for the Issuance for Specific Licenses).

In addition to the requirements set forth in RH 3.8 and RH 3.9, special requirements for a license to receive, possess, and use source material for milling or by-product material are addressed in Section 3.10.6. Part IV of the regulations sets forth standards (permissible doses, levels, and concentrations) for protection against radiation.

REFERENCES FOR SECTION 2.0

CDH (Colorado Department of Health), 1984. "State of Colorado Rules and Regulations Pertaining to Radiation Control," Denver, Colorado.

EPA (U.S. Environmental Protection Agency), 1983. "Standards for Remedial Actions at Inactive Uranium Processing Sites," Federal Register, Vol. 48, No. 3, January 5, 1983, pp. 590-604 (40 CFR Part 192).

EPA (U.S. Environmental Protection Agency), 1982. "Hazardous Waste Management System; Standards Applicable to Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities; and EPA Administered Permit Programs," Federal Register, Vol. 47, No. 143, July 26, 1982, pp. 32274-32388 (40 CFR Parts 122, 260, 264, and 265).

3.0 ALTERNATIVES FOR THE REMEDIAL ACTION

3.1 HISTORY AND PRESENT STATUS OF THE DURANGO SITE

The United States Vanadium Corporation (USV) built the Durango Mill in 1942 on the site of an old lead smelter. It furnished vanadium to the Metals Reserve Company, a company established by the Federal government for the purchase of strategic materials needed during World War II. In 1943, USV began reprocessing the vanadium tailings for the recovery of uranium for sale to the Manhattan Project. The mill operated until 1946 and was then shut down until 1949. The Vanadium Corporation of America (VCA) leased the property, later purchasing it, and operated the plant for the purpose of extracting uranium which they sold to the U.S. Atomic Energy Commission. The initial milling capacity of about 175 tons of ore per day was expanded to 430 tons per day by 1956 and to 750 tons per day by 1958. Ore averaging 0.29 percent uranium oxide and 1.60 percent vanadium oxide was delivered to the Durango mill from mines of the Uravan Mineral Belt, Dry Valley, Carrizo, Cove Mesa, Placerville, Hermosa Creek, Lightner Creek, and Monument Valley. The company also purchased ore from independent operators and processed ore and upgrader products from company-controlled properties. All feed material was hauled to the Durango mill by truck. The VCA retained ownership of the mill site and adjoining property until 1967 when VCA was merged into the Foote Mineral Company. The ore-processing operation continued until March, 1963, when the mill was shut down permanently. The site was purchased by Ranchers Exploration and Development Corporation in 1977. In 1984, Ranchers Exploration and Development Corporation was acquired by Hecla Mining Company.

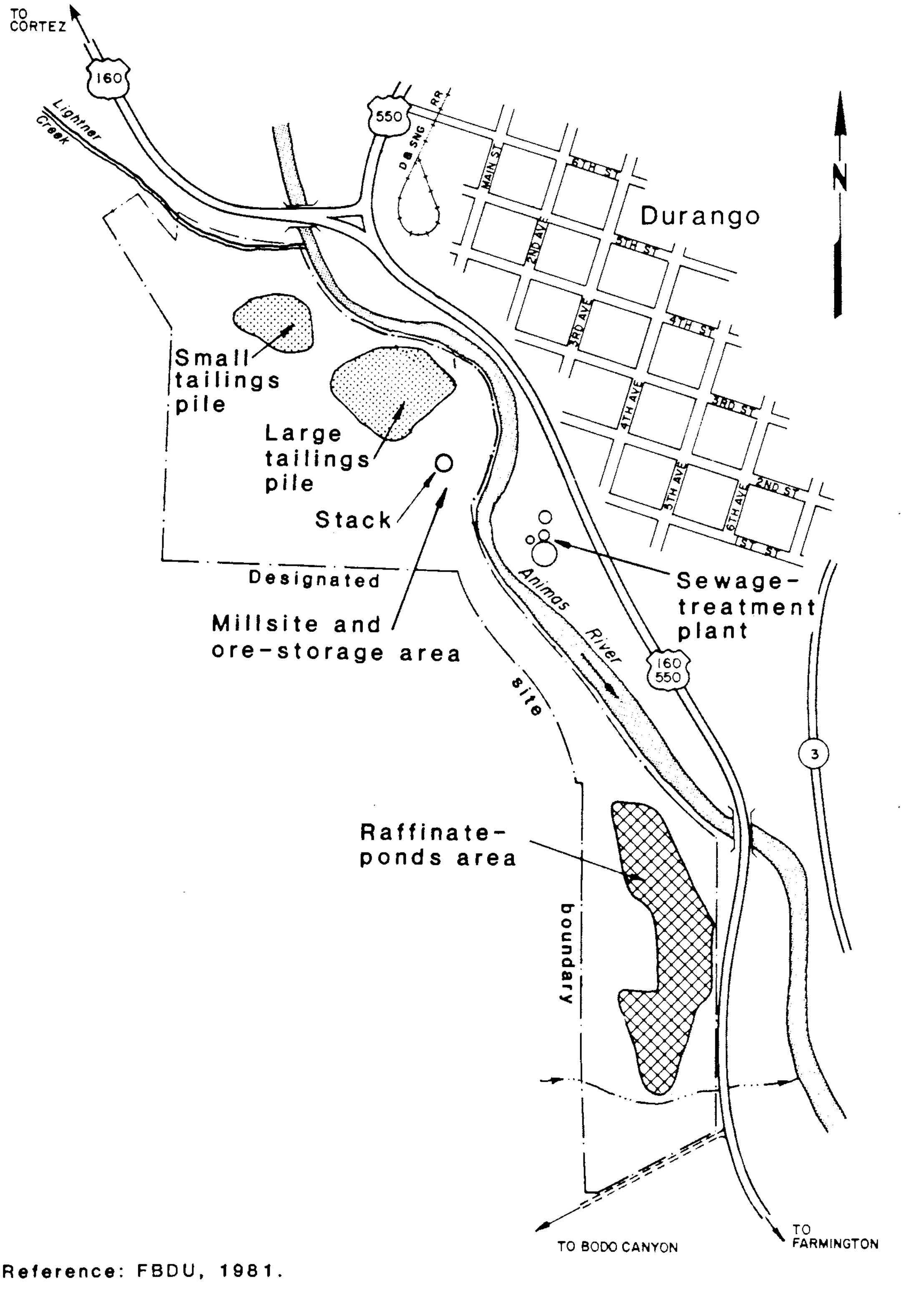
3.2 DESCRIPTION OF THE ALTERNATIVES

3.2.1 Background

The Durango site encompasses an area of 126 acres on the west bank of the Animas River at the southwest edge of the city of Durango, Colorado. Included in the Durango site are two uranium tailings piles, the mill site area and its associated structures, and the raffinate ponds area. The relationship of the tailings and mill site to the city of Durango and the surrounding area is shown in Figure 3.1.

The two uranium tailings piles abut Smelter Mountain and cover 21 acres. The larger of the two piles is about 230 feet high and contains approximately 1,230,000 tons of tailings. The smaller pile rises about 90 feet and contains approximately 325,000 tons of tailings. At present, the slopes of the tailings piles have not been stabilized with an earth cover because of the steepness of the pile slopes; however, an active vegetation program has been instituted on the slopes with some success. About two feet of soil have been placed on the flatter terrain on top of the piles.

Adjacent to the southeast portion of the large tailings pile is the mill site area. The mill and equipment buildings have been decontaminated and removed in accordance with State of Colorado



Reference: FBDU, 1981.

FIGURE 3.1 VICINITY MAP OF THE DURANGO AREA

regulations (Haywood et al., 1980); however, the smelter stack and some minor structures remain.

At the southern end of the site is the approximately 15-acre area containing the abandoned raffinate ponds. Raffinate was channeled from the mill to the unlined raffinate ponds via a 0.5-mile channel; the channel and raffinate ponds have been filled with earth and broken shale, and covered with soil.

Estimated quantities of the uranium tailings and other contaminated materials involved in the stabilization of the site are summarized in Table 3.1. Additional information on the Durango site is included in Appendix A of the DEIS, Conceptual Designs and Engineering Evaluations, Remedial Action Alternatives.

Table 3.1 Contaminated materials at the Durango site

Material	Volume (cubic yards)	Weight (tons)
Uranium and vanadium tailings	1,200,000	1,555,000
Slag	45,000	79,000
Contaminated earth from mill site tailings area	248,000	368,000
Raffinate ponds and associated area	102,000	138,000
Rubble, stack, and buildings	1,000	2,000
Off-site and windblown contaminated area	13,000	18,000
Vicinity-property materials	8,000[a]	11,000
Totals	1,617,000	2,171,000

[a]As stated in Appendix B of the DEIS (Vicinity-Property Remedial Actions) the amount of contaminated material may be as great as 13,700 cubic yards rather than the 8000 cubic yards shown here. Eight thousand cubic yards was the estimated volume at the time the conceptual designs were prepared. The difference in these two volumes is less than 0.5 percent of the total volume of the contaminated material and would not affect the conceptual designs.

Ref. FBDU, 1981.

Three basic strategies have been investigated for remedial actions at the Durango site: the first would be to stabilize the uranium tailings and other contaminated materials at the site; the second would be to transport the tailings and other contaminated materials to an alternate disposal site for stabilization and then to decontaminate the Durango site; the third would be to transport the tailings and other contaminated materials to an alternate disposal site for reprocessing and then to decontaminate the Durango site. All three strategies would meet the EPA standards and the mandate of UMTRCA to minimize health hazards associated with inactive uranium-processing facilities. However, the topography of the site and the close proximity of the Animas River and Lightner Creek to the Durango site would necessitate a greater level of maintenance if the tailings were stabilized at the Durango site rather than at an alternate disposal site.

A basic difference in the strategies bears on the future use of the Durango site. A stabilized Durango site would meet the final EPA disposal standards; however, the site would still contain radioactive materials. Therefore, use of the stabilized Durango site would be permanently restricted so as to assure containment of the radioactivity. The strategy of decontaminating the Durango site would create a stabilized disposal site with restricted use at a distant location, which would allow the decontaminated Durango site to be used for other purposes.

Five remedial action alternatives have been developed for dealing with the uranium tailings and other associated contaminated materials located at the Durango site. These alternatives are:

1. No action.

2. Stabilize the uranium tailings and other associated contaminated materials at the Durango site.

3. Transport the uranium tailings and other associated contaminated materials (either by truck or conveyor) to the Bodo Canyon site for stabilization and decontaminate the Durango site.

4. Transport the uranium tailings and other associated contaminated materials to the Long Hollow site for stabilization and decontaminate the Durango site.

5. Transport the uranium tailings to the Long Hollow site for reprocessing and then decontaminate the Durango site and stabilize the tailings and other associated contaminated materials at the Long Hollow site.

These five alternatives span the reasonable options for remedial action and are discussed in more detail in Appendix A, Conceptual Designs and Engineering Evaluations, Remedial Action Alternatives, in the DEIS. The truck transportation option for stabilization at Bodo Canyon, Alternative 3a, was discussed in Appendix A; the conveyor transportation option for stabilization at Bodo Canyon, Alternative 3b, is described in the Addendum to Appendix A in this FEIS. Other alternatives were identified but eventually eliminated from further consideration as alternatives. These considered-but-rejected alternatives are briefly discussed in Section 3.2.7 and in more detail in Appendix C, Alternatives That Were

Considered But Rejected, in the DEIS. The no action alternative provides a baseline for comparison with other alternatives. The conceptual design described for the alternative which is selected for remedial action will undergo considerable refinement during the final design phase. Additional design features to protect water quality and ensure protection from erosion will be developed.

3.2.2 Alternative 1 - no action

This alternative involves leaving the Durango site in its present condition and under the control of its present owners, Hecla Mining Company. Maintenance and monitoring would be continued by Hecla under the current storage permit from the State of Colorado. If the no-action alternative were followed, pathways in which contaminants are being released to the atmosphere, biosphere, and hydrosphere would continue to exist and levels of contaminant release would remain, in general, as they are today. However, such a course of action would not be consistent with the intent of Congress in UMTRCA (PL95-604) and would not result in the DOE's compliance with the EPA standards (40 CFR Part 192). The analysis of the no-action alternative assumes that the present partial cover and vegetation are maintained on the tailings piles (requiring irrigation and fertilization) and that the piles remain structurally intact.

3.2.3 Alternative 2 - on-site stabilization

In this alternative, all tailings and other contaminated materials would be stabilized above grade at the mill site and tailings piles areas. The stabilization area would include about 38 acres of the 126-acre Durango site. At the Durango site, locations for placing the tailings are limited. For example, in the raffinate ponds area there is a fault line which limits the area that could be used. The area is also the proposed site of a pumping station for the Animas-La Plata project (see Section 4.9.2). The location for the on-site stabilization has been optimally located to provide the mildest slopes feasible and conditions as stable as possible given the existing geological and hydrological site surroundings. Also, the location was selected to minimize the quantity of contaminated material that would be moved.

To provide stabilization for the tailings and other contaminated materials, the following general scope of construction work would be required:

- Temporary security fences would be erected where needed.

- Diversion ditches would be constructed along the upgradient edge of the stabilization area to intercept and divert surface-water flows around the radioactively contaminated materials during the construction phase.

- All contaminated materials would be transported to the stabilization site and blended with the tailings during recontouring of the two piles into a single pile. Due to the present uncertainty of the geotechnical characteristics of the tailings, part or all of the tailings may have to be handled to provide stability. Any contaminated machinery that is found would be buried. The contoured pile would have more stable slopes of 3 horizontal to 1 vertical.

- A stabilization cover, consisting of five feet of clay soil overlain by one foot of sand and gravel bedding material and mantled by two feet of gravel, cobbles, and boulders, would be placed over the contaminated materials.

- A grouted riprap erosion barrier (large pieces of quarried rock bonded together by a mixture of cement and sand grout) for channelization and flood protection would be constructed at the toe of the stabilized pile along the south bank of Lightner Creek and the west bank of the Animas River.

- A permanent access barrier consisting of three-foot-high concrete posts connected by steel cable would be constructed around the stabilization area with warning signs, placards, monuments, and other security measures.

- The remaining 88 acres of the site would be released for unrestricted use.

Slope stabilization

Stabilization of the uranium tailings and other contaminated materials at the Durango site would involve flattening the existing slopes of the two tailings piles. The slopes on the tailings piles currently range from 1.3 to 2.5 horizontal to 1 vertical, with the majority being steeper than 2 horizontal to 1 vertical. In order to provide more stable slopes for the stabilized pile, the tailings would be removed from the top of the large tailings pile and placed around the toe of both piles, as well as between the two piles and on top of the small tailings pile. The elevation at the top of the large tailings pile is approximately 6720 feet and the elevation of the stabilized pile would be 6740 feet. The stabilized pile would be higher than the existing pile because of changes in its configuration and the addition of material from the raffinate ponds and other off-site locations.

This approach is based on the assumption that the tailings are homogeneous. However, additional data may indicate that the tailings are not homogenous and that some parts of the piles are more susceptible to slope failure. Should this be the case, more of the tailings would have to be excavated, blended, and compacted to achieve the desired safety factors.

The topographical restrictions and the limited plan dimensions of the Durango site, would not allow slopes flatter that 3 horizontal to 1 vertical if the toe of this pile is at least 20 feet from the banks of the Animas River and Lightner Creek. The 20-foot setback from the creek and river and the 3 horizontal to 1 vertical slopes represent a compromise between a flatter slope and less setback and a steeper slope and more setback. If all setbacks were eliminated, the slope could be flatter; however, even with no setback, the slope would still be steeper than 4 horizontal to 1 vertical.

Transportation

Transportation of the uranium tailings and other contaminated materials would be by scrapers and 25-ton-capacity trucks. The existing tailings piles would be recontoured as previously described Contaminated materials from the raffinate ponds area and off-site locations would be transported to the tailings site and added to the piles as the tailings were being recontoured. Details on the relocation of contaminated materials are presented in Appendix A, Conceptual Designs and Engineering Evaluations, Remedial Action Alternatives, in the DEIS.

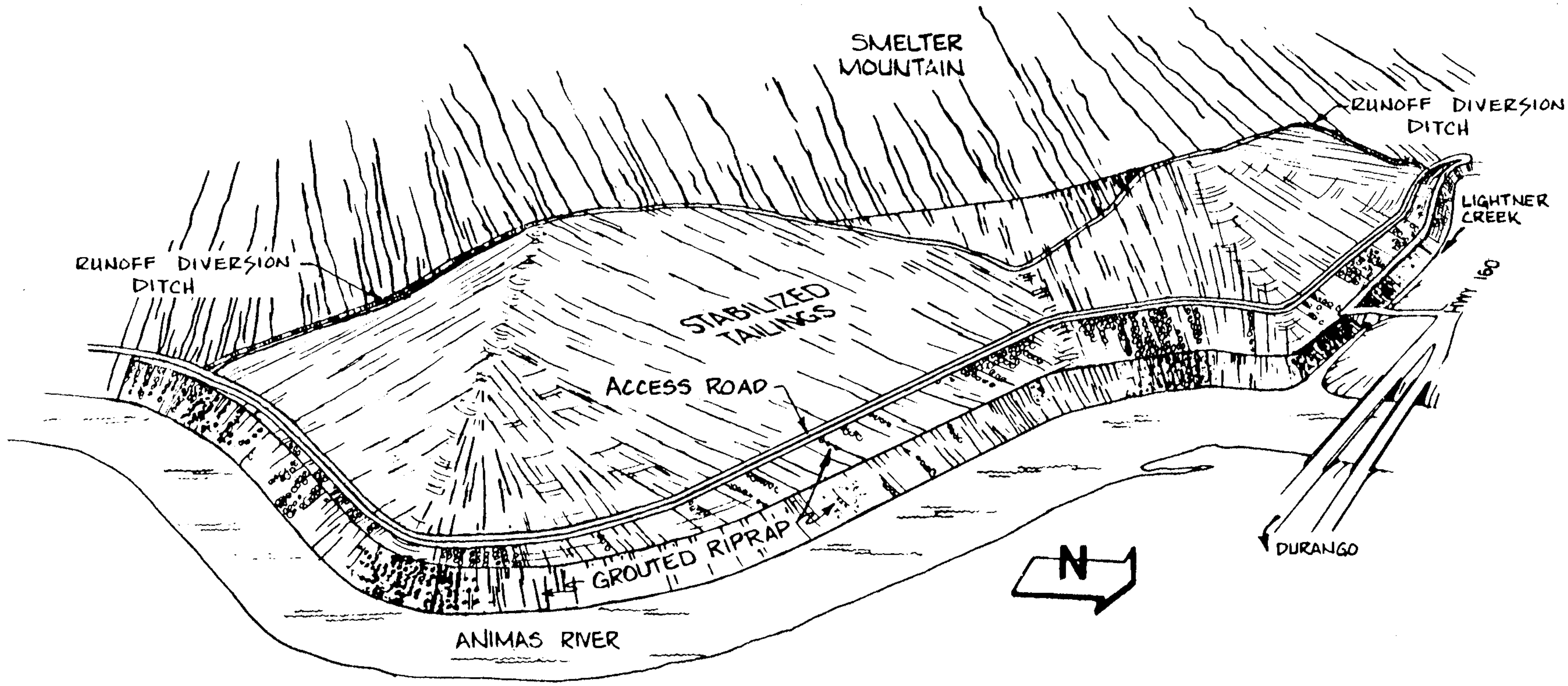
Following recontouring of the tailings, the slopes would be stabilized by placing a five-foot-thick clay cover over the contaminated materials. The clay soil would be excavated from two borrow sources located in and near Bodo Canyon Areas C and D (see Figure A-9, Appendix A, in the DEIS). It is estimated that 268,800 cubic yards of clay soils would be needed for the stabilization cover.

Surface-water control

In preparation for on-site stabilization, runoff diversion ditches (interception ditches) would be constructed along the boundary between the hillside and the tailings piles at the north and south ends of the stabilization area. These diversion ditches would intercept and divert surface-water flows around these areas, thereby reducing the quantity of contaminated water that must be handled during construction. The diversion ditches would discharge only uncontaminated water to the Animas River and Lightner Creek (Figures 3.2 and 3.3).

The ditches would be designed to control runoff from the Probable Maximum Precipitation (PMP) event, which would provide a very conservative design for normally expected runoff. The final design would determine ditch flow parameters and erosion-protection methods, and riprap size would be compatible with the level of design. However, periodic inspection would be necessary and repairs may be necessary from time to time.

A two-foot-thick blanket of grouted riprap would be installed over the interface between the tailings and the natural slope uphill of the stabilized pile. The blanket would consist of eight



NOT TO SCALE

FIGURE 3.2 SCHEMATIC OF ON-SITE STABILIZATION AT THE DURANGO SITE

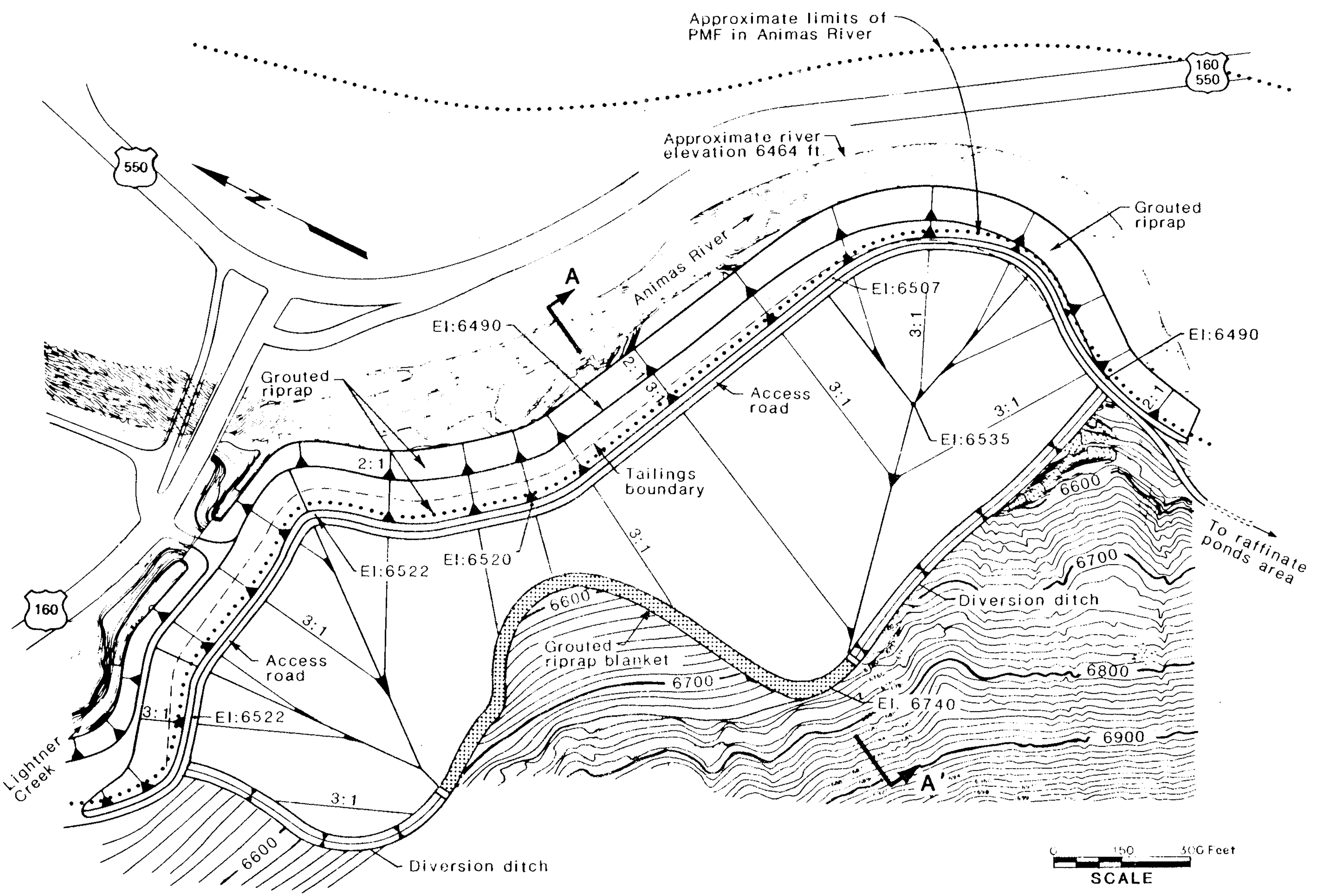


FIGURE 3.3 PLAN VIEW OF THE DURANGO SITE

to 16-inch-diameter quarried rock bonded together by a mixture of cement and sand grout and would extend along this interface between the diversion ditches (Figure 3.3). Runoff from approximately 70 acres above the stabilization area would flow into and along the diversion ditches, over the grouted riprap blanket, and over the slope-protection gravel to Lightner Creek and the Animas River. To protect the slopes of the stabilized tailings, the banks of Lightner Creek and the Animas River would be reinforced and channelized. Channelization would be accomplished by placing grouted riprap containing quarried rock up to 42 inches in diameter along the south bank of Lightner Creek, the west bank of the Animas River, and on the toe of the stabilized pile. The grouted riprap would be five feet thick and keyed into the Mancos Shale to a depth of five feet. The grouted riprap would require repeated maintenance to remain intact over the design life of the project.

The amount of water applied to control fugitive dust would be controlled so as to avoid excessive runoff. Runoff from contaminated areas would be channeled into a lined contaminated-water storage reservoir. The collected water would be available for use in tailings compaction, or would be either evaporated or treated and discharged to the Animas River.

Ground-water and infiltration control

Sources of ground-water recharge that increase the potential for ground-water contamination related to the stabilized uranium tailings and other contaminated materials are (1) inflow of ground water into the pile during periods of high flow in Lightner Creek and the Animas River, and (2) infiltration through the reclamation cover into the stabilized material.

Analyses were performed to evaluate the potential for groundwater seepage into the tailings pile under Probable Maximum Flood (PMF) conditions. Existing ground-water conditions, base elevation of the tailings pile, and the hydraulic conductivity of the alluvium were assumed based on the data provided by Bendix (BFEC, 1983).

The passage of the PMF would produce a river water surface elevation above the 6490 foot bottom elevation of the tailings for only about 25 hours at the upstream part of the tailings pile. The downstream portion of the tailings pile would experience a river water surface elevation above the 6490 foot elevation for less than 10 hours. This relatively short duration, considered with the grouted riprap erosion barrier and the permeability of the alluvium under the tailings, indicates that water would not rise into the tailings during the passage of the PMF.

The primary barrier against infiltration of surface runoff into and through the tailings pile would be the reclamation cover. The cover would consist of a five-foot layer of recompacted clayey soil overlain by a one-foot layer of sand and fine gravel bedding material and a two-foot-thick surface layer of 14-inch-minus sized boulders, cobbles, and gravel for erosion protection (Figure 3.4).

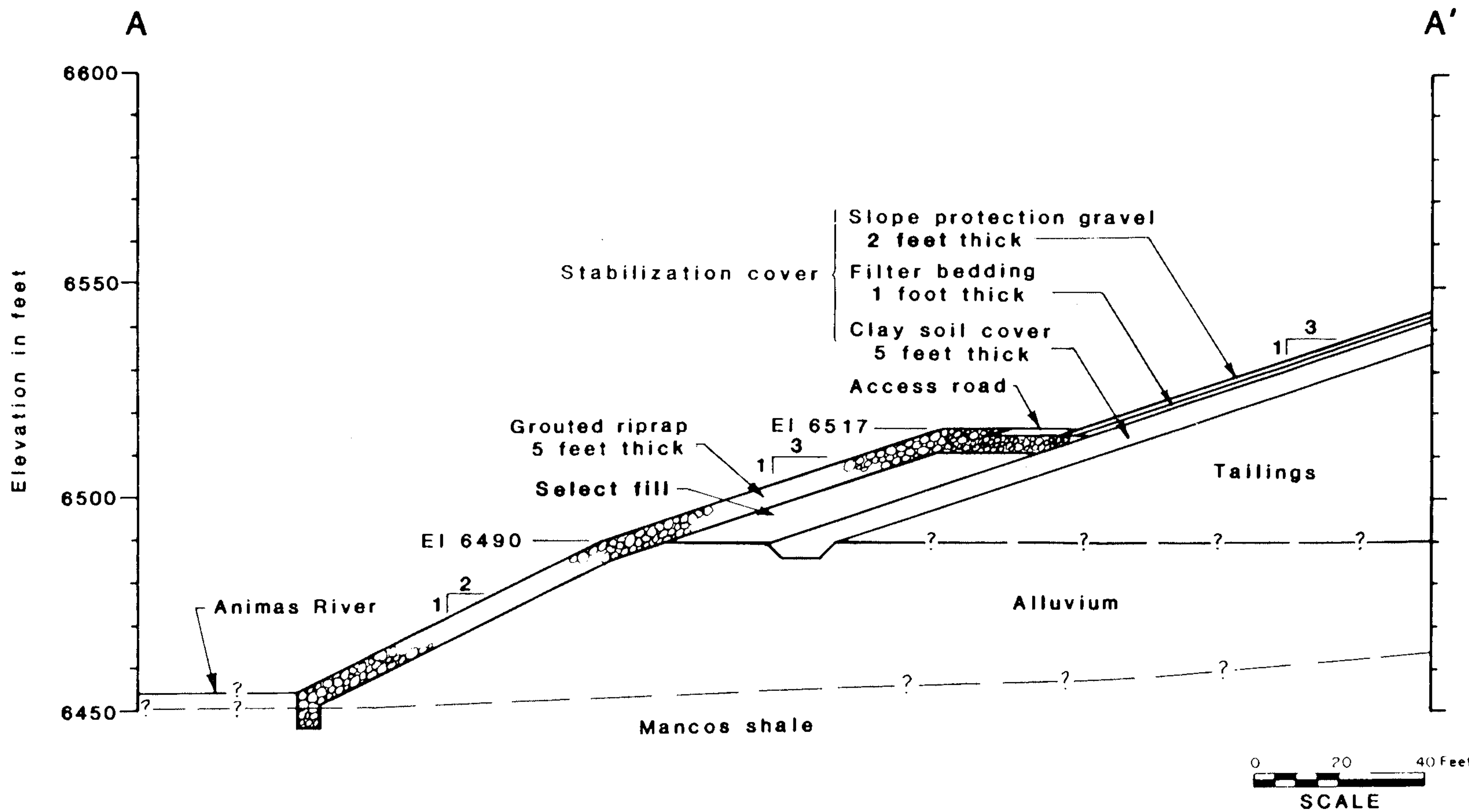
Analyses were performed to estimate the infiltration that would take place through the stabilization cover. The mean annual precipitation at Durango is approximately 18.7 inches (Gale Research Company, 1980). The permeability of the compacted clayey soil to be used for the stabilization cover is approximately 0.1 foot per year (Dames & Moore, 1983), and, therefore, the rate at which water would infiltrate the soil is very low. Further, the slope of the stabilized pile would be 3 horizontal to 1 vertical. Because of the low infiltration rate of the clayey reclamation cover soils combined with the steepness of the slopes of the stabilized pile, it is estimated that 98 percent of the average annual precipitation would run off the stabilized tailings pile (USBR, 1977). Only a small portion of the remaining two percent, or 0.4 inch per year, would percolate through the stabilization cover and tailings pile to be ultimately released as leachate from the base of the pile.

The mean annual lake evaporation in the Durango area is approximately 42 inches (USDC, 1968), or 2.25 times the mean annual precipitation. Thus, the Durango area is in a net evaporation area. Limited theoretical and field studies have shown that evaporation from bare soils, such as the surface of the stabilized tailings pile, varies from about 10 to 95 percent of that from a free water surface, depending on the degree of saturation of the soil surface (Chow, 1964). Assuming even the lowest end of this range of 10 percent, the evaporation rate can be expected to be at least 4.2 inches per year which exceeds the amount of moisture that is estimated to be available for infiltration. For this reason, it is anticipated that infiltration through the reclamation cover and into the tailings would be small and have a negligible impact on water quality.

3.2.4 Alternative 3 - stabilization at Bodo Canyon--the preferred alternative

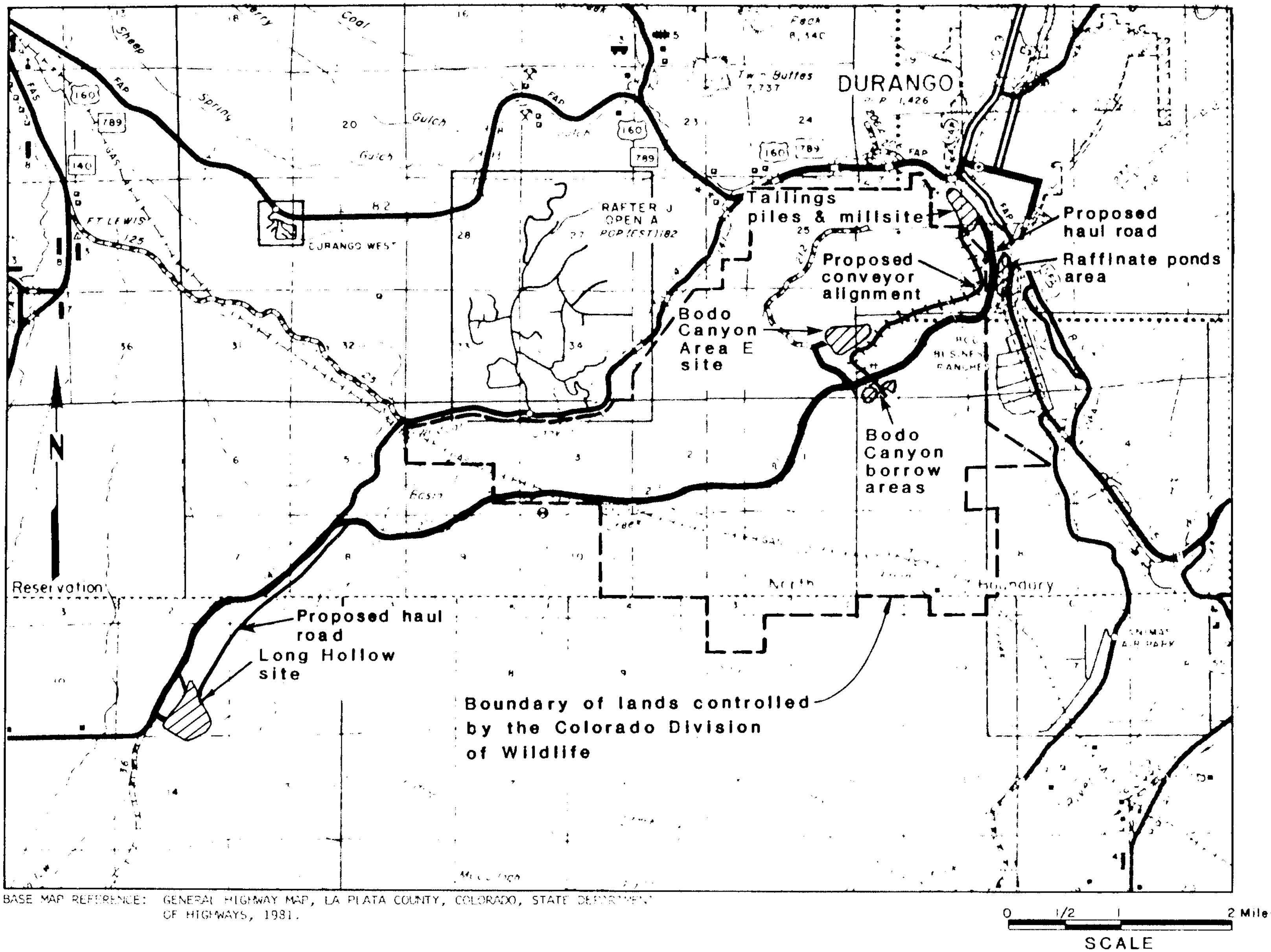
In this off-site remedial action alternative, the uranium tailings and other contaminated materials would be stabilized at the Bodo Canyon site (Figure 3.5). The Bodo Canyon site is an approximately 41-acre parcel of land located approximately 3.5 road miles southwest of the Durango site. The tailings would be contained by a clay liner three feet thick, a radon barrier consisting of five feet of clayey soils followed by two feet of rock including filter layers for erosion protection, and four embankments constructed from on-site clayey soils and weathered shale.

Two transportation modes are options with Alternative 3. Transportation of the tailings and contaminated material from the Durango site to the Bodo Canyon site by truck is addressed as option 3a or Alternative 3a. Transportation of the tailings and contaminated material to the Bodo Canyon site primarily by conveyor is addressed as option 3b or Alternative 3b. Alternative 3a was



Note: Depth of tailings and thickness of Alluvium are not known.

FIGURE 3.4 DETAIL OF CROSS SECTION A-A' AT TOE OF STABILIZED PILE FOR THE DURANGO SITE



BASE MAP REFERENCE: GENERAL HIGHWAY MAP, LA PLATA COUNTY, COLORADO, STATE DEPARTMENT OF HIGHWAYS, 1981.

FIGURE 3.5 MAP OF AREA SHOWING LOCATIONS OF THE DURANGO, BODO CANYON, AND LONG HOLLOW SITES AND THE TRANSPORTATION CORRIDORS

described in the DEIS; however, Alternative 3b has been added in this FEIS as a result of a reevaluation of remedial-action alternatives.

The remedial action, with either option, would include the following five basic phases:

1. Preparation of the Durango site and upgrading of the roads to the disposal site, and installation of temporary security fences where needed at both the Durango and Bodo Canyon sites.

2. Preparation of the Bodo Canyon disposal site.

3. Excavation, transportation, and placement of the uranium tailings and other contaminated materials.

4. Reclamation of the decontaminated Durango site; release of the 126-acre Durango site for unrestricted use.

5. Reclamation and revegetation of areas adjacent to the Bodo Canyon disposal site, and borrow areas; erection of a permanent access barrier consisting of three-foot-high concrete posts connected by steel cable (or like system) around the stabilization area with warning signs, placards, monuments, and other security measures at the Bodo Canyon site.

Alternative 3a - Stabilization at Bodo Canyon with Truck Transportation

Preparation of the Durango site and haul roads

Before contaminated materials could be moved, haul roads would be built and site preparation at the Durango site would be completed. This preparatory work would include upgrading of haul roads between the Durango site and the Bodo Canyon site, and construction of access roads across the Durango site, a truck-wash station, a contaminated water storage reservoir, and temporary security fences where needed.

The road between the Durango site and the Bodo Canyon site would be widened and improved. A minimum width of 35 feet would be required for two-way traffic of the 25-ton-capacity haul trucks. The haul road would be compacted, a geotextile fabric placed to improve the trafficability, and the haul road would be surfaced with gravel. Water or a chemical dust palliative would be applied as required to minimize dust.

Access roads would have to be constructed on the east slope of Smelter Mountain at the Durango site to allow excavation and removal of the uranium tailings. The first haul road would extend from the top of the large tailings pile to the main haul road at the south edge of the raffinate ponds area (see Figure A-19,

Appendix A, Conceptual Designs and Engineering Evaluations, Remedial Action Alternatives, in the DEIS).

A two-stage, truck-wash station would be constructed at the south end of the Durango site. This facility would automatically wash the exterior of all vehicles prior to their leaving. The vehicles would be washed initially with recycled second-stage rinse water; they would then go through the second-stage rinse using fresh water.

Contaminated wash water and all contaminated water collected on the site would be pumped to the contaminated water storage reservoir. The storage reservoir would be located near the south end of the Durango site and lined with an impermeable synthetic liner material to minimize seepage losses. The reservoir would be sized to store up to 5.5 acre-feet of water during the winter months. Included in this storage allocation is sufficient volume to store the 24-hour 100-year runoff from the truck-wash station, a tailings working area of about four acres, and direct precipitation on the pond itself (see Appendix A, Conceptual Designs and Engineering Evaluations, Remedial Action Alternatives, Section A.5.3.4, of the DEIS). During the summer months when evaporation is highest, a minimum volume of 0.5 acre-foot of water would be maintained in the reservoir for dust control in contaminated areas on the site.

Temporary security fences and gates would be installed to limit access to the Durango site during remedial action.

Preparation of the Bodo Canyon site

Site preparation at the Bodo Canyon site would be undertaken concurrently with preparations at the Durango site. The Bodo Canyon site preparation would include construction of a network of surface-water runoff controls, stripping and stockpiling 0.5 foot of topsoil from the disposal area, construction of four perimeter embankments, the first section of the liner, a truck-wash station, a water storage reservoir, and temporary security fences.

Diversion channels would be lined with riprap of the proper size to withstand erosive water velocities caused by the Probable Maximum Precipitation (PMP). The Remedial Action Plan (DOE, 1985) contains a description of the methods used to calculate the riprap size.

Surface-water runoff from a total of approximately 12 acres from four small drainage areas upslope from the perimeter of the disposal area would be diverted during construction by a network of ditches. These diversion ditches would collect surface runoff along the upstream edges of the site and direct the runoff into drainage channels cut through surrounding ridges for discharge into adjacent drainages (Figure 3.6). The diversion ditches would be sized to collect and divert runoff from the PMP event. The final design of the ditches would provide for reasonable slopes and velocities for the PMP runoff. The drainage channels would be

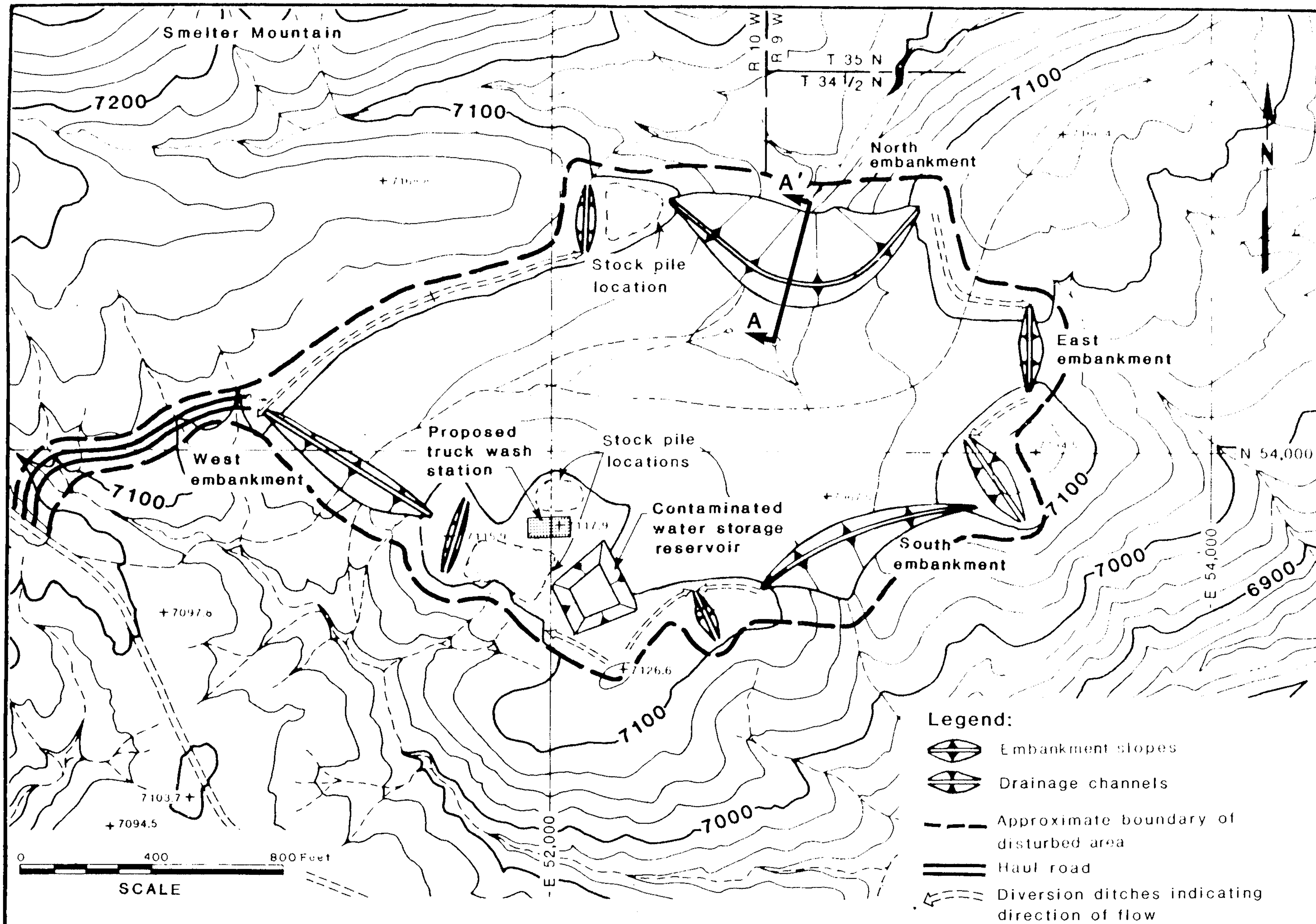


FIGURE 3.6 CONSTRUCTION FEATURES AT THE BODO CANYON SITE

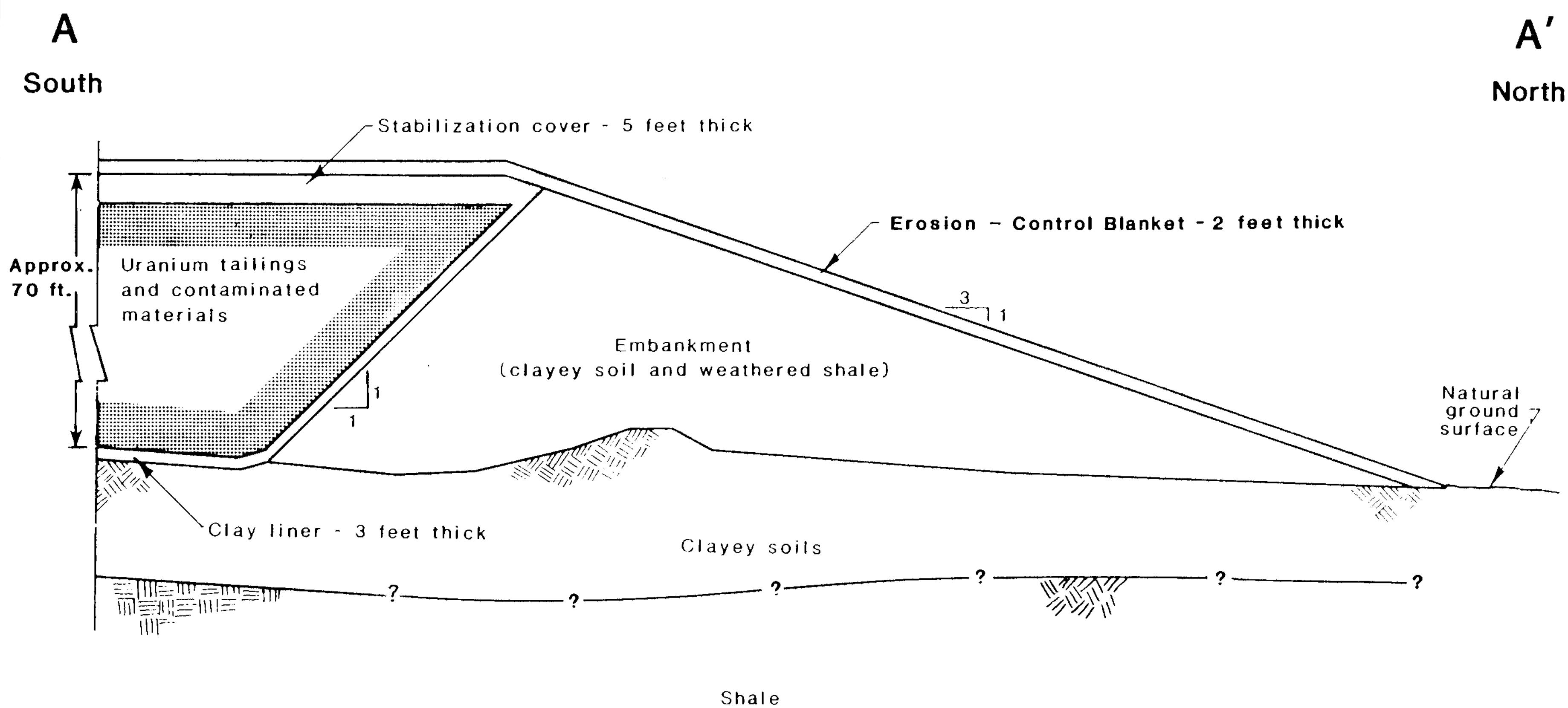
lined with riprap such that the ditches would withstand the erosional forces occurring during this very severe event. However, periodic inspection would be required to ensure that repeated lesser flows are not allowed to cause cumulative damage. Additional erosion protection would be provided for the existing drainages near the site to ensure that migration of their channels would not impact the stabilized tailings.

A 0.5-foot-thick layer of topsoil would be stripped from within the area of the disposal site and stockpiled for future use.

Construction of four perimeter embankments would be required to provide adequate volume for the anticipated 1,617,000 cubic yards of contaminated materials to be placed at the Bodo Canyon site (see Figure 3.6). The embankments would be constructed of earthen materials excavated from within the perimeter of the disposal site. During embankment construction, selected clayey soils would be placed on the inside slopes as part of the liner system. The interior and exterior slopes of the embankments would be 1 horizontal to 1 vertical and 3 horizontal to 1 vertical, respectively (Figure 3.7).

Exterior slopes of 3 horizontal to 1 vertical were chosen over flatter slopes to avoid blocking adjacent drainages which would have required extensive diversion or armoring of the toes of the embankment slopes. Additional armoring at the toe of the north embankment, to protect against erosion from PMP runoff in the east-west drainage near the toe, would be required. Erosion protection would be provided to control gully formation. This would require 40,000 cubic yards of rock 15 inches in diameter at the head of the present gully formation. Detailed design of these erosion protection measures would be prepared during the final design. Interior slopes of 1 horizontal to 1 vertical are adequate to hold the interior slopes in place prior to placement of the tailings. The outside slopes of the embankments would be covered with a three-foot-thick layer of two-foot-minus sized boulders, cobbles, and gravel for erosion protection. These riprap materials would be obtained from an inactive quarry west of the raffinate ponds area or other sources. Detailed analyses of the embankment stability are in Appendix A, Conceptual Designs and Engineering Evaluations, Remedial Action Alternatives, Section A.5.2.6 in the DEIS.

A truck-wash system similar to the unit at the Durango site would be constructed at the Bodo Canyon site. After depositing loads of contaminated materials and before leaving the disposal site, each vehicle would pass through a two-stage truck wash to cleanse its exterior. The contaminated wash water would be pumped to a water storage reservoir at the Bodo Canyon disposal site (see Figure 3.6). As with the Durango site reservoir, the contaminated water storage reservoir at the Bodo Canyon site would contain all excess contaminated water. The reservoir would be sized to maintain a minimum volume of 0.5 acre-foot for on-site dust control (in contaminated areas) with a maximum storage volume of 5.1 acre-feet, which includes a 100-year flood storage volume similar to that described for the Durango site.



Note: 1. This section is typical for all embankments at Bodo Canyon site.
2. Location of cross section is shown in Figure 3-6.

CROSS-SECTION NOT TO SCALE

FIGURE 3.7 CROSS SECTION THROUGH NORTH EMBANKMENT AT THE BODO CANYON SITE

The final phase of site preparation would be to construct the first section of the three-foot-thick compacted-clay liner (Figure 3.8). By staging the construction process, the exposed area of contaminated materials would be minimized, and most of the liner and stabilization-cover materials would have to be moved only once.

Excavation, transportation, and placement of uranium tailings and other contaminated materials

The Durango site excavation plan calls for the construction of haul roads on the east slope of Smelter Mountain to the top of the large tailings pile and excavation of the tailings in six- to 10-foot-thick lifts. As the excavation proceeded, new haul roads would be constructed at 30-foot intervals as the pile was lowered. When the top elevation of the large tailings pile was lowered enough to match that of the small pile, both piles would be excavated at the same time until all contaminated materials were removed. Additional equipment would be excavating the contaminated materials in the mill site area and the raffinate ponds area.

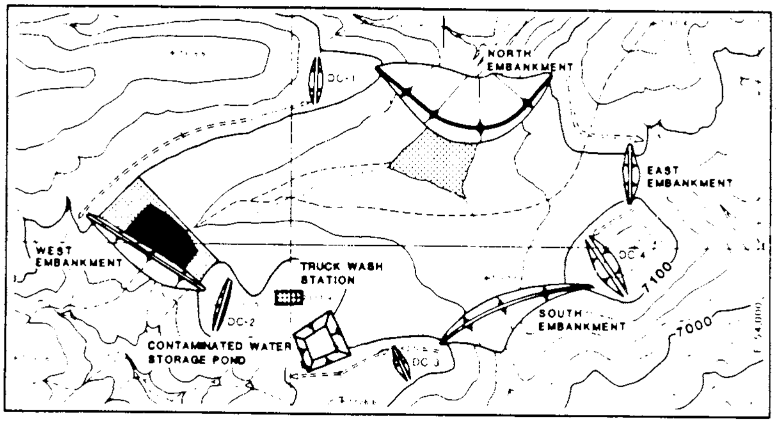
Once the uranium tailings and other contaminated materials were excavated, they would be loaded into 25-ton-capacity trucks fitted with removable covers and water seals on the end gates to minimize loss of contaminated materials during transportation. As explained previously, before the trucks left the Durango site, they would pass through a two-stage wash system to remove any contaminated materials from the outside of the trucks.

Each truck would follow the Bodo Canyon Road (County Road 211) to the Bodo Canyon site. Upon arriving at the disposal site, the trucks would dump their loads on previously prepared sections of the three-foot-thick compacted-clay liner (Figure 3.8). Contaminated materials would be dumped, spread with graders, and compacted. A three-foot-thick clay liner is considered thick enough to withstand the brief, one-time traffic of 25-ton-capacity trucks and other equipment. The deposition sequence is such that each segment of clay liner is only subjected to one pass of a truck or other construction equipment before it is covered with tailings. This placement sequencing would be covered with a minimum five-foot layer of compacted clay excavated from within the basin.

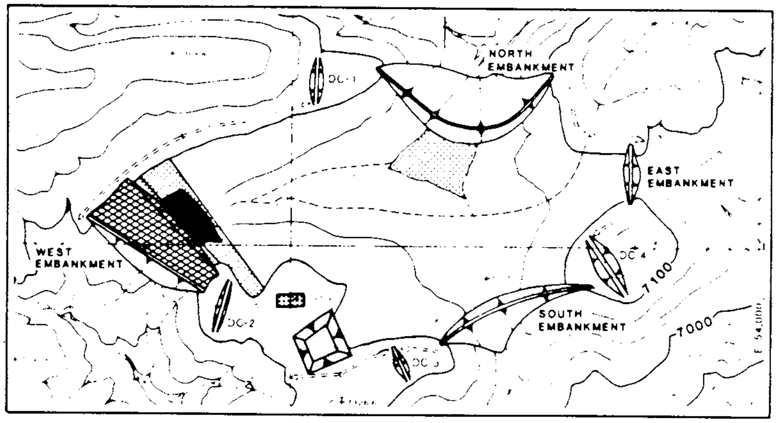
After the trucks dumped their loads at the disposal site, the bed covers would be resecured and the exterior of the trucks washed prior to leaving the site. The cleaned trucks would then return down the Bodo Canyon Road to the Durango site for another round trip.

Restoration and vegetation of the decontaminated Durango site

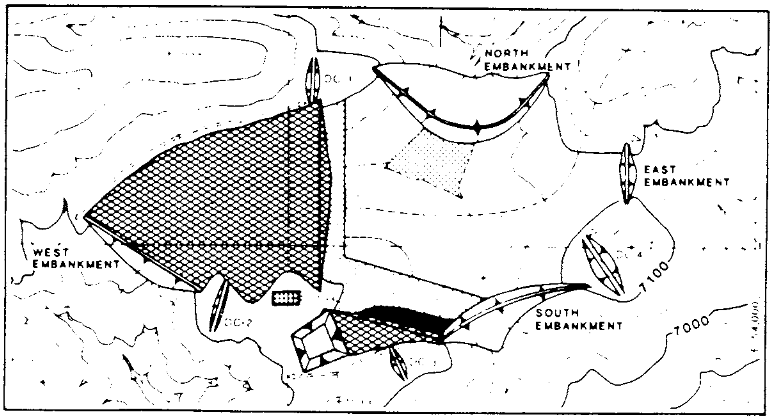
To decontaminate the Durango site, approximately 1,617,000 cubic yards of uranium tailings and contaminated materials would



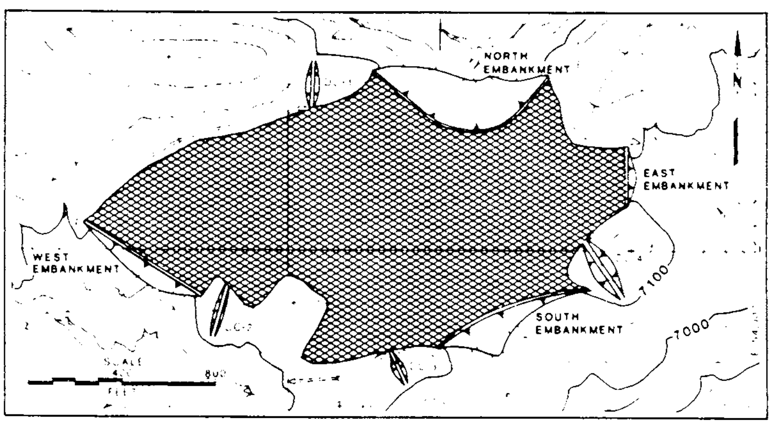
STEP 1
- Initial site preparation
- First section of clay lining is complete
- First section of tailings is being deposited



STEP 2
- First section of tailings has been placed to design elevation
- First section of tailings has been covered with a minimum of **5.0** feet of reclamation material
- Second section of clay lining is complete
- Tailings are being placed in second working section



STEP 3
- **The valley east of the west embankment has been filled with tailings, covered with 5.0 feet of reclamation cover & graded to final configuration**
- **Clay liner has been placed west of the south embankment**
- **Tailings are deposited on clay lining located west of south embankment**
- **Final 2.0 feet of erosion protection cover has been placed on tailings located on west side of site**



STEP 4
- **5-foot thick reclamation cover & 2-foot-thick erosion protection is in place & final contouring complete**

LEGEND

LINED AREA

CONTAMINATED MATERIALS PLACED

STABILIZED AND RECLAIMED SURFACE

EMBANKMENT SLOPES

DISCHARGE CHANNELS

DC-1

DIVERSION DITCHES INDICATING DIRECTION OF FLOW

FIGURE 3.8 CONSTRUCTION STAGING FOR THE BODO CANYON SITE

be moved to the Bodo Canyon site. This volume would include contaminated natural soils, and materials imported from vicinity-property cleanup. After all the contaminated soils had been removed from the Durango site, the contaminated water storage reservoir would be retained until all the water had evaporated. The synthetic lining would then be removed and taken to the disposal site. To restore the Durango site to desired grade, approximately 187,000 cubic yards of fill material would be imported from off-site borrow sources, dumped, placed, and graded. The areas excavated adjacent to Smelter Mountain would be backfilled to ensure the stability of the mountain slopes. If appropriate for proposed land use, reclamation would also include revegetation of the Durango site. Finally, the temporary security fences would be removed and the entire 126-acre Durango site would be released for unrestricted use.

Reclamation and revegetation of the Bodo Canyon site

After deposition and grading of the uranium tailings and other contaminated materials reached the design elevation, they would be covered with five feet of clay followed by two feet of rock, including a filter layer for erosion protection. This stabilization cover would be graded to provide controlled drainage of surface runoff from the site (Figure 3.9).

The only area that would not be covered immediately would be the contaminated water storage reservoir. Before covering this structure, the water in the basin would be allowed to evaporate, after which the sides of the synthetic liner would be folded in and a five-foot-thick stabilization cover placed over the reservoir.

A 0.5-foot-thick layer of topsoil would be placed on the disturbed areas not covered by riprap or gravel and would be revegetated. The embankment would be protected from erosion by a three-foot-thick blanket of two-foot-minus sized boulders, cobbles, and gravel. Permanent access barriers consisting of three-foot-high concrete posts connected with steel cable or a similar barrier would be installed around the stabilized area.

The area disturbed at the Bodo Canyon borrow site would be recontoured, covered with the stockpiled topsoil, and revegetated.

Alternative 3b - Stabilization at Bodo Canyon with Transportation Primarily by Conveyor

Preparation of the Durango site and transportation routes

As part of Alternative 3b, the Durango site would be prepared by installing Sauerman scrapers at the tailings piles and constructing loading hoppers and chutes for the conveyor system. The access road leading from the Durango tailings piles to the raffinate ponds would be improved for one-way truck traffic and installation of the conveyor. A truck-wash station, contaminated wa-

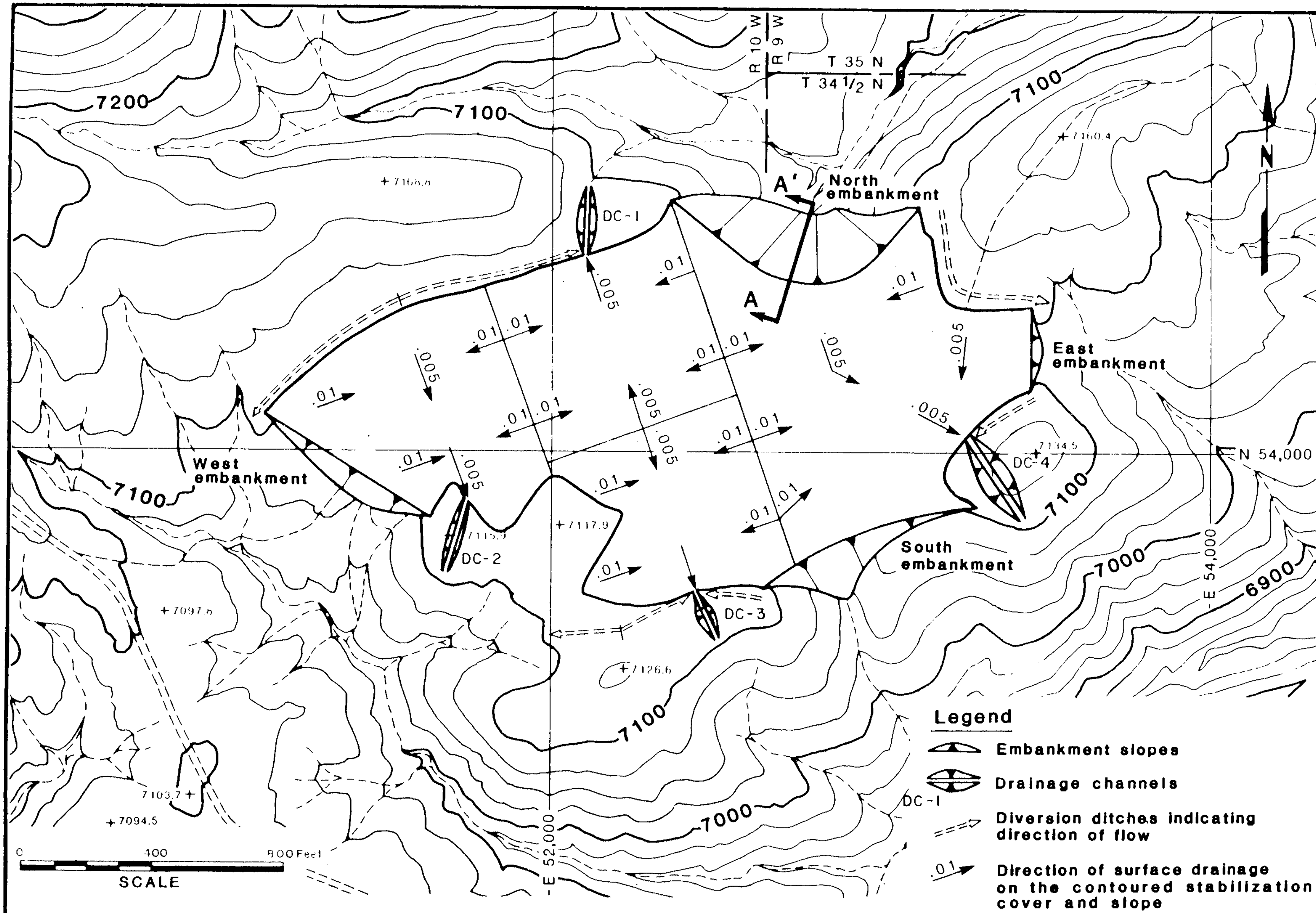


FIGURE 3.9 SURFACE-WATER CONTROLS AT THE BODO CANYON SITE

ter storage reservoir, and temporary security fences would be constructed as has been described for Alternative 3a, the truck option.

County Road 211 between the raffinate ponds area and the Bodo Canyon site would be improved by constructing as many as three turnouts, installing a geotextile fabric, and placing a layer of gravel on the road bed. This is needed for haul trucks to be able to pass each other on narrow parts of the road, and to ensure that the integrity of the road would be maintained during heavy usage.

A pipe conveyor would be constructed having a total approximate length of 12,300 feet between the Durango tailings site and the Bodo Canyon disposal site. A pipe conveyor differs from a conventional belt conveyor in that after the material is loaded onto the belt, the rollers (idlers) roll the belt around the material forming a pipe configuration. With the material enclosed in the belt there would be little opportunity for spillage or dust emissions during transport. The conveyor route would begin at the tailings piles and follow the access road at the base of Smelter Mountain south for 4300 feet to the raffinate ponds. A hopper loader would be constructed at the raffinate ponds area so that contaminated materials could also be loaded. The conveyor route would continue from the raffinate ponds area climbing west to a ridge between the Bodo Canyon road (County Road 211) and the north drainage. The last part of the conveyor route continues up the ridge to the Bodo Canyon site (see Figure 3.5). Construction of the conveyor and access road would occupy an area 20 feet wide along the route of the conveyor. Some limited grading of the conveyor route would be done to provide access to construction equipment. Culverts would be installed at ephemeral stream crossings. The Addendum to Appendix A, Conceptual Design and Engineering Evaluations, Remedial Action Alternatives, in this FEIS describes other details of the site preparation and transportation.

Preparation of the Bodo Canyon site

Preparation of the Bodo Canyon site would be essentially the same as for the truck option, Alternative 3a, with the following exceptions. Pads for unloading tailings from the conveyor would be constructed on the south side of the site and a radial stacking conveyor or another type of distribution conveyor would be erected. A conveyor would be constructed between the Bodo Canyon disposal site and the Bodo Canyon borrow area over a distance of approximately 2000 feet. This would be used to transport clayey soils to the Durango site for site restoration.

Excavation, transportation, and placement of uranium tailings and other contaminated materials

Tailings would be excavated from the piles using Saurman scrapers which would be anchored to large crawler tractors located at the top of each pile. As the bucket descended the slope, tailings would be loaded into the bucket and then emptied into the hopper loader at the bottom of the piles. Tailings would be excavated and loaded onto the conveyor at a rate of approximately 800 tons per hour (TPH). In addition to the scrapers, one crawler tractor dozer and one back hoe would be used on the piles to move the tailings to the scraper path.

Bulky rubble from the demolition of buildings and the smelter stack would be hauled by truck to the Bodo Canyon site rather than by conveyor. Trucks would be operated and cleaned as described in the description of the truck transport option.

Tailings would be unloaded at Bodo Canyon using a radial stacking conveyor or another type of distribution conveyor. After being unloaded, the tailings and contaminated material would be spread and compacted on the prepared clay liner in a manner similar to the plan for the truck transport option. Excavation, transportation, and placement of the tailings are described in more detail in the Addendum to Appendix A, Conceptual Designs and Engineering Evaluations, Remedial Action Alternatives, of this FEIS.

Restoration and vegetation of the decontaminated Durango site

Restoration and vegetation of the Durango site would proceed as described for the truck transportation option, with the following exception. The 187,000 cubic yards of fill material would be transported from the Bodo Canyon borrow area to the Durango site by means of the pipe conveyor. To accomplish this, the conveyor belt would be washed with high pressure water sprays, the conveyor terminals would be reversed, and the conveyor belt would operate in a downhill mode.

3.2.5 Alternative 4 - stabilization at Long Hollow

In the second off-site remedial action alternative, the uranium tailings and other contaminated materials would be transported to the Long Hollow site for stabilization (see Figure 3.5). The Long Hollow site is an approximately 80-acre parcel of land located approximately 11 road miles southwest of the Durango site.

The stabilization process would include the same five basic phases as for the Bodo Canyon alternative (see Section 3.2.4).

Preparation of the Durango site

The site preparation of the Durango site for Alternative 4 would be the same as described for the Bodo Canyon site alternative (see Section 3.2.4).

Preparation of the Long Hollow site

At the same time that the Durango site was being prepared, site preparation at the Long Hollow disposal site would be initiated. Disposal-site preparation would include construction of perimeter diversion channels, stripping and stockpiling 0.5 foot of topsoil from the stabilization area, construction of an underdrain and clay liner, construction of an earthen embankment across the valley floor, construction of a truck-wash station, construction of a water storage reservoir, and erection of temporary security fences and gates.

Surface-water runoff from approximately 445 acres of drainage area upslope from the site would be controlled during construction by diversion channels. These channels would collect the runoff along the edges of the site and direct it into the Long Hollow drainage channel south of the earthen embankment (Figure 3.10). The diversion channels would be sized to collect and divert runoff from the PMP event. The final design of the channels would provide for reasonable slopes and velocities for the PMP runoff. Riprap would be provided such that the channels would withstand the erosional forces occurring during this very severe event. Periodic inspections would be made as part of the surveillance and maintenance plan to ensure that repeated lesser flows are not allowed to cause cumulative damage.

A 0.5-foot-thick layer of topsoil would be stripped from segments of the disposal and borrow areas and stockpiled for future use.

An underdrain and liner would be constructed by excavating six feet of natural material from within the stabilization area and stockpiling this material on the site. An underdrain, designed as a graded filter, would then include the use of vitrified clay pipe to achieve the necessary capacity of three cubic feet per second (see Section A.6.2.2, Appendix A, Conceptual Designs and Engineering Evaluations, Remedial Action Alternatives, of the DEIS for design details). The underdrain would extend to 20 feet from the limit of the tailings and to the center line of the earthen embankment. The underdrain would be overlain by a three-foot-thick compacted-clay liner that would underlie the tailings and extend to the centerline of the earthen embankment. The underdrain is required to provide an avenue for the movement of shallow ground water to the south and to thereby prevent mounding of ground water beneath the tailings.

Construction of an embankment would be required to provide adequate volume for the anticipated 1,617,000 cubic yards of contaminated materials. The embankment would be constructed of earthen materials excavated from the diversion channels. These materials would include the same type of clay soils excavated from within the stabilization area, and select clayey soil would be compacted on the interior slope of the embankment, thus, becoming part of the liner system. Interior and exterior slopes on the embankment would be 1 horizontal to 1 vertical and 5 horizontal to 1 verti-

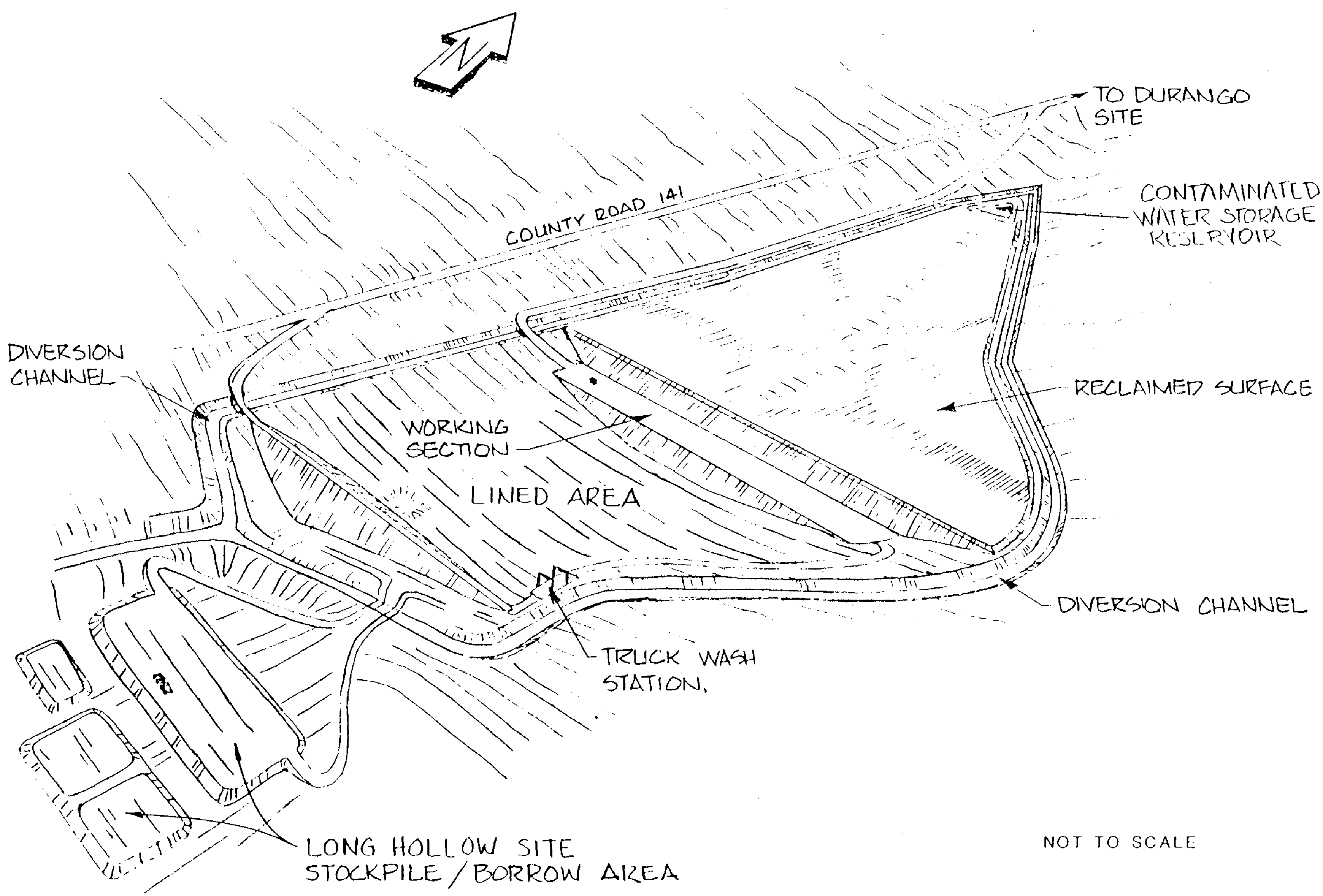


FIGURE 3.10 SCHEMATIC DIAGRAM OF EARTHWORK OPERATION AT THE LONG HOLLOW SITE

cal, respectively (Figure 3.11). Interior slopes of 1 horizontal to 1 vertical are adequate to hold the interior slopes in place prior to placement of the tailings.

A truck-wash system similar to the unit at the Durango site would be constructed at the Long Hollow site (see Figure 3.10). After the trucks deposited their loads of contaminated materials and before leaving the disposal site, each vehicle would pass through the two-stage truck wash, which would wash contaminated material from the outside of the truck.

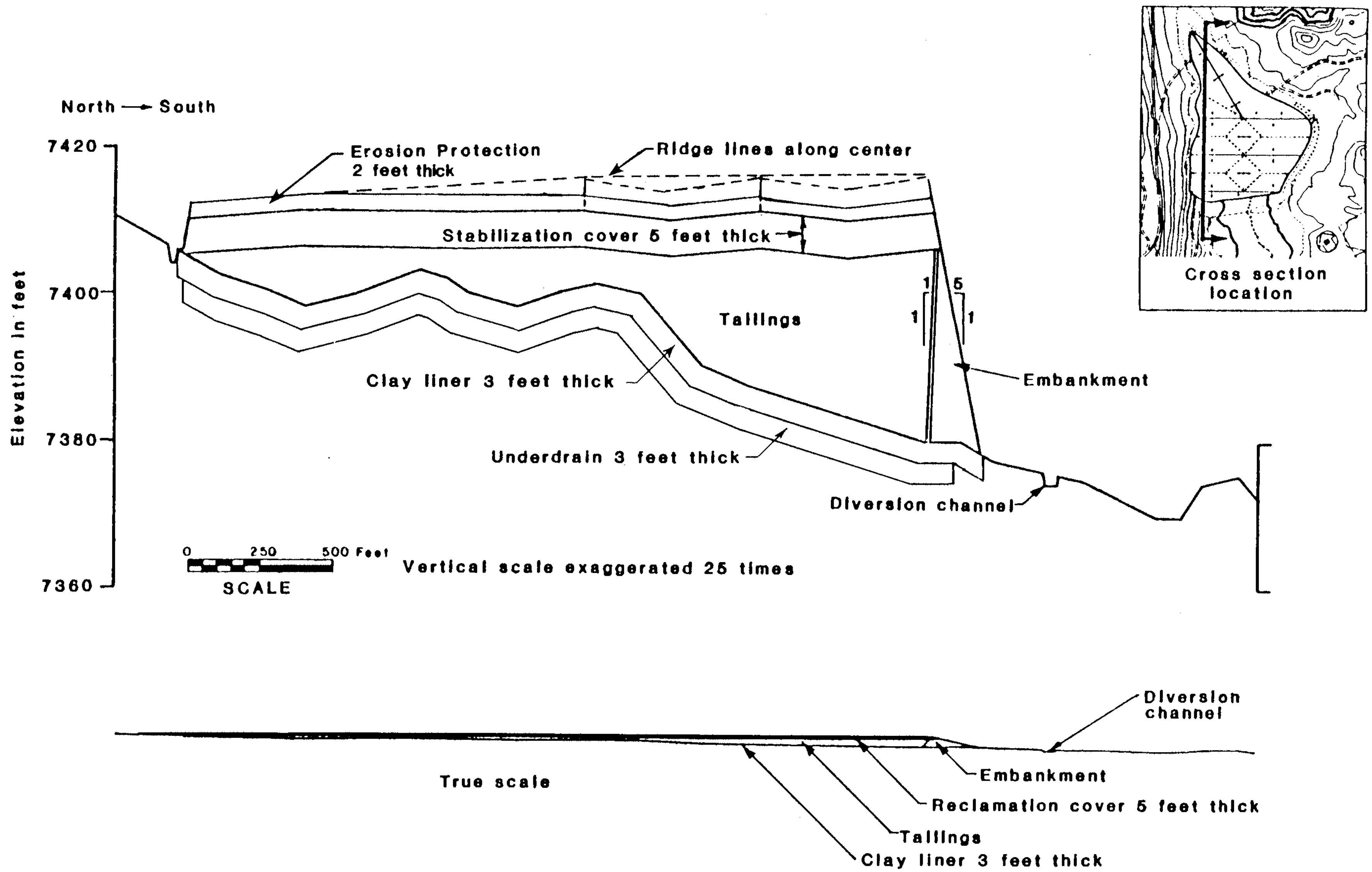
The contaminated wash water would be pumped to a contaminated water storage reservoir at the upper end of the Long Hollow site. This contaminated water storage reservoir would contain all excess contaminated water collected on the Long Hollow site. The reservoir would be sized to maintain a minimum water volume of 0.5 acre-foot (163,000 gallons) for on-site dust control, and would have a maximum storage volume of 5.5 acre-feet. Included in this storage allocation is sufficient volume to store runoff from a 24-hour 100-year storm event from the truck-wash station, a tailings working area of about eight acres, and direct precipitation on the reservoir.

Excavation, transportation, and placement of uranium tailings and other contaminated materials

The Durango site excavation plan calls for the construction of haul roads on the east slope of Smelter Mountain to the top of the large tailings pile, then excavation of the tailings in six- to 10-foot-thick layers. As excavation proceeded, a new haul road would be constructed after each 30-foot drop in elevation until the entire pile was removed. After the top elevation of the large tailings pile was lowered to that of the small pile, both piles would be worked concurrently until all contaminated material was removed. While the tailings were being removed, additional equipment would be moving the contaminated materials in the mill site and the raffinate ponds areas.

Once the tailings and other contaminated materials were excavated, they would be loaded into 25-ton-capacity trucks. The truck beds would be fitted with water seals on the end gates and removable covers to minimize loss of contaminated materials during transportation. As explained previously, before the trucks left the Durango site, they would pass through a two-stage wash system to remove any contaminated materials from their exterior. After the wash, each truck would follow County Road 211 (Bodo Canyon Road and Ridges Basin Road) to a haul road constructed parallel to County Road 141 (Wildcat Canyon Road), which would take them to the Long Hollow site.

Upon arrival at the Long Hollow disposal site, the trucks would dump their loads on the lining. The contaminated materials would then be spread with graders and compacted. The tailings would be placed in 100-foot-wide strips until the design elevation



Reference: FMFA, 1978.

FIGURE 3.11 LONGITUDINAL CROSS SECTION OF STABILIZED TAILINGS

of the strip was reached. After the contaminated materials reach the design elevations, they would be covered with a minimum five-foot-thick layer of compacted clay followed by two feet of rock including filter layers (1 inch $\leq D_{50} \leq$ 2 inches) on the topslopes for erosion protection. Materials for the clay cover would be excavated on the site. If necessary, additional clay soils would be obtained from the Bodo Canyon borrow area.

After the trucks dumped their loads at the disposal site, the bed covers would be resecured and the truck's exterior washed prior to leaving the site. The cleaned trucks would then return to the Durango site by the same route for another round trip.

Reclamation of the decontaminated Durango site

As discussed for the Bodo Canyon alternative, to decontaminate the Durango site, approximately 1,617,000 cubic yards of uranium tailings and contaminated materials would be moved. This volume would include contaminated natural soils, and materials imported from vicinity-property cleanup. The contaminated water storage reservoir would be maintained until all the water had evaporated; the synthetic lining and the soil immediately around the liner would then be removed and taken to the disposal site. To restore the Durango site back to desired grade, approximately 187,000 cubic yards of fill material would be imported from the Bodo Canyon borrow area. The reclamation process would also include revegetation of the Durango site. The areas excavated adjacent to Smelter Mountain would be backfilled to ensure the stability of the mountain slopes. Temporary security fences would then be removed. Following reclamation, the 126-acre Durango site would be released for unrestricted use.

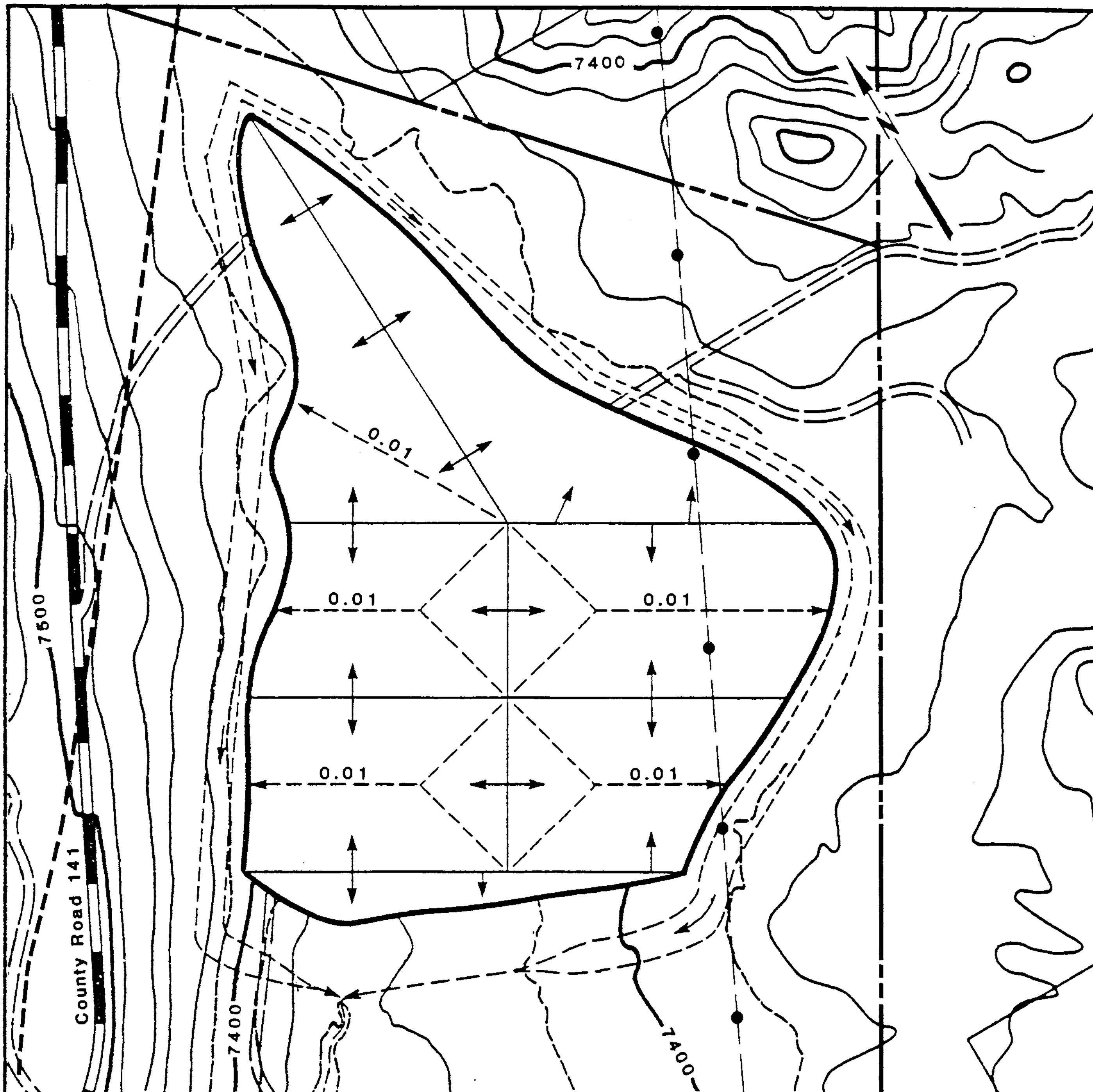
Reclamation and revegetation of the Long Hollow site and Bodo Canyon borrow area

When the ground level of uranium tailings and associated contaminated materials reach the design elevation, they would be covered with five feet of clay followed by two feet of rock for erosion protection. This stabilization cover would be graded to provide controlled drainage of surface runoff (Figure 3.12). The borrow area would be graded to blend with the surrounding topography, covered with stockpiled topsoil, and revegetated. A permanent access barrier with gates, warning signs, and the like, would be installed around the 80-acre Long Hollow site.

The area disturbed at the Bodo Canyon borrow area would be recontoured, covered with stockpiled topsoil, and revegetated.

3.2.6 Alternative 5 - reprocessing and stabilization at Long Hollow

In this off-site remedial action alternative, the uranium tailings would be transported to the Long Hollow site, reprocessed



0 250 500 Feet

SCALE

BASE MAP REFERENCE:
USGS TOPOGRAPHIC QUADRANGLE MAP
"KLINE," COLORADO, DATED 1963.

Diversion ditches indicating direction of flow

0.01 Direction of surface drainage on the contoured stabilization cover and slope. Slopes not indicated equal 0.005.

Legend

Proposed WPRS tunnel as per CGS, Diversion

6-inch-diameter natural gas pipeline as per CGS, 1981

2-inch-diameter natural gas pipeline as per CGS, 1981

Power transmission line as per FMFA, 1978

FIGURE 3.12 SURFACE-WATER CONTROLS AT THE LONG HOLLOW SITE

to recover uranium and vanadium resources, and then stabilized with the other contaminated materials.

The reprocessing and stabilization process would include the following six basic phases:

1. Preparation of the Durango site and upgrading of the roads to the disposal site, and installation of temporary security fences where needed at both Durango and Long Hollow sites.

2. Preparation of the Long Hollow disposal site.

3. Dismantling, shipment, and installation of the Naturita processing plant at Long Hollow.

4. Relocation of mill tailings to Long Hollow and reprocessing by modified heap leach method, followed by relocation and placement of other contaminated materials and final placement of the stabilization cover.

5. Reclamation of the decontaminated Durango site; release of the 126-acre Durango site for unrestricted use.

6. Reclamation and revegetation of the Long Hollow disposal site (except tailings embankment) and borrow areas; erection of permanent access barriers, gates, and warning signs at the Long Hollow site.

Preparation of the Durango site

The site preparation of the Durango site for Alternative 5 would be the same as described for the Bodo Canyon and Long Hollow alternatives (see Section 3.2.4).

Preparation of the Long Hollow site and installation of plant equipment from Naturita

At the same time that the Durango site was being prepared, site preparation, including mill equipment installation, at the Long Hollow disposal site would be initiated. Disposal site preparation would include stripping and stockpiling 0.5 foot of topsoil from the stabilization area, construction of a perimeter drainage interceptor channel and retention ponds, and grading of facilities areas and process ponds. These activities would be followed by refurbishment and installation of the processing plant equipment shipped from Naturita, construction of ancillary facilities, aggregate surfacing of plant roads, and would end with testing and start-up of the processing plant.

Preparation of the Long Hollow site would begin with stripping 0.5 foot of topsoil from the area to be graded, and stockpiling it east of the power transmission line for future use.

Construction of the perimeter drainage interceptor channel and retention ponds would also be initiated at the beginning of this activity (Figure 3.13). The interceptor channels would collect surface runoff from approximately 310 acres of drainage area upslope from the site and direct the runoff to the Long Hollow drainage channel south of the reprocessing facilities.

After topsoil stripping and construction of the perimeter drainage system, grading of facilities areas and process ponds would take place. During grading operations, on-site drainage culverts would be installed. Upon completion of grading operations, a clay and synthetic liner system would be installed together with leak-detection piping and underground-utilities piping. The electrical power substation would also be installed.

Leaching ponds with a combined capacity of 1,285,000 cubic yards storage volume and evaporation ponds with a storage capacity of 500,000 cubic yards would be constructed. Interior and exterior slopes on the embankment would be 1.5 horizontal to 1 vertical and 5 horizontal to 1 vertical, respectively (Figure 3.14).

A truck-wash system similar to the unit at the Durango site would be constructed at the Long Hollow site. After the trucks deposited their loads of tailings and before leaving the disposal site, each vehicle would pass through the two-stage truck wash.

The contaminated wash water would be pumped to a contaminated water storage reservoir at the upper end of the Long Hollow site. This contaminated water storage reservoir would contain all excess contaminated water collected on the Long Hollow site. The reservoir would be sized to maintain a minimum water volume of 500 gallons for on-site dust control, and would have a maximum storage volume of 2500 gallons.

<u>Excavation, transportation, and reprocessing of uranium tailings</u>

The Durango site excavation plan calls for the construction of haul roads on the east slope of Smelter Mountain to the top of the large tailings pile, then excavation of the tailings in six- to 10-foot-thick layers. As excavation proceeded, a new haul road would be constructed after each 30-foot drop in elevation until the entire pile was removed. After the top elevation of the large tailings pile was lowered to that of the small pile, both piles would be worked concurrently until all contaminated material was removed.

Once the tailings are excavated, they would be loaded into 25-ton-capacity trucks. The truck beds would be fitted with water seals on the end gates and removable covers to minimize loss of contaminated materials during transportation. As explained previously, before the trucks left the Durango site, they would pass through a two-stage wash system to remove any contaminated materials from their exterior. After the wash, each truck would follow County Road 211 to the new haul road to the Long Hollow site.

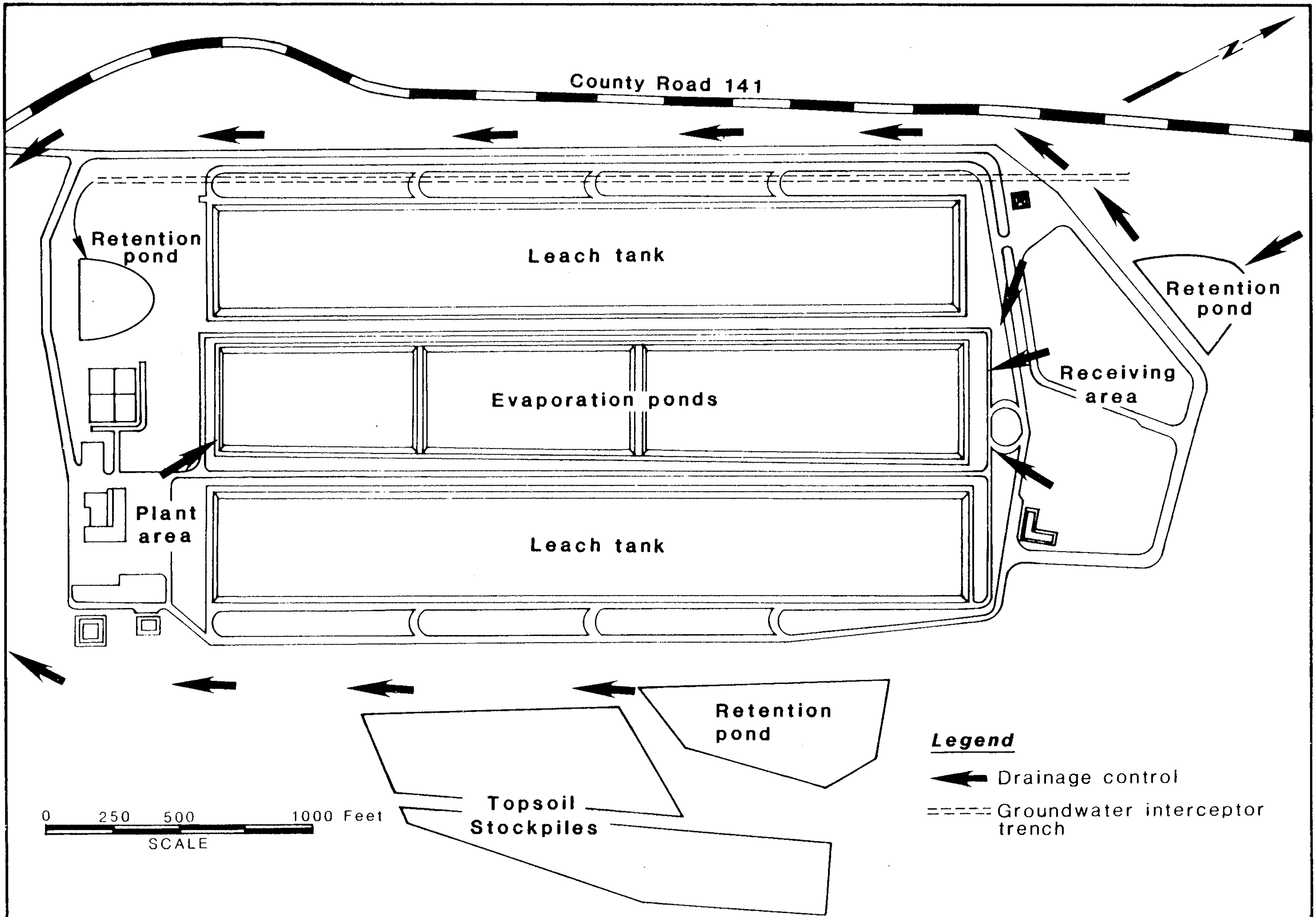


FIGURE 3.13 DRAINAGE CONTROLS DURING REPROCESSING

NOTE:
See Figure A-33 for detail on cover & liner systems.

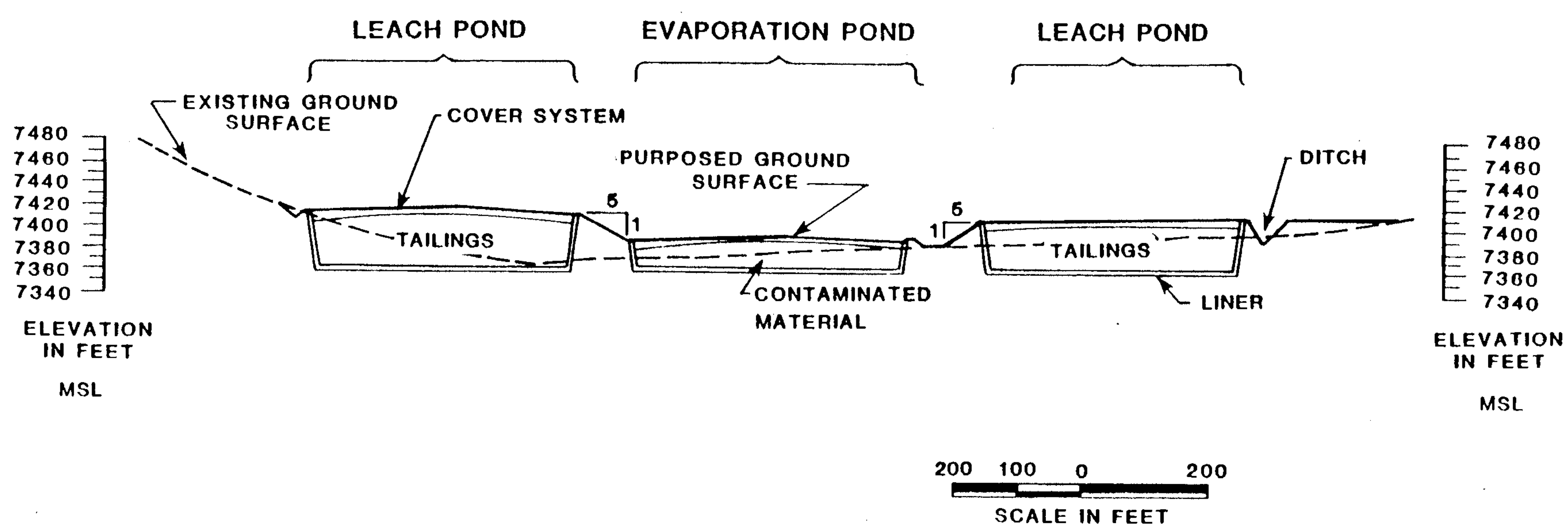


FIGURE 3.14 CROSS SECTION OF LONG HOLLOW REPROCESSING ALTERNATIVE

Upon arrival at the Long Hollow disposal site, the trucks would dump the tailings at the receiving area shown in Figure 3.13. After disposal, the bed covers would be resecured and the truck's exterior washed prior to leaving the site. The cleaned trucks would then return to the Durango site by the same route for another round trip.

The tailings would be blended and placed into the leach tanks by spreader conveyor (see Figure 3.14). Sulfuric acid leach solution would then be distributed across the surface and the pregnant solution withdrawn through bottom drains. The uranium and vanadium would be recovered from the pregnant acidic liquid by solvent extraction, precipitation, and filtration. Following completion of reprocessing, remaining contaminated materials at the Durango site would be transported to Long Hollow and deposited in the evaporation pond areas. At the same time, the process plant equipment would be dismantled, except for truck washing, maintenance, and fueling facilities that would need to remain in operation until the completion of the stabilization and closeout phase. Equipment that would not be suitable for resale as salvage would be buried, together with remaining contaminated materials.

Reclamation of the decontaminated Durango site

Reclamation of the Durango site for Alternative 5 would be the same as described for Alternative 4 (see Section 3.2.5).

Reclamation and revegetation of the Long Hollow site and Bodo Canyon borrow site

Following completion of reprocessing and transport of remaining contaminated materials to the Long Hollow site, these materials would be covered with six feet of clayey soils cover, followed by two feet of gravel for erosion protection. It is estimated that six feet of cover would be required for Alternative 5 in contrast to the five feet of cover required for Alternatives 2, 3, and 4 because under Alternative 5, the lesser contaminated soils would be used to fill in the evaporation pond rather than being placed over the tailings. The surface of the stabilization cover would be graded to drain surface runoff (Figure 3.15). The reservoir for contaminated water would be retained until all the water had evaporated. The sides of the synthetic liner would then be folded in and a five-foot-thick stabilization cover placed over the reservoir. Permanent access barriers, gates, and warning signs would be installed around the 195-acre Long Hollow site. The Bodo Canyon borrow area would be recontoured to blend with the surrounding topography, covered with stockpiled topsoil, and revegetated.

3.2.7 Alternatives eliminated from further consideration

The alternative remedial actions for the Durango uranium mill tailings that were considered during the EIS process but were de-

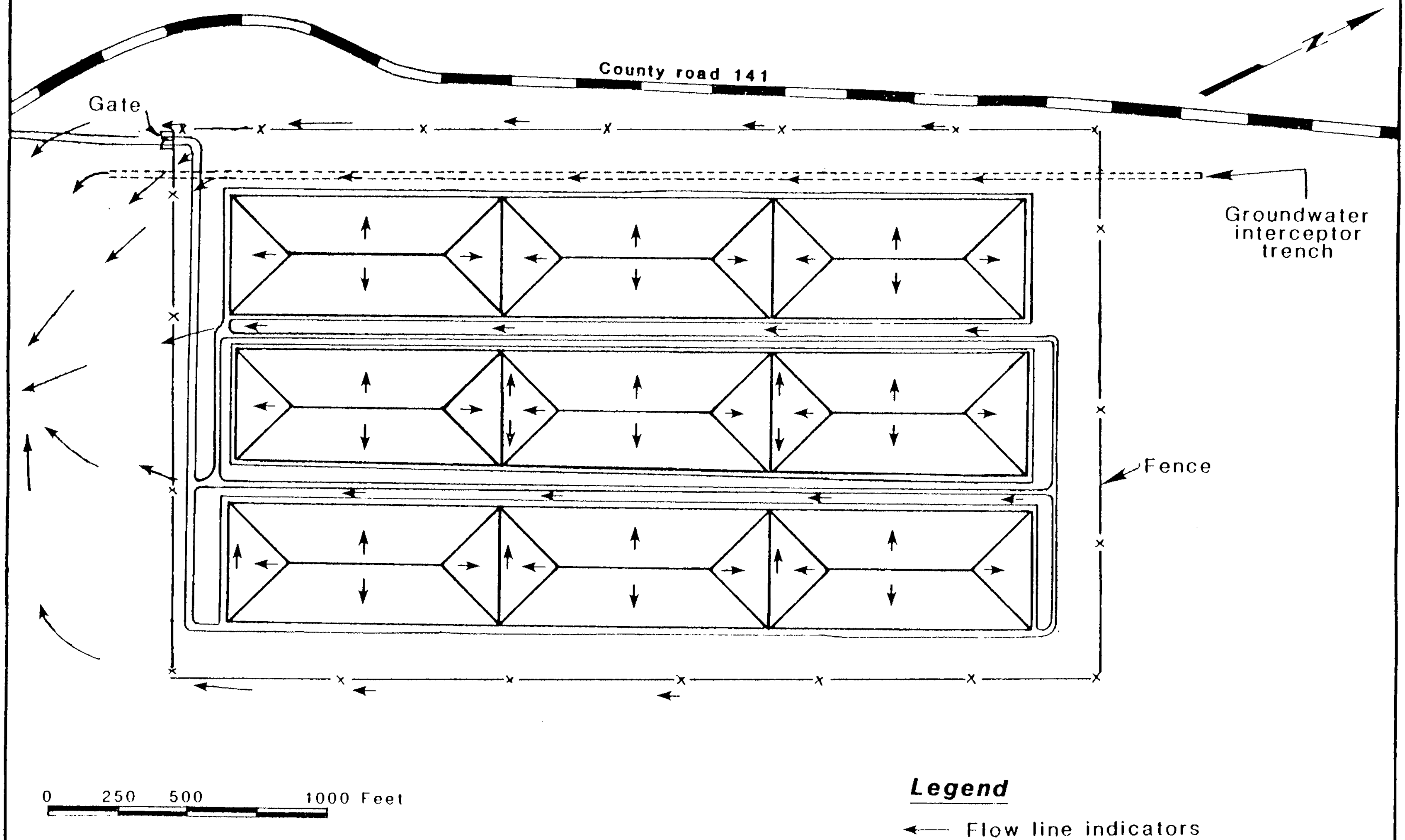


FIGURE 3.15 FINAL CONFIGURATION OF STABILIZED PILES FOR LONG HOLLOW REPROCESSING ALTERNATIVE

termined to be unreasonable can be divided into three classes: (1) alternatives involving disposal of the Durango tailings at other locations nominated by the State of Colorado; (2) alternative methods for transporting the tailings; and (3) disposal of the tailings in Montrose County. These alternatives are discussed in greater detail in Appendix C, Alternatives That Were Considered But Rejected, in the DEIS.

Stabilization at other state-nominated locations

The State of Colorado initially evaluated nine areas within a 30-mile radius of Durango for the disposal of the Durango tailings and associated contaminated materials. The State recommended that the DOE further evaluate three of the areas (Long Hollow, Rabbit Mountain, and Pine Ridge) and that Bodo Canyon be subject to further study. The DOE subsequently obtained additional information on transportation costs, mineral resources, ground and surface waters, and geology regarding Rabbit Mountain that caused it to be eliminated from further consideration (see Appendix C in the DEIS for details). An independent evaluation of the remaining three sites concluded that the Pine Ridge area was not a reasonable alternative because of near-surface geohydrology conditions, and surrounding land-use patterns.

Alternative transportation methods

Several studies have addressed the feasibility and costs of moving the Durango tailings by four modes of transportation: truck, conveyor, aerial tram, and slurry pipeline. In addition to the transportation modes, these studies have also addressed loading and unloading options. The process for selecting these modes has been based on their environmental impacts, technical feasibility, and estimated costs. Several other transportation modes have been suggested, including narrow-gauge rail, carbon dioxide pipeline, and a combination of tunnels and conveyors. These modes have not been addressed in detail within the EIS because of various concerns, including their environmental impacts, technical feasibility, cost, rights-of-way costs, and lease rights.

Following the publication of the DEIS, the concept of transporting the tailings by conveyor from Durango to Bodo Canyon was reevaluated. A recent refinement of proven conveyor technology, the "pipe conveyor," was found to be particularly well suited for use with the Durango remedial action. Pipe conveyors can be designed and operated to negotiate steeper slopes and sharper curves than is possible with conventional belt conveyors. The estimated cost for using a pipe conveyor is comparable to the estimated cost for using trucks to transport the tailings in Alternative 3a. Some advantages of conveyor transport over truck transport are less noise, less traffic, less dust, fewer animal-truck collisions, and lower rate of occupational injury. Based on these factors, the use of a pipe conveyor was added as an option for moving the tailings with Alternative 3.

The use of an aerial tram to transport tailings to the Bodo Canyon site was also evaluated on a preliminary basis. A tram system was considered to involve a higher difficulty in cleaning up a spill which could occur high on the steep north slope of Smelter Mountain. A firm cost estimate for a tram system could not be obtained from the tram manufacturer in time for consideration in this FEIS. Because of these drawbacks, an aerial tram transportation system has not been included in any of the alternatives described in this FEIS.

The use of slurry pipelines for transport has been preliminarily studied by the DOE. The most recent cost analysis indicated that such a system would be slightly more expensive than the truck system (JEG, 1983). However, this method has not received any further analysis because of its high demand for water (as much as 4100 acre-feet during the life of the project without recycle), its corresponding need for land to dry the slurried tailings before disposal, and other major environmental impacts. Therefore, this transportation method was determined to be an unreasonable alternative.

Tailings transport to Montrose County

In 1981, the Montrose County Board of Commissioners passed a resolution encouraging and petitioning the DOE to give full consideration to the movement of tailings into western Montrose County, near Naturita. The apparent receptiveness of Montrose county to disposal of uranium-mill tailings caused the State of Colorado to request that the DOE provide a detailed review of the viability of relocating mill tailings at three sites, including Durango, designated for remedial action under the UMTRA Project to the Naturita, Colorado area (Hazle, 1982).

The DOE determined that relocation of the Durango tailings to Montrose County could not be a reasonable alternative for remedial action. Transport of the more than 1.5 million tons of tailings over more than 100 miles of sometimes steep and heavily travelled roads between Durango and Naturita would unnecessarily increase risks of vehicle accidents and public radiation exposure; the transportation costs could easily be two to three times the already substantial transportation costs of Alternative 4. Transport of the tailings to Montrose County by train is not possible because an industrial rail line does not serve Durango. In addition, quite apart from an unfavorable cost-benefit ratio, the DOE might not have the authority under PL95-604 to dispose of any mill tailings at a commercial waste-disposal site. (Relocation to the Naturita area was proposed in the context of Colorado's plan for developing a single site in that area for the disposal of low-level radioactive waste and uranium mill tailings.)

3.3 ENVIRONMENTAL IMPACTS

In this section, the comparison of the principal environmental impacts of the five alternatives considered, mitigation measures taken to lessen the impacts, and a summary of the major impacts are discussed. A tabular comparison of all impacts is presented in Table 1.3.

3.3.1 Comparison of impacts

Radiological impacts are foremost among the public's concerns. Under the no-action alternative (Alternative 1), the public would continue to be exposed to uncontrolled radioactivity from the Durango site. For example, the general public out to 80 kilometers (50 miles) during a 100-year time period would receive an excess bronchial population dose commitment of 66,000 man-rem under the no-action alternative. This excess bronchial dose would be expected to cause 1.32 excess lung cancer deaths over the 100-year period, an average of 0.013 excess lung cancer deaths per year. If the tailings are left unstabilized, the potential for intentional or unintentional misuse remains, increasing the risk of lung and other cancers.

In Section H.1.1.2 of Appendix H, Radiological Information, in the DEIS, it is conservatively assumed that radon is being emitted from the surface of the tailings piles at an areal flux of 973 picocuries per square meter per second (pCi/m^2s). All four of the action alternatives would reduce this flux to the EPA standard of 20 pCi/m^2s (40 CFR Part 192). The number of excess cancer deaths would be similarly reduced. During the period of time taken for the remedial action, this flux would be gradually reduced, either because the contaminated materials were stabilized and isolated under an earthen cover as in Alternative 2, or because the materials were relocated to another site as in Alternatives 3 and 4, or because the tailings were relocated, reprocessed, and stabilized at another site as in Alternative 5. Each alternative would have similar effects on population exposure following remedial action. Levels of contaminated dust would increase initially because of excavation and loading of the contaminated materials; after project completion the exposure would be reduced from the present level. The potential radiation exposure of the public to radon daughters over the 100-year period including remedial action is estimated to be a total population dose commitment of 969 man-rem for Alternative 2, 1050 man-rem for Alternative 3a, 1050 man-rem for Alternative 3b, 996 man-rem for Alternative 4, and 2620 man-rem for Alternative 5. Within the exposed population, these exposures would result in additional lung cancer deaths of 0.019 for Alternative 2 , 0.021 for Alternative 3a, 0.021 for Alternative 3b, 0.020 for Alternative 4, and 0.053 for Alternative 5 during the first 100 years following the project. The differences in lung cancer deaths among the alternatives are primarily the result of differences in the amount of contaminated material moved and the durations of the alternatives. Following remedial action, all action alternatives would have approximately the same health impacts of 0.0001 per year.

Alternative 1 would have no effect on existing air quality in the Durango area. Alternatives 2, 3, 4, and 5 would each cause short-term adverse impacts on existing air quality during remedial action activities. The primary National Ambient Air Quality

Standards, 24-hour maximum, for total suspended particulates would be exceeded during Alternatives, 2, 3a, 3b, and 4. Only Alternative 5 would not exceed the maximum 24-hour standard. All of the alternatives would comply with the annual total suspended particulate standard. After completion of any of the four action alternatives, overall improvement in air quality would be expected.

There would be no impact on topography or soils under Alternative 1. For Alternative 2, the two steeply sloped and flat-topped tailings piles would be reshaped against Smelter Mountain into one smoothly contoured pile, which would cover an area of about 38 acres at the north end of the Durango site. The pile would have slopes of 3 horizontal to 1 vertical. Approximately 706,000 cubic yards of clay soil, sand and gravel, and quarried riprap would be imported to construct the stabilization cover, backfill excavated areas, and construct a grouted riprap erosion barrier along the banks of Lightner Creek and the Animas River. In both options of Alternative 3, all areas excavated to remove contamination at the Durango site would be returned to their approximate original grade, requiring about 187,000 cubic yards of imported soil for backfill. The raffinate ponds area would be recontoured following decontamination. A low, gently undulating mound with an elevation of 7110 to 7115 feet would permanently replace a 38-acre shallow drainage basin in Bodo Canyon; about 44,000 cubic yards of quarried riprap materials would be imported to provide erosion protection on the downstream faces of the earthen embankments which would cover an additional three acres. Approximately 141,000 cubic yards of imported gravel and riprap would be required for an erosion protection barrier over the stabilized tailings, drainage channels, and for gully erosion protection. Under Alternative 4, an almost flat, but gently undulating surface at the Long Hollow site would be constructed over an area of about 76 acres at the head of a shallow concave-shaped valley; a smoothly contoured slope of 5 horizontal to 1 vertical would cover an additional four acres at the south end of the site; and approximately 77,000 cubic yards of imported riprap materials would be required for erosion protection in the drainage channels. Approximately 241,000 cubic yards of imported gravel and bedding material would be required for an erosion-protection barrier over the stabilized tailings. In addition, 351,000 cubic yards of sand and gravel would be imported to the Long Hollow site to construct a drainage blanket beneath the stabilized tailings. Requirements for backfill materials at the Durango site would be the same under Alternative 4 as for Alternative 3. Under Alternative 5, an almost flat but gently undulating mound would be constructed over an area of 195 acres at the Long Hollow site. The mound would be a maximum of 18 feet high and would have maximum sideslopes of 5 horizontal to 1 vertical. Approximately 457,000 cubic yards of imported gravel and riprap would be required for an erosion-protection barrier over the stabilized tailings and for drainage channels. Requirements for backfilling materials at the Durango site would be the same under Alternative 5 as for Alternatives 3 and 4.

Under the no action alternative (Alternative 1), overland flow from precipitation would continue to slowly erode tailings from the piles and contaminated soils from other areas of the Durango site. All such surface drainage would ultimately enter the Animas River where the eroded soil and tailings particles would be deposited. Erosion of these radioactively contaminated materials would be prevented by the stabilization cover in Alternative 2. The cover has been designed to minimize infiltration of incident precipitation and erosion from overland flow during a Probable Maximum Precipitation (PMP) storm event. The grouted riprap erosion barrier at the base of the pile is designed to withstand the erosive velocities generated during a Probable Maximum Flood (PMF) but would require repeated maintenance throughout the design life of the site. For Alternatives 3, 4, and 5, the slopes of the stabilization cover, diversion channels, and retention embankments have been designed to pass surface flows from the PMP without erosion. Hence, the potential for contamination of surface waters under any of the action alternatives would be small. Uncontaminated water required at the Durango site in Alternatives 2, 3, 4, and 5 would be taken from the Animas River. Withdrawal rates would be about 13,500 gallons each working day for Alternative 2, 22,500 gallons each working day for Alternatives 3a, 3b, or 4, and 10,000 gallons each working day for Alternative 5. Considering an annual flow of 950 cubic feet per second (cfs), these withdrawal rates would amount to 0.0022 percent for Alternative 2, 0.0037 percent for Alternatives 3 and 4, and 0.0016 percent for Alternative 5. Under extreme low-flow conditions such as the lowest minimum flow ever recorded of 94 cfs on March 2, 1913 (USGS, 1981), those withdrawal rates would still only amount to 0.022, 0.037, and 0.016 percent of the minimum-recorded flow for Alternative 2, Alternatives 3a, 3b, and 4, and Alternative 5, respectively. Thus, these rates of withdrawal would not have a noticeable effect on the quantity or quality of the river's flow under any conditions.

No action (Alternative 1) would allow leachates to continue migrating from the tailings piles to the Animas River as in the past. Even after a stabilization cover was placed over the tailings (Alternative 2), contaminants in the ground water beneath the piles and leachates within the piles would continue to slowly migrate to the Animas River, but at a reduced rate. Once these contaminants reached the river, they would be diluted beyond detectability. In Alternatives 3a, 3b, and 4, the design concepts include a clay liner and cover to minimize seepage into and from the radioactively contaminated materials as well as to retard migration of heavy metals and radionuclides by adsorption on clay particles in natural ion-exchange processes. Ground water in both the shallow alluvial aquifer and the deeper system at Bodo Canyon (Alternatives 3a and 3b) do not meet EPA primary or secondary drinking water standards. In Alternative 4, to prevent the ground-water table from rising into the tailings, the installation of an underdrainage system is included in the stabilization design for the Long Hollow site. With the underdrain installed, leachate generation resulting from infiltration of incident precipitation and redistribution of moisture within the tailings is expected to be small and of the same order as the natural rates of ground-water recharge. Based on computer modeling studies, the rate of leachate generation from the stabilized pile is estimated to be on the order of 0.5 percent of the rate of natural ground-water discharge from below to the underdrain system once steady-state has been reached. Therefore, the leachate would be diluted by a factor of more than 200 to 1 at the point of discharge from the underdrain, resulting in projected levels of 0.05 mg/l uranium, 5800 mg/l sulfate, 8.7 mg/l iron, and 0.75 mg/l manganese. These levels are only slightly above natural ground-water concentrations for these constituents at Long Hollow (see Table F-39, Appendix F, Water Resources Information, in the DEIS). Other constituents which may be present in concentrations above background include vanadium, barium, lead, and arsenic. Degradation of water quality in the Long Hollow drainage downstream of the stabilization area would be possible (Alternative 4); however, significant degradation of surface-water quality would be unlikely. Potential impacts on ground-water discharge areas are expected to be small to nondetectable. In Alternative 5, a clay and synthetic liner system would be used to inhibit seepage of contaminated water from the tailings into the shallow ground water. An interceptor trench would be placed on the northwest side of the site to intercept the shallow ground water, redirect it around the tailings, and thereby prevent the ground-water table from rising into the tailings.

Although Alternatives 4 and 5 include stabilizing the tailings at the same location, they include different measures for ground-water protection. Additional ground-water data collection and analysis are ongoing and will be used to select the most appropriate measure(s) to protect the ground water should Alternative 5 be selected. The measures presently include the construction of an underdrain and clay liner as in Alternative 4, the construction of an interceptor ditch and clay and synthetic liner system as in Alternative 5, and shifting the location of the stabilization area to the southeast away from the ground-water discharge area. The underdrain may become partially plugged over the long term but would still maintain its integrity.

Freeing all or part of the 126-acre Durango site for unrestricted use would increase its value. Present land values of industrial property south of the site range from $55,000 to $65,000 per acre. Therefore, under Alternative 2, releasing 88 acres for general use could conceivably increase the value of the site by $2.8 million. If all of the site were available for general use, as it would be under Alternatives 3a, 3b, 4, and 5, the value of the land could increase to as much as $4.6 million.

Alternative 1 would produce no construction-related impacts on populations and employment, housing and community services, transportation networks, energy-consumption patterns, and occupational health and safety. Alternatives 2, 3, 4, and 5 would produce minor and similar short-term impacts in all of these areas.

Alternative 2 would create short-term (one-year) jobs for 56 construction workers and would contribute to an estimated six long-term (post remedial action) jobs for environmental surveillance required of all UMTRA Project sites combined. The income and taxes from these jobs would have little effect on the economy and social infrastructure of Durango or La Plata County. The short-term influx of workers and their families would only slightly affect the existing available housing and excess capacity in community services. Transportation networks in Durango would not be seriously affected by Alternative 2. About 369,000 gallons of engine fuel, 33,600 kilowatt-hours of electricity, and 8350 tons of cement would be expended for Alternative 2. Just as on any other large construction project, occupational accidents and injuries would be expected to occur. According to 1981 incidence rates, 0.014 fatal work accidents and about 1.99 disabling injuries could be expected during the one-year construction period.

In Alternative 3a, short-term (18-month) jobs would be created for 71 construction workers and would contribute to an estimated six long-term (post remedial action) jobs for environmental surveillance required for all UMTRA Project sites combined. As in Alternative 2, these jobs would have little effect on the local economy considering the overall personal income for La Plata County. Effects on housing and community services would be similar to those for Alternative 2 but would be increased by about 27 percent; increased demand on community services would be negligible, although housing demand in Durango could be strained should most of the inmigrants choose to live there and not elsewhere in La Plata County. Approximately 1,069,000 gallons of engine fuel and 79,200 kilowatt-hours of electrical power would be expended with the implementation of Alternative 3a; this is about three times the amount of fuel and 2.4 times the amount of electrical power that would be required for Alternative 2. Cement consumption would be considerably less than for Alternative 2; only 159 tons would be required under Alternative 3a. A few more occupational accidents would be expected for Alternative 3 than for Alternative 2 because of the larger work force required. Based on 1981 incidence rates, 0.025 fatal work accidents and 4.23 disabling injuries could be expected, about twice the numbers expected for Alternative 2.

With Alternative 3b, 64 short-term construction jobs would be created and would add an estimated six long-term (post remedial action) jobs for environmental surveillance required for all UMTRA Project sites combined. As with the other alternatives, these jobs would have little effect on the local economy. Housing and community services impacts would be about 50 percent larger than for Alternative 2. The 151 new households would probably be able to find housing among the 215 housing vacancies in Durango (1980 data) or elsewhere in La Plata County. Approximately 936,000 gallons of engine fuel and 4,044,000 kilowatt-hours of electrical power would be expended for Alternative 3b; this is about three times the amount of fuel and 122 times the amount of electrical power than would be required under Alternative 2. As with Alternative 3a, the use of cement would be only 159 tons. The expected numbers of occupational fatalities would be almost as low as Alternative 2; Alternative 3b would involve 0.018 fatalities. Disabling injuries among construction workers would be the lowest of any of the action alternatives with only 1.65 injuries during implementation of Alternative 3b.

Alternative 4 would create short-term (28 months) jobs for 79 construction workers and would contribute to an estimated six long-term (post remedial action) jobs in environmental surveillance required for all UMTRA Project sites combined. Again, the jobs created by Alternative 4 would have little effect on the economy for Durango and La Plata County. The slight difference in staffing requirements between this alternative and those for Alternative 3 would not be enough to create noticeable differences in housing or community services effects. The amount of fuel use and electrical-power consumption would be 1,618,000 gallons and 88,000 kilowatt-hours, respectively. Cement usage would be the same as required for Alternative 3. The number of fatal work accidents that would be expected under Alternative 4 (0.040) is almost twice that for Alternative 3. However, based on 1981 incidence rates for the trucking industry, about 9.13 disabling injuries could be expected in Alternative 4 because of the large number of truck drivers required. This is an increase of 116 percent over that of Alternative 3 and nearly 360 percent increase over that of Alternative 2.

Alternative 5 would create short-term (82 months) jobs for 64 construction workers and would contribute to an estimated six long-term (post remedial action) jobs for environmental surveillance required for all UMTRA Project sites combined. These jobs would have little effect on the economy for Durango and La Plata County. The amount of fuel use and electrical-power consumption would be 2,975,000 gallons and 2,567,000 kilowatt-hours, respectively. A substantial volume of chemicals would be used during the reprocessing activities. A total of 0.098 fatal work accidents and 14.57 disabling injuries for truck drivers would occur. These are substantially greater than for the other alternatives.

Among the nonradiological impacts, impacts on the transportation corridors would be the most noticeable. County Road 211 (Bodo Canyon and Ridges Basin Roads) and County Road 212 are improved dirt roads that vary in width from about 18 to 30 feet and presently carry little traffic. Under either Alternative 2 or 3a, an approximate two-mile stretch of County Road 211 would be widened to a minimum of 35 feet, surfaced with gravel, and improved to handle 25-ton capacity trucks. Also, under Alternatives 3a and 3b, a short section of County Road 212, extending north from its junction with County Road 211 to a point immediately west of the disposal site, would have to be widened and improved. With Alternative 3b, County Road 211 would be improved by placing a geotextile fabric, covering the road with gravel, and constructing turnouts so that vehicles could pass safely. Truck traffic on County Road 211 in Bodo Canyon would increase by an average of about 280 trips per day for a period of five months under Alternative 2, and on County Roads 211 and 212 by approximately 544 trips per day for 16 months under Alternative 3a. Truck traffic would cause the average daily traffic count on County Road

211 to increase by 14 trips per day for 22 months under Alternative 3b. An additional six-mile stretch of County Road 211 would be widened, surfaced, and improved in Alternative 4, and truck traffic would average about 540 trips per day for a period of 15 months. In addition, a haul road approximately two-miles long would have to be constructed for Alternative 4. Alternative 5 would result in the same impacts as Alternative 4 except that the rate of truck traffic would be substantially reduced (a maximum of 72 trips per day) and the impacts would occur over a much longer period (82 months).

Under Alternative 2, approximately 24 acres (Bodo Canyon borrow area) of winter range for deer and elk would be destroyed for at least one year (during remedial action); it would take a minimum of five years following reclamation for a self-sustaining vegetation cover to become established and at least 20 years for reestablishment of habitat similar to that presently on the site. For Alternatives 3a, 3b, 4, and 5, the borrow area would be reduced to about 16 acres. Approximately 41 acres of important deer and elk winter range would be permanently removed from Bodo Canyon under Alternatives 3a and 3b, about 80 acres of marginal pastureland would be permanently removed in Alternative 4, and about 195 acres of marginal pastureland would be permanently removed under Alternative 5. The conveyor route in Alternative 3b would affect approximately 20 acres of important deer and elk winter range during the 22-month period of remedial action.

A wildlife mitigation plan would be implemented to mitigate the impacts under any of the action alternatives. Such a plan would include measures to minimize adverse impacts on wildlife and to provide replacement of wildlife habitat and wildlife oriented recreational use. A draft mitigation plan for Alternative 3a is included as Appendix L in this FEIS which has been developed in consultation with the Colorado Division of Wildlife and the Nature Conservancy.

The smelter stack at the Durango site would be demolished or decontaminated under all action alternatives. Nine cultural resource sites that are eligible for nomination to the NRHP would be destroyed at the Bodo Canyon site under Alternatives 3a and 3b. With Alternatives 4 and 5, five cultural resource sites would be disturbed. Appropriate mitigation plans would be implemented as directed by the Colorado State Historic Preservation Officer.

All of the action alternatives have been designed to remain effective for up to 1000 years to the extent reasonably achievable and, in any case, for at least 200 years. Alternatives 3a, 3b, 4, and 5 would meet this design standard with very limited maintenance. However, Alternative 2, stabilization at the Durango site, would require a much greater level of maintenance over the project's design life because of the potential for meandering of the Animas River channel, the design's dependence on grouted riprap for erosion protection, and the extensive use of surface-water diversion channels to direct surface-water flow from Smelter Mountain around the north and south ends of the stabilized pile. The greater level of maintenance required for Alternative 2 has been included in the costs of this alternative. The estimated maintenance cost is based on replacing 25 percent of the grout every 25 years for 1000 years.

A final impact that would result from any of the action alternatives is cost. As indicated in Table 1.2, Alternative 1 would cost Hecla Mining Company approximately $300,000 for maintaining the vegetative cover on the piles. Alternative 2 would cost $21.0 million in 1983 dollars, Alternative 3a would cost $26.3 million, Alternative 3b would cost $24.1 million, and Alternative 4 would cost $41.8 million. Alternative 5 would cost $61.2 million, however this cost would be partially offset by the sale of the uranium and vanadium recovered during reprocessing ($26.7 million). Therefore, the net cost of Alternative 5 would be $34.5 million. The market conditions of uranium and vanadium fluctuate, and the actual value of the uranium and vanadium recovered may differ from the values used in estimating the net cost of Alternative 5. Therefore, the net cost of this alternative may change upward or downward. The cost distribution between the DOE and the company performing the reprocessing would be negotiated between the two parties. The long-term maintenance costs of Alternative 2 would be substantially greater than for Alternatives 3a, 3b, 4, and 5.

3.3.2 Mitigation measures

The potential environmental impacts from remedial action alternatives would be reduced through the use of appropriate mitigating measures. A number of these have been incorporated into the plans for all sites in Alternatives 2, 3a, 3b, 4, and 5. These include fugitive dust control by spraying with water or using dust palliatives, diversion of surface-water runoff for containment of contaminated water in storage reservoirs, and use of protective equipment such as dust masks by the remedial-action workers.

Additional actions for mitigating exposure of remedial-action workers to radioactively contaminated particulates include stopping the handling of contaminated materials during periods of high wind and using trucks with tight-fitting covers and water seals on the tailgates. Public exposure to radiation during the construction phases would be limited by restricting access to the construction areas through the use of fences and gates. The exact mitigation measures for fugitive dust impacts would be determined during the final design phase of the project with the review and approval of the Colorado Department of Health.

Nonradiological air-quality impacts would be reduced by keeping internal-combustion engines tuned to keep emissions to a practical minimum and by using exhaust controls on all vehicles and equipment. Dust-control measures would be implemented and used during all material-handling activities. All contaminated materials would be hauled in covered trucks, and excavation and loading operations would be halted during periods of adverse weather conditions.

Water erosion of contaminated materials would be controlled by construction of diversion ditches upgradient from areas where contaminated materials would be exposed. Temporary dikes or berms would also be installed to divert or collect storm water in order to prevent it from contacting contaminated areas. Water collected in excavations and sumps would be pumped to lined contaminated water storage reservoirs located on all sites; water in the reservoirs would be allowed to evaporate before the reservoir lining was buried on the disposal site.

The impacts of noise would be reduced by using functional and properly maintained mufflers on all construction equipment and vehicles, and by scheduling hauling trips and noisy activities at all sites to take place within daylight hours according to state and local ordinances and the recommendations of the Colorado Division of Wildlife. Hearing-protection devices would be worn by workers either operating or working close to excessively noisy machinery.

The impacts of the remedial actions on wildlife would be reduced by strategically scheduling construction activities and by reclaiming disturbed habitat. The remedial-action traffic would be restricted to daylight hours from April through November and would thereby reduce the potential for road kills. Remedial actions for Alternatives 3a, 3b, 4, and 5 would not occur during periods of heavy snowfall. Reprocessing activities under Alternative 5 would not occur during the winter months, (November through March). Because the winter is the period of most intense use of the Bodo Canyon area by big game, the impacts on these species would be further reduced. Under all action alternatives, a wildlife mitigation plan, as mentioned in Section 3.3.1, would be developed and implemented. A draft mitigation plan for Alternative 3a is presented in Appendix L of this FEIS.

Impacts to cultural resources would be mitigated by planning construction to avoid cultural sites where possible or by excavating the sites to recover cultural information as described in Section 5.21.

Following completion of the remedial actions, a surveillance and maintenance program would be conducted for the final stabilized disposal site as required under the terms of the license issued by the NRC. The type of surveillance and maintenance that is proposed by the DOE is described in Section 5.22.

3.3.3 Summary of major impacts

Three major issues pertaining to radiation, transportation, and cost have been identified in the impact analysis.

Alternative 1 would leave unchanged the present unacceptable level of radiation exposure to people living in the city of Durango. Alternative 1 does not meet the EPA standards (40 CFR Part 192) and is unacceptable. Alternatives 2, 3a, 3b, 4, and 5 would each meet the EPA standards for cleanup of inactive uranium mill tailings sites and disposal of uranium mill tailings. Any of the action alternatives would reduce the residual radiation doses to the general population to near-background levels. Alternatives 2, 3a, 3b, 4, and 5 have been designed to remain effective for up to 1000 years to the extent reasonably achievable and, in any case, for at least 200 years. Alternatives 3a, 3b, 4, and 5 would meet this design standard with very limited maintenance. However, Alternative 2, stabilization at the Durango site, would require a much greater level of maintenance over the project's design life because of the potential for meandering of the Animas River channel, the design's dependence on grouted riprap for erosion protection, and the extensive use of surface-water diversion channels to direct surface-water flow from Smelter Mountain around the north and south ends of the stabilized pile. The greater level of maintenance required for Alternative 2 would increase the costs of this alternative.

Each of the action alternatives would involve truck transport of the contaminated and uncontaminated materials. The differences among the transportation-related impacts of the four action alternatives are related to the number of trucks that would be used, the borrow and disposal sites involved, and the roads that would be used. Alternative 2 would require the least amount of truck traffic because there would be no relocation of radioactively contaminated materials off the Durango site. Alternatives 3a and 4 would require the same amount of truck traffic; however, Alternative 4 would evoke greater transportation impacts because the haul distance to the Long Hollow site is three times the haul distance to the Bodo Canyon site (Alternative 3a). Alternative 5 would require a greater number of total truck trips than Alternatives 3a, 3b, and 4; however, the trips would occur over an 82-month period (over three times longer than the other alternatives), and therefore, the daily impacts of Alternative 5 would be less than Alternatives 3a and 4. Fewer daily truck trips (14 per day) would be required for Alternative 3b than for any of the action alternatives. However, the period of time would extend for 22 months with Alternative 3b as opposed to 18 months with Alternative 3a.

Based on the present land values for industrial property south of the Durango site, the release of 88 acres under Alternative 2, or all of the site as under Alternatives 3a, 3b, 4, and 5, might increase the value of the Durango site by \$2.8 million and \$4.6 million, respectively.

The direct monetary cost of Alternative 1 to the owner of the Durango site would be \$0.3 million. Direct costs of the remedial actions for Alternatives 2, 3a, 3b, and 4 would be about \$21.0, \$26.3, \$24.1, and \$41.8 million, respectively. The direct monetary costs for Alternative 5 would be \$61.2 million; however, this cost would be partially offset by the sale of the uranium and vanadium produced which would yield \$26.7 million. The net cost of Alternative 5 is, therefore, \$34.5 million (\$61.2 minus \$26.7 million). The DOE would negotiate with the private company performing the reprocessing to determine the DOE's share of the total project costs.

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4.0 AFFECTED ENVIRONMENT

Described in this section are those features of the existing environment that may be affected by the alternative remedial actions discussed in Section 3.0.

4.1 REGIONAL CHARACTERISTICS

The region potentially affected by the alternatives under consideration is the central part of La Plata County in southwestern Colorado. The Durango, Bodo Canyon, and Long Hollow sites are all within about eight air miles of one another southwest of the city of Durango, the primary population center in the region (Figure 4.1).

Durango, the county seat and regional trade center, lies in the valley of the Animas River at an elevation of about 6500 feet above mean sea level. The city, which has a population of almost 11,600, is surrounded by mountainous terrain with peaks rising to more than 1600 feet above the Animas River valley. The semi-arid climate of the Durango area is characterized by warm summers, cool springs and autumns, and moderately cold winters.

Economic growth and development of southwest Colorado has always been heavily influenced by its geologic and topographic characteristics and the cultural populations of the Southwest. Durango is located on the northern rim of the San Juan Basin in an area of geologic, topographic, and land-use transition. North of the rim are the high, mountainous crystalline-rock complexes where base and precious metals were once extensively mined. These areas are now used primarily for outdoor recreation including skiing, big-game hunting, backpacking, and camping. South of the rim is a broad basin of sedimentary rocks characterized by mesas, plateaus, and flatlands where agriculture, livestock grazing, coal mining, and oil and natural-gas production are dominant. Prehistoric cultural sites are abundant, most notably in Mesa Verde National Park, and attract tourists to the region from all over the world.

The primary landowner in the region is the Federal Government, which controls 56.7 percent (over 600,000 acres) of the land in La Plata County; these lands include the San Juan National Forest north of Durango and the large Indian reservation lands held in trust for the Southern Utes and the Ute Mountain Utes. Privately owned lands (41.6 percent) are second in extent followed by the state (1.4 percent) and then county and municipal lands (0.3 percent) combined.

Services, retail trade, agriculture, and state and local governments are the most prominent economic sectors in La Plata County. The high employment in services and retail trade reflects the importance of tourism to the county's economy. Employment in services, retail trade, and agriculture accounts for approximately 23, 19, and six percent, respectively, of the total county employment. State and local governments account for about 15 percent.

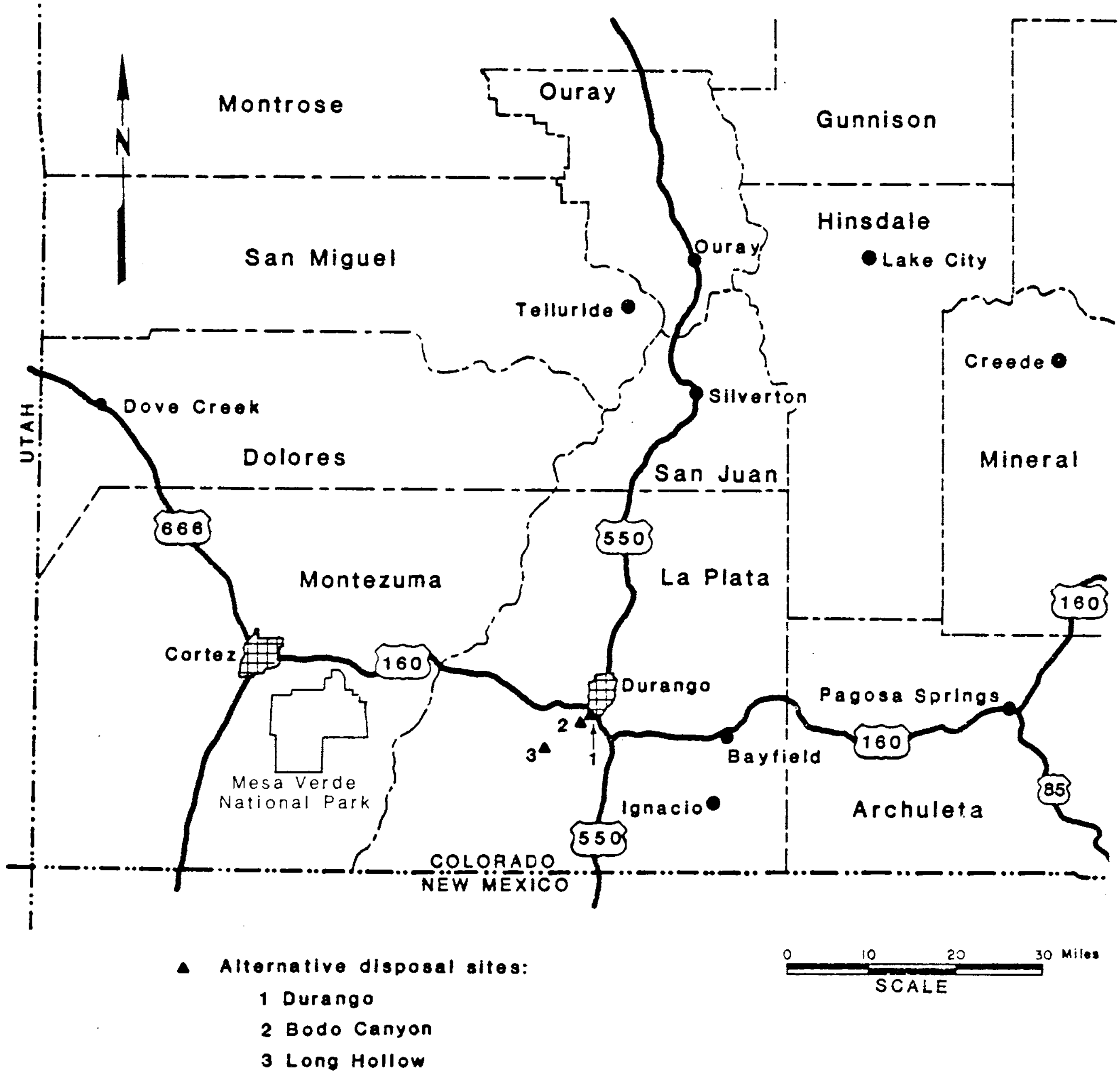


FIGURE 4.1 REGIONAL MAP OF SOUTHWESTERN COLORADO

4.2 DESCRIPTION OF THE AFFECTED AREAS

4.2.1 Durango site

The Durango site is located just outside of the southwestern city limits of Durango, La Plata County, Colorado (see Figure 3.1). The site is bordered on the north by Lightner Creek and U.S. Highway 160, on the east by the Animas River and U.S. Highways 160 and 550, and on the southwest by the slopes of Smelter Mountain. Hecla Mining Company currently owns the site. Land-use patterns in the vicinity of the northern part of the site are shown in Figure I-4 in Appendix I, Information on Populations, Socioeconomics, and Land Use, of the DEIS.

The entire Durango site covers an area of approximately 126 acres. Located in the northern half of the site are the old mill site, ore-storage areas, and the two tailings piles. The abandoned raffinate ponds area is located at the south end of the site. The two tailings piles abut Smelter Mountain. Their bases are about 20 and 30 feet above Lightner Creek and the Animas River, respectively. The tops of the tailings piles are relatively flat. The slopes of the piles are steep, ranging from about 1.3 to 2.5 vertical to 1 horizontal.

The small tailings pile is about 90 feet high and covers an area of approximately seven acres. The large pile, just south of the small pile, covers 14 acres and is about 230 feet high (FBDU, 1981). It is estimated that the small pile contains about 317,000 cubic yards (325,000 tons) of tailings and the large pile about 883,000 cubic yards (1,230,000 tons). Just to the southeast of the large tailings pile is an eight-acre area that was used for the ore-processing mill and ore storage. The mill buildings have been removed, but the brick flue stack from the lead smelter that originally occupied the site is still standing. Also remaining on the site is a one-story concrete block office building adjacent to the stack, a small corrugated-metal warehouse building near the toe of the large tailings pile, and the former smelter superintendent's house near the small tailings pile at the northern end of the site. Various concrete foundations and rubble from demolition of the mill structures and slag from the smelter operation remain on the site. During mill operations from 1959 to 1962, raffinate from the ore-processing system was channeled in a ditch along the face of Smelter Mountain to an approximate 15-acre area 0.5 mile south of the mill site. Here, the raffinate was spread in a number of excavated, shallow ponds and allowed to evaporate. In the early 1970s the ditch and the ponds were filled with local uncontaminated soil materials and graded.

In addition to uranium tailings, the site contains vanadium tailings, slag from the old lead smelter, contaminated soils, and most probably, other rubble and debris deposited in the piles during the life of the ore-processing operations. The uranium tailings are a mixture of the processed ore residues and the chemicals used in the uranium-extraction process. Available information indicates that the tailings were not deposited uniformly within the impoundment areas of the piles. The nonuniformity reflects changes in the milling process, the variety of ore sources, and differential sorting and migration of particle sizes from the discharge point. These tailings consist of finely ground sands with a low clay content (FBDU, 1981); they probably range from fine- to medium-grained sand around the face of the piles to slimes where the piles abut the slopes of Smelter Mountain. Slimes are fine-grained materials, being primarily silt-sized particles with very little material in the clay-size range.

The mill site and the toe of the large tailings pile are located, in part, on a 35-foot-thick shelf of man-made fill materials; away from the tailings this includes at least 25 feet of vitreous smelter slag. The thickness of slag beneath the tailings is unknown. Although they can be highly fractured, the smelter slag deposits form a stable, erosion-resistant shelf above the Animas River (BFEC, 1983). The slag was tested for toxicity using the U.S. Environmental Protection Agency (EPA) RCRA EP Toxicity Procedure (DOE, 1984). The slag contained concentrations of heavy metals which were below EPA's threshold concentrations (40 CFR Part 261.24). The slag is, therefore, not a hazardous waste.

The generally sparse vegetation at the site includes grasses and herbaceous plants. Revegetation through seeding and regular irrigation on the slopes of the tailings piles has been only partially successful. Wind and water erosion of the piles continues to occur. A relatively good stand of grasses has been established in the raffinate ponds area. All surface drainage from the site ultimately ends up in the Animas River.

Other details of the area surrounding the Durango site are discussed in Section I.4.9, in Appendix I, Information on Populations, Socioeconomics, and Land Use, in the DEIS, and in FBDU (1981).

4.2.2 Durango vicinity properties

Since the uranium ore processing started at the Durango site, wind and water have eroded small amounts of materials from the tailings piles to the surrounding areas. Also, some of the tailings have been used as fill and construction materials in the Durango area at a time when the potential health hazard of uranium mill tailings was unrecognized. Thus, elevated gamma-radiation levels and radon-daughter concentrations have been documented (EPA, 1973; EG&G, 1981; ORNL, 1981, 1982) to occur at various locations off the Durango site (see Figure B-1, Appendix B, Vicinity Property Remedial Actions, Durango site, in the DEIS). Those properties at which elevated radiation levels exceed EPA standards because of the presence of uranium-mill tailings are called "vicinity properties." Presently there are 137 locations in Durango where tailings may be present.

Almost half of the properties affected are residential (64); commercial and industrial properties are the next largest category (34). Miscellaneous properties, including school grounds, cemetery access roads, a horse-race track, a church park, and a Federal building, are among the sites which may require remedial action.

It is estimated that 8000 cubic yards (10,600 tons) of contaminated materials would be removed from the 137 vicinity properties, and that an additional 13,000 cubic yards (17,600 tons) of soil contaminated by windblown tailings would be removed from areas adjacent to, but not on, the Durango site. After the contaminated materials are removed, the vicinity properties would be restored to the appearance they had prior to cleanup. The contaminated materials and soil would be stockpiled on the Durango site prior to stabilization either at that site or at one of the other proposed alternate stabilization sites.

As discussed in Appendix B, Vicinity Property Remedial Actions, Durango site, in the DEIS, the volume of contaminated material at the 137 vicinity properties could be as much as 13,700 cubic yards rather than the 8000 cubic yards discussed above. However, 8000 cubic yards was the estimated volume when the conceptual designs were prepared for this document. This difference in volume is less than one half of one percent of the volume of all contaminated material at the Durango site and does not affect the conceptual designs presented in this document. A more complete discussion of the affected vicinity properties, the need for and the methods of remedial action, and the impacts resulting from the cleanup activities are presented in Appendix B.

4.2.3 Bodo Canyon site

The proposed alternate disposal site in Bodo Canyon is located approximately 1.5 air miles due southwest of the Durango site in the eastern half of Section 36, Township 35 North (T35N), Range 10 West (R10W), and the western half of Section 31, T341/2N, R9W, in La Plata County, Colorado. Access to the Bodo Canyon site from the Durango site is by traveling south on U.S. Highway 550 to the intersection with County Road 211 (Bodo Canyon Road) just south of the raffinate ponds area and then turning west into Bodo Canyon. At the top of Bodo Canyon, approximately two miles west of U.S. Highway 550, a dirt road (County Road 212) extends northwesterly from Bodo Canyon Road and passes just west of the Bodo Canyon site enroute to the top of Smelter Mountain (see Figure 3.5).

The Bodo Canyon drainage area is in an ephemeral drainage basin of about 4.5 square miles bordered by Smelter Mountain on the north, Carbon Mountain on the south, the Animas River on the east, and the drainage divide between Ridges Basin and Bodo Canyon on the west. The upper slopes on the north and south sides of the Bodo Canyon drainage area have gradients up to 20 percent and drain into small canyons and subbasins (see Figure F-1, Appendix F, Water Resources Information, in the DEIS). As shown in Figure F-2, (in Appendix F, in the DEIS) the Bodo Canyon site (Area E) is located in a gently sloping subbasin near the upper west end of the Bodo Canyon drainage area at an elevation of about 7100 feet. Maximum topographic relief across the site is about 100 feet, measured from the highest point on the site to the bottom of the valley on the north side of the site. This valley and an east-west-trending ridge to the northwest separate the Bodo Canyon site from surface drainages off Smelter Mountain. Almost all surface drainage from the site itself is discharged to the valley north of the site.

The Bodo Canyon site is part of a land parcel deeded to the Colorado Division of Wildlife by The Nature Conservancy with the restriction that it be managed only as "wildlife habitat." Use of the area for any other purpose would require modification of deed restrictions prior to transfer of the the title to the DOE by the state.

Natural vegetation in Bodo Canyon ranges from grasslands to sagebrush on bottomlands to foothills covered with scrub oak, rabbitbrush, and other shrubs. Scattered ponderosa pine, pinyon pine, and juniper occur throughout the area but are especially prevalent on the upper slopes. Because the vegetation is not grazed by domestic livestock, it provides excellent forage and cover for many species of game and non-game wildlife.

Numerous prehistoric sites and artifacts of early-American cultures are known to exist in the Bodo Canyon-Ridges Basin area. Thirty sites have been identified in the vicinity of the Bodo Canyon site.

4.2.4 Long Hollow site

The Long Hollow alternate disposal site is located in Section 110, T34N, R11W, La Plata County, approximately eight miles in a straight-line distance (about 11 miles by road) southwest of the Durango site (see Figure 3.5). Two access routes to the Long Hollow site from the Durango site are available. One is via U.S. Highway 160 westerly for about two miles to County Road 141 (Wildcat Canyon Road) and then southwesterly for approximately 8.5 miles. The second route is to follow County Road 211 through Bodo Canyon and Ridges Basin to County Road 141, and then turn southwest to the site.

This alternate disposal site lies in a relatively flat foothill valley at an elevation of about 7400 feet that forms the headwaters for the Long Hollow drainage system. This system is an ephemeral tributary of the La Plata River. The site has very little topographic relief with gentle sideslopes and a very low gradient from north to south. Maximum topographic relief across the proposed stabilization area is approximately 35 feet.

Natural vegetation in the vicinity of the site consists primarily of grassland with scattered sagebrush on the valley floor. Slopes to the east support mountain mahogany and scrub oak communities while those to the west are occupied by pinyon-juniper woodlands with intervening areas of sagebrush and rabbitbrush. Deer and elk occur in the area.

The site is privately owned and currently used in the spring and fall as a gathering, lambing, and grazing area for sheep. Three historic sites and two isolated archaeological finds were identified in the vicinity of the Long Hollow site.

4.2.5 Bodo Canyon borrow area

Two adjacent borrow sites in Bodo Canyon, herein referred to as the Bodo Canyon borrow area, are located approximately 0.3 mile south of the Bodo Canyon site just east of the intersection of County Roads 211 and 212 (see Figure 3.5). Access to the borrow area from the Durango site is essentially the same as that for the Bodo Canyon disposal site. Similarly, the borrow area is located on lands owned by the Colorado Division of Wildlife.

As indicated in Figures A-9 and A-10, Appendix A, Conceptual Designs and Engineering Evaluations, Remedial Action Alternatives, in the DEIS, the borrow area is located at the base of the north-facing slope of Carbon Mountain and very near County Road 211 (Bodo Canyon Road). Elevations in the vicinity of the borrow area range from about 6900 to 6975 feet. Topographic relief across the borrow site in Area D is about 30 feet, whereas the relief is about 50 feet across the borrow site to the east of Area D (see Figure A-9, Appendix A, in the DEIS).

Natural vegetation in the borrow area consists primarily of sagebrush with scattered patches of wheatgrass. Isolated pinyon pine and juniper trees occur on the low ridges to the east and west of the borrow area. Deer and elk utilize the area in both summer and winter.

Neither prehistoric sites nor artifacts have been identified within the borrow area.

The inactive sandstone quarry is located in a narrow canyon approximately 0.2 mile west of the raffinate-ponds area (see Figure A-10, Appendix A, in the DEIS).

4.3 CLIMATE

The climatic zone of southwestern Colorado can be termed as a highland or mountain climate that is temperate and semi-arid (Gale Research Company, 1980). According to the Koeppen climatic classification system, the climate is characteristic of a mid-latitude steppe, that is, semi-arid and cool (Critchfield, 1966). It is characterized by warm summers, cool springs and autumns, and moderately cold winters. In general, precipitation is distributed rather evenly throughout the year.

The Durango area is often affected by well-developed weather systems approaching from the north or west during the cooler months and by local thunderstorms during the summer months. Rapid changes in topographic relief in the immediate vicinities of the Durango and the alternate disposal sites influence the wind and temperature patterns at these locations which, in turn, influence the wind dispersion characteristics of these areas.

4.3.1 Temperature

A second-order National Weather Service (NWS) Station (No. 05-2432-2) is located in northwest Durango at 2810 West Third Avenue. The most recent climatological summary available from this station indicates an annual average temperature of 46.8°F (NOAA, 1975) during the 23-year period from 1951 to 1973. The extreme temperatures ranged from -30°F in January 1963 to 101°F in July 1973. January had the lowest average daily minimum temperature of 10.7°F, and July had the highest average daily maximum temperature of 86.7°F. During 1982, the annual average temperature at the NWS station was 45.7°F, or 1° lower than the long-term average (CSU, 1982).

Meteorological monitoring stations were operated near the Durango tailings piles and at the Bodo Canyon site during 1982. During the time that the meteorological monitoring was in progress, access to privately-owned lands at the Long Hollow site was denied; however, it is expected that meteorological conditions at the Long Hollow site will be similar to those at the Bodo Canyon site. Annual average temperatures recorded at the Durango and Bodo Canyon stations during 1982 were 48.9 and 48.4°F, respectively. Daily average minimum and maximum temperatures recorded at the Durango station ranged from 22.3 to 84.6°F, respectively, while those in Bodo Canyon ranged from 18.1 to 84.4°F, respectively. Comparisons of the Durango NWS station and the monitoring-station data suggest that temperatures in the vicinities of the monitoring stations may average slightly higher than those recorded for the NWS. These differences are representative of the temperature variations found over short distances in mountain and valley terrain. Summaries of temperatures recorded at the Durango and Bodo Canyon monitoring stations are listed in Tables D-5 and D-6, Appendix D, Meteorological and Air-Quality Information, in the DEIS.

Although the long-term record indicates that July is usually the warmest month of the year, August proved to be the warmest month of 1982. On the average, temperatures can be expected to reach or exceed 90°F about 18 days out of the year.

On the average, the Durango area has a frost-free period of 121 days starting in May and lasting through September (Gale Research Company, 1980). On about 10 days out of the year the temperature will reach 0°F or below (NOAA, 1975).

Temperatures in the transportation corridor will not differ significantly from those recorded at the meteorological sites near the tailings piles and in Bodo Canyon. Any noticeable difference in extreme temperatures will be because of the influence of the terrain in the immediate vicinity of the corridor.

4.3.2 Precipitation and evaporation

Site-specific precipitation measurements are not available for the Durango or alternate disposal sites. The precipitation patterns for these sites will be similar to the long-term patterns recorded in Durango. The annual average precipitation measured in Durango at the NWS station over a 23-year period (1951-1973) is 18.69 inches (NOAA, 1975). The highest average monthly precipitation is 2.66 inches in August, while June has the least with 0.75 inches. Snow can occur from October through May, with December and January experiencing the greatest average snowfalls of 46 and 58 inches, respectively. On the average, only 11 days out of the year experience 0.5 inch or more of precipitation (rain or snow), and only one day of the year is likely to experience one inch or more of precipitation (Miller et al., 1973).

It is estimated that about 15 intense thunderstorms can be expected in the Durango area each summer (Miller et al., 1973). During the warmer months, lasting from May through October, there is a 50-percent probability that 0.6 inch of rain will occur in a one-hour period and one inch will occur in a period of six hours; however, there is only a 10-percent probability of a six-hour rainfall yielding 2.2 inches of rain (Miller et al., 1973).

The mean annual lake evaporation in the Durango area is 42 inches (USDC, 1968).

4.3.3 Winds

Wind speeds and directions were measured at the monitoring stations near the Durango site and in Bodo Canyon during 1982. Lack of permission for access to the Long Hollow site precluded wind measurement at this location. Measurements of winds near the Durango site were made at the west end of Fourth Street, west of the railroad tracks, but east of the river (see Figure D-1 in Appendix D, Meteorological and Air-Quality Information, in the DEIS). This location is within 0.2 mile of the tailings piles. Winds monitored at this location are representative of winds that will influence the dispersion of air pollutants generated by the remedial-action activities. Wind data are not available from the NWS station.

Based on the Durango and Bodo Canyon monitoring stations, wind speeds in the Durango vicinity are equal to or less than 10 miles per hour about 94 percent of the time. During 1982, the annual average wind speed near the Durango site was 6.6 miles per hour, whereas the annual average in Bodo Canyon was 5.3 miles per hour. Calm conditions (less than one mile per hour) measured near the Durango site occurred only 0.3 percent of the time. The proximity of the site to the Lightner Creek stream valley (U.S. Highway 160), Smelter Mountain, and the narrowing of the Animas River valley are all partially responsible for the low occurrence of calm winds.

About 41 percent of the time, the predominant wind direction near the Durango site is west-northwest down the river valley. The predominant direction in Bodo Canyon is from the west-southwest about 15 percent of the time. Winds in Bodo Canyon are more evenly distributed in all directions because of less topographic channeling through the broader Bodo Canyon area. The predominant wind direction in Long Hollow is probably more southwesterly than Bodo Canyon because of the difference in orientation of these two valleys. Wind speeds in Long Hollow may be slightly higher than Bodo Canyon because Long Hollow is flatter and has less vegetation to reduce the wind by friction.

Joint frequency of occurrence distributions (wind roses) of wind speed and direction recorded at the monitoring stations in Durango and Bodo Canyon during 1982 are provided in Appendix D, Meteorological and Air-Quality Information, in the DEIS, Figures D-2 and D-3, respectively.

4.3.4 Stability

The capability of the lowest several hundred meters of the atmosphere to disperse pollutants depends on numerous factors, including local topography, the temperature of the pollutant, wind speed and direction, and the height of discharge. For the purpose of modeling the behavior of gaseous pollutants, a parameter called stability has been developed. This parameter incorporates the effects of wind speed, solar radiation, and cloud cover to predict to what extent a gaseous plume will spread out vertically and horizontally as it moves downwind. Six stability classes are recognized, ranging from extremely unstable to very stable atmospheric conditions. The importance of determining the percent occurrence of each stability class at a given location lies in predicting when atmospheric conditions would prevent or hinder dispersion of the pollutants. Inadequate dispersion may result in a buildup of a pollutant at a particular location. Table D-6, Appendix D, Meteorological and Air-Quality Information, in the DEIS, illustrates the percent occurrence for each stability class at Durango and Bodo Canyon. Class 1 is unstable; Class 6 is stable. Class 4 is considered neutral and is the predominant stability class during the period from one hour before sunset to one hour after sunrise, and is the assumed class during all overcast conditions. As is apparent from Table D-6, Appendix D, in the DEIS, neutral or stable conditions occur at the two sites 70 and 67 percent of the time, respectively.

4.4 AIR QUALITY

The Durango, Bodo Canyon, and Long Hollow sites are located in La Plata County in Air Quality Control Region No. 9. The National Ambient Air Quality Standards (NAAQS) are used to classify counties as being below the NAAQS (attainment) or above the NAAQS (nonattainment). The NAAQS for all criteria pollutants are presented in Table D-7, Appendix D, Meteorological and Air-Quality Information, in the DEIS; Durango is designated attainment for these criteria pollutants. The nearest Prevention of Significant Deterioration (PSD) Class I area is Mesa Verde National Park, located about 32 miles west of the Durango site.

The pollutant of primary concern for this project is total suspended particulates (TSP) which is monitored by the state in the city of Durango. Records for Durango indicate that TSP values exceeded the NAAQS during 1979 and 1980 (Colorado Department of Health, 1981); however, the region is exempt from nonattainment status because of the rural fugitive dust policy that regards the elevated TSP concentrations as being caused by nonanthroprogenic sources (EPA, 1977). The state's preliminary data for 1982 indicate that the annual geometric mean concentration of TSP for Durango was 53 micrograms per cubic meter. The second highest 24-hour concentration measured during 1982 was 136 micrograms per cubic meter, well below the national standard of 260 micrograms per cubic meter.

Site-specific ambient TSP concentrations were measured every four days during 1982 at the meteorological monitoring stations near the Durango site and in Bodo Canyon as described in Appendix D, Section D.1. The annual geometric mean concentrations measured near the Durango site and in Bodo Canyon were 39 and 15 micrograms per cubic meter, respectively. The highest 24-hour concentrations measured at the sites were 142 and 77 micrograms per cubic meter, respectively. Because of remoteness, the Bodo Canyon particulate measurements are representative of those in Long Hollow. Results of the air-particulate measurements conducted at the Durango and Bodo Canyon sites are presented in Appendix D in the DEIS.

Other criteria pollutants of secondary importance that would be emitted by the remedial actions are carbon monoxide, nitrogen oxides, hydrocarbons, and sulfur oxides. None of these pollutants are monitored by the state in Durango.

4.5 SURFACE AND SUBSURFACE FEATURES

4.5.1 Topography and soils

Durango site

The Durango site is located at the base of Smelter Mountain on the west bank of the Animas River at the southwest edge of the city of Durango. The original topography of the mill site has been altered by construction activities and the placement of two tailings piles against the northeast side of Smelter Mountain. Elevations of the valley floor at this location vary from about 6490 feet above mean sea level at the base of the tailings piles to 6520 feet at the higher areas of the old mill site (see Figure A-3, Appendix A, Conceptual Designs and Engineering Evaluations, Remedial Action Alternatives, in the DEIS). Tops of the small and large tailings piles are at approximate elevations of 6580 and 6730 feet, respectively. All drainage from the mill site and tailings piles is to Lightner Creek and the Animas River. At the southernmost end of the Durango site, at the old raffinate ponds area, the ground surface slopes toward the Animas River and elevations range from about 6490 to 6530 feet (Figure A-4, Appendix A, in the DEIS).

Natural soil structures over most of the Durango site have been destroyed or covered by site use. Tnerefore, a soil survey was not performed at the Durango site. Where natural soils do exist, mainly on the sideslopes of Smelter Mountain and the ridge west of the raffinate ponds area, they consist of gravelly silty sands that support minimal plant growth. Most of the site is covered with man-made fill materials that were probably locally derived from the steep slopes along the west side of the site. The slopes of the tailings piles, consisting of sand with some silt, have been seeded and occasionally irrigated so that plant growth (grass) covers large portions of the piles. At the south end of the site, the old raffinate ponds depressions have been filled in with locally derived fill materials, graded, and revegetated.

Bodo Canyon site

The Bodo Canyon site is located in a gently sloping subbasin in and near the upper west end of the Bodo Canyon drainage area which covers approximately 4.5 square miles and ranges in elevations from 7725 feet above mean sea level at the top of Smelter Mountain to about 6600 feet at the mouth of Bodo Canyon (see Figure 3.7). Ground-surface elevations across the site range from highs of approximately 7125 to 7135 feet at points along the southern boundary to as low as 7035 feet in the northeast-trending gully on the north side of the site (see Figure A-13, Appendix A, Conceptual Designs and Engineering Evaluations, Remedial Action Alternatives, in the DEIS). Almost all the surface area of the site slopes toward the upper reach of this gully where a small embankment was originally constructed to capture surface drainage and form a watering pond for livestock. Gradients across the site are quite varied, ranging from less than two percent to more than 15 percent. The area is almost plateau-like; slopes drop away quickly from the site's southern boundary to the floor of Bodo Canyon.

Soils on the Bodo Canyon site range from clays to silty clay loams (see Tables E-1 and E-3, Appendix E, Soils, Geologic, and Seismic Information, in the DEIS). Eight different soil types have been mapped in the area (see Figure E-1, Appendix E, in the DEIS) by the U.S. Department of Agriculture, Soil Conservation Service (SCS, 1982). Three of the soils representing the majority in the area are relatively similar except for clay content in the surface horizon, but differ appreciably at depth (see Table E-2, Appendix E, in the DEIS). Because of its lower clay content, the Falfa clay loam is deemed more suitable for use as topsoil than other soils in the area.

Long Hollow site

Tnis relatively flat alternate disposal site is located at the north end of Long Hollow and forms the headwaters for the entire Long Hollow drainage system (see Figure A-20, Appendix A, Conceptual Designs and Engineering Evaluations, Remedial Action Alternatives, in the DEIS). Ground-surface elevations range from about 7440 feet above mean sea level along the drainage divide north of the site to about 7370 feet just downstream of the site. The gradients from north to south through the center of the site range from about two percent at the northern end to less than one percent at the southern boundary. Sideslopes of the valley range from about three to five percent on the west and from three to eight percent on the east. Outside the site to the east, gradients increase to as much as 20 percent. Maximum topographic relief on the site itself is approximately 30 feet.

Of the nine different soil types mapped by the SCS (1982), the Arboles clay covers most of the Long Hollow site (see Figure E-2, Appendix E, in the DEIS). This soil material has a very high clay content that would limit its use, without treatment, as topsoil during reclamation of the stabilized site. Typically, Arboles soils have very low permeabilities, high shrink-swell properties, high water-holding capacity, and moderate erosion potential.

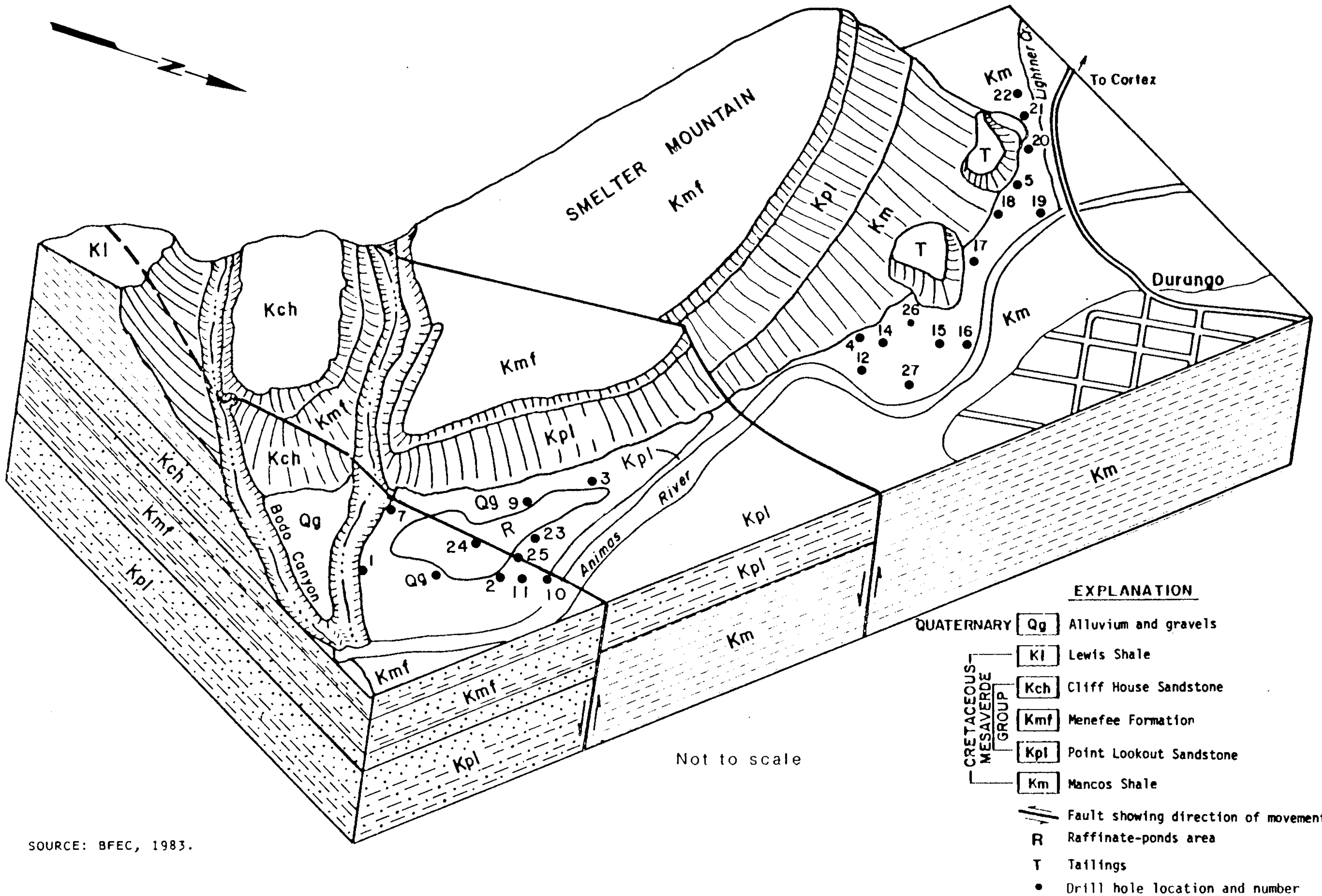
4.5.2 Geologic features

The Durango and alternate disposal sites are located at the northern end of the San Juan Basin which is characterized by southwest-trending hogbacks that have steep northern slopes and more gentle southern slopes. The highest ridges in the area exceed 8000 feet above mean sea level with relief exceeding 1200 feet. Valleys between the hogbacks are drained by intermittent or ephemeral streams that have eroded deeply into the alluvium and shales underlying the valleys.

Durango site

Bedrock underlying the tailings area of the Durango site consists of several hundred feet of Cretaceous-age Mancos Shale (see Figure E-5, Appendix E, Soils, Geologic, and Seismic Information, in the DEIS) which is a thick, laterally persistent marine shale. At Durango, the Mancos Shale contains minor interbeds of argillaceous and arenaceous limestone, and argillaceous sandstone, which locally may be water bearing (Markos and Bush, 1982; BFEC, 1983). Water-bearing Quaternary gravels, which may represent glacial outwash or alluvial river gravels, directly overlie the Mancos Shale. Man-made fill materials, vitreous smelter slag, and tailings overlie the zero- to 60-foot thickness of unconsolidated alluvial and colluvial materials.

Definition of the Cretaceous-age bedrock formations beneath the raffinate ponds area is made complicated because of a north-northeast-trending inactive fault that passes through the raffinate ponds area as indicated in Figure 4.2 (BFEC, 1983). West of the fault, drill holes penetrated laminated gray to black shale, silty shales, and sandy shales of the lower part of the Point Lookout Sandstone. Sequences of massive sandstones, shales, carbonaceous shales, and thin coal beds were penetrated by drill



SOURCE: BFEC, 1983.

FIGURE 4.2
GENERALIZED GEOLOGY OF THE DURANGO SITE AND DRILL HOLE LOCATIONS

holes on the east side of the fault. As in the tailings area, the bedrock is overlain by an unconsolidated sequence of Quaternary gravels, colluvium and alluvium, and man-made fill materials to more than 40 feet in thickness.

Structurally, the Durango site is on the Hogback Monocline that dips to the southeast at five to 15 degrees.

Bodo Canyon site

Bedrock formations that crop out in Bodo Canyon include the Cretaceous-age Point Lookout Sandstone, Menefee Formation, and Cliff House Sandstone of the Mesa Verde Group, and the Lewis Shale. The Cliff House Sandstone underlies all of the Bodo Canyon site (see Figures A-1 and A-3 in CGS, 1981).

The Mesa Verde Group, which has been divided into three separate stratigraphic units, overlies the Mancos Shale (Zapp, 1949). The lowermost Mesa Verde rock unit is the Point Lookout Sandstone, a light-colored, thin-bedded to massive, 400-feet-thick sandstone unit. The erosion-resistant Point Lookout Sandstone underlies the Smelter Mountain hogback north of the Bodo Canyon site. Overlying the Point Lookout Sandstone is a complex assemblage of lenticular sandstone beds, dark-colored shale and siltstone beds, and coal beds called the Menefee Formation. The Menefee Formation ranges from 250 to 350 feet in thickness and contains the major coal beds that occur in the Durango area. The Cliff House Sandstone, overlying the Menefee, consists of interbedded calcareous sandstone, siltstone, and silty shale. Although a resistant, ledge-forming unit in the vicinity of Mesa Verde National Park, the Cliff House Sandstone southwest of Durango is less resistant to erosion than is the underlying Point Lookout Sandstone unit of the Mesa Verde Group, which consists of hard sandy shale, siltstone, and shaley sandstone beds that contain occasional thin sandstone beds. The main stream channels to the north and south of the Bodo Canyon site are bedrock controlled, and there is no evidence that significant erosion or deposition will occur within or adjacent to the site in the next 1000 years (Schumm and Harvey, 1983).

At the Bodo Canyon site, surficial materials consist of unconsolidated alluvium and colluvium deposits of silty clay, silt, and sand that are locally interbedded with layers of mixed sandstone and shale bedrock fragments. Drill holes penetrated as much as 65 feet of interbedded silty clay, sandy clay, clayey silt, and sandy silt in the north-central part of the Bodo Canyon site (Dames & Moore, 1983). (See Figures A-9 and A-10, Appendix A, Conceptual Designs and Engineering Evaluations, Remedial Action Alternatives, in the DEIS). Along the crest edge of Bodo Canyon, surficial deposits of as little as one foot were encountered in test pits (DOE, 1985).

The Bodo Canyon area lies on the Hogback Monocline, along the north-northwest boundary of the San Juan Basin. Dips of the bedrock are from five to 15 degrees southwest in Bodo Canyon but range up to 35 degrees farther south.

The northern San Juan Basin, including the ancient Hogback Monocline, has not been subject to major faulting. However, a northeast-trending fault, herein called the "Ridges Basin Fault," has been mapped (Zapp, 1949) from Ridges Basin potentially extending into Bodo Canyon (see Figure E-5, Appendix E, Soils, Geologic, and Seismic Information, in the DEIS). A field study (JEG, 1985a) found no trace of the fault along the mapped fault trace within one mile of the site. Air-photo analysis and aerial low sun angle reconnaissance of the entire length of the mapped trace revealed no features indicative of faulting. A test trench constructed for this study which should have intersected the fault where it would enter the Bodo Canyon site also revealed no indication of faulting. In addition, several other lineaments were investigated by trenching but revealed no evidence of faulting at the Bodo Canyon site. It is concluded that the Bodo Canyon site is free of active faulting.

Several small inactive faults with displacements less than 10 feet are exposed in the Cliff House Sandstone on the slope to the south of the site, but are probably not related to the fault mapped by Zapp (1949) since their displacements are in the opposite direction.

Long Hollow site

Bedrock beneath the Long Hollow site consists of approximately 600 to 800 feet of the Cretaceous age Lewis Shale (FOCERI, 1978). This formation consists of a laterally persistent sequence of dark gray shale interbedded with thin, relatively sparse limestone, siltstone, and sandstone beds. The top of the Cliff House Sandstone aquifer is at a depth of about 700 feet. Surficial deposits of alluvium and colluvium up to 23 feet thick overlie the weathered and unweathered bedrock; these deposits consist of low to moderately plastic clay with minor amounts of silt, sand, and gravel, and occasionally cobbles.

The Long Hollow site is located along the northwest flank of the San Juan Basin on a gentle monocline that dips about six degrees to the southeast toward the center of the basin. Immediately north of Long Hollow are the Perrins Peak Syncline and the Durango Anticline that plunge to the south and may converge near the Long Hollow site (CGS, 1981).

Faults mapped nearest to the Long Hollow site occur at distances of about 2.25 miles (CGS, 1981) and four miles (Zapp, 1949). FOCERI (1978) indicates that anomalous steep dips in the Lewis Shale are present about one mile north-northeast of the site and that these may be fault-related.

Fracturing and jointing in the Lewis Shale are reported to be variable near the surface, ranging from unfractured to highly fractured (FMFA, 1978) with most fractures being open.

Mudflows originating on the slopes to the east of Long Hollow extend to the valley floor (FOCERI, 1978); however, they do not reach the disposal site.

4.5.3 Mineral resources

Mineral resources in the northern San Juan Basin include coal, oil, gas, sand, and gravel. Primary sources of coal in the northern San Juan Basin are the Fruitland Formation and the Menefee Formation. All three alternate disposal sites are located stratigraphically below the Fruitland Formation (see Figure E-3, Appendix E, Soils, Geologic, and Seismic Information, in the DEIS). The Durango site is also located below the Menefee Formation, so no coal reserves are known to underlie this site. There are no known current leases for either coal or oil and gas that are outstanding on any of the three alternate disposal sites.

The Menefee Formation underlies the Cliff House Sandstone at a shallow depth (100 to 200 feet) below the Bodo Canyon site. Coal beds ranging in thickness from 0.7 to 4.5 feet occur in the upper 50 feet of the Menefee Formation in Bodo Canyon (Zapp, 1949); at least nine abandoned prospects and small coal mines in the Menefee Formation are located within a one-mile radius of the Bodo Canyon site. One coal bed that has been mined is 4.6 feet thick and occurs about 140 feet below the top of the formation. Therefore, this coal bed could be about 250 to 300 feet below the ground surface in the Bodo Canyon site. Based on Zapp's total resource calculations for T35N, R10W, the site could be underlain by as much as 400,000 tons of potentially recoverable coal. The potential value of this coal, at $20 per ton, would be $8 million. Menefee coal also underlies the Long Hollow site at a depth that is probably greater than 1000 feet. No known coal mines exist near the Long Hollow site.

The production of oil increased by 47 percent in La Plata County during the period from 1977 through 1980, although the production rate is still relatively minor. One dry oil and gas exploration well was drilled across the Animas River from the Durango site in Section 32, Township 35 North (T35N), Range 9 West (R9W). No wells are known to have been drilled in Bodo Canyon, therefore the potential for oil or gas production there is unknown. However, an oil and gas exploration well drilled in Section 1, T34N, R10W, about 1.5 miles south-southwest of the Bodo Canyon site, was dry. Wells have been drilled in the Long Hollow area in Section 8, T34N, R10W, north of the Ute line and in Section 27, T34N, R11W, south of the Ute line. None of these wells produced economically significant quantities of oil or gas (CGS, 1981). The Long Hollow area has low to moderate potential for oil or gas development, however developing a well there is considered to be a high risk (Meibos, 1985).

Sand and gravel resources are abundant in the Animas River valley. The Durango site overlies alluvial gravels within the modern floodplain of the Animas River (Animas Regional Planning Commission, 1976). No gravel deposits are located within the Bodo Canyon or Long Hollow sites (CGS, 1981; Moore and Scott, 1981; Scott and Moore, 1981).

4.5.4 Seismicity

The Durango, Bodo Canyon, and Long Hollow sites are all in close proximity to one another. Because of this proximity and the regional nature of seismicity, conclusions regarding seismicity apply equally to all of the alternate disposal sites.

No known Neogene faults (within the last 25 million years) occur within 50 miles of Durango (Kirkham and Rogers, 1981) and only minor seismicity has been recorded during the past 100 years near Durango. Locations and dates of the historical seismic events that may have affected the Durango area are listed in Table 4.1.

A map showing the locations of these events and many smaller events within this 200-mile radius is presented in Figure E-6, Appendix E, Soils, Geologic, and Seismic Information, in the DEIS; discussions of the larger earthquakes are also included in Appendix E, in the DEIS.

A seismic hazard study of the Durango, Colorado, area was undertaken as a part of an assessment of the long-term stability of an existing uranium mill tailings pile and two alternative disposal site areas (JEG, 1985a, and Appendix M, Seismic Evaluation, in this FEIS). Both deterministic and probabilistic approaches were used.

Several accelerations of 0.01 to 0.02g have probably occurred in the site area since 1960, based on an assessment of recent seismic activity. The maximum potential horizontal acceleration in rock expected at the site area during a Maximum Credible Earthquake (MCE) related to a specific known seismogenic feature is found to be 0.09g, resulting from a magnitude 7.5 earthquake in the Dulce, New Mexico area.

The probability of occurrence of various levels of acceleration for various time periods was calculated using the computer code ACC.LINE.AREA (Chiang et al., 1984). Summarized values are as follows:

- Ten-year time interval - less than 10 percent probability of occurrence of an acceleration exceeding 0.05g.
- Two hundred-year time interval - less than 10 percent probability of occurrence of an acceleration exceeding 0.09g.
- One thousand-year time interval - less than 10 percent probability of occurrence of an acceleration exceeding 0.12g.

Table 4.1 Summary of historical seismic events that may have affected the Durango area

Date			Location		Richter	Distance from sites		Acceleration
Yr	Mo	Da	Lat (N)	Long (W)	magnitude	km	miles	in Durango area
1960	10	11	38.3	107.6	5.5	117	63	0.02g
1966	01	23	36.9	107.3	4.6	58	31	0.02g[a]
1966	01	23	37.0	107.0	5.5	75	41	0.02g
1966	05	19	36.9	107.0	4.6	80	43	0.01g[a]
1966	06	02	36.9	107.0	5.0	80	43	0.02g
1967	01	16	37.7	107.9	4.1	50	27	0.01g[a]
1967	12	10	36.7	107.2	5.1	82	44	0.02g
1976	01	05	35.8	108.3	5.0	163	88	<0.01g

[a]By extrapolation of lowest magnitude curve to lower magnitudes.

Ref. NOAA Earthquake Data File, (NOAA, 1981).

4.5.5 Geomorphic hazards

Assessments of potential geomorphic hazards of the processing site and alternate disposal sites were prepared for this FEIS (JEG, 1985a,b,c). A geomorphic hazard is considered to be any landform change that can affect the long-term integrity (1000 years) of the proposed stabilization.

Durango site

Possible critical hazards to the Durango tailings site include catastrophic flooding by the Animas River and erosion resulting from the natural process of channel evolution. The sites rest within a narrow, bedrock-confined, inner valley that has been cut since the last glaciation which ended perhaps 16,000 years ago. As approximated by an analysis of the Probable Maximum Flood (PMF), large discharges of the Animas River would submerge the lowest part of the tailings by about 30 feet, and a much smaller (500-year) flood would reach the lowest part of the tailings.

The natural change in the river channel itself would cause downstream shift of meanders and valley widening. Long-term rates using geomorphic models and an inclusive range of boundary conditions are: for downstream meander shift: 217 to 2900 feet per 1000 years, and for valley widening: 56 to 90 feet per 1000 years.

At the raffinate ponds site, geomorphic hazards would not be severe. Because the ponds are above river level, they would not be affected by flooding. Erosion of the site by natural river channel evolution is not likely either because: (1) the site is underlain by bedrock which is more resistant to erosion; (2) the rate of valley widening is slower than at the tailings site; and (3) the Animas River channel at that point is straight instead of meandering.

Bodo Canyon site

The greatest hazard to the Bodo Canyon area is a large gully that extends from a north drainage into the surficial deposits flooring the site. Erosion rates on the slopes draining toward the site may be from a few feet to as much as 10 feet per 1000 years. Potential problems could occur where the north embankment truncates the gully and rests against the steep, eroding slope on the east.

Long Hollow site

Possible geomorphic hazards at the Long Hollow site are shifting of the drainage divide between the site and Ridges Basin, formation of gullies, and catastrophic flooding. The site is sufficiently far from the divide (500 feet) that the present rate of slope retreat (100 feet per 1000 years) would not affect the site. The site has a high potential for gully formation. All of the runoff from the site drains into a small ephemeral channel which may become incised during a PMF.

4.6 WATER

4.6.1 Surface water

Durango site

Perennial surface waters in close proximity to the Durango site include the Animas River and its tributary, Lightner Creek. Upstream from the tailings piles, the Animas River has a drainage area of approximately 770 square miles, including that of Lightner Creek, and a length of approximately 62 miles. Lightner Creek has a total stream length of approximately 15 miles. Surface elevations in the drainage basin vary from approximately 12,400 feet in the headwaters on the La Plata Mountains to 6460 feet at the Durango site. The U.S. Geological Survey maintains a gauging station on the Animas River in Durango 0.8 mile upstream from the confluence of Lightner Creek with the river. At this point, the Animas has a drainage area of 692 square miles and a 75-year average annual flow of 838 cubic feet per second (cfs). The lowest minimum flow ever recorded during the period 1895 through 1980 was 94 cfs, which occurred March 2, 1913 (USGS, 1981). For a drainage area of 770 square miles, including the drainage area for Lightner Creek, the average flow in the Animas River past the Durango site is estimated to be 950 cfs.

At present, water from the Animas River is diverted for irrigation, municipal, and industrial uses in Colorado and New Mexico. The city of Durango pumps water from the Animas River upstream of the Durango site to supplement withdrawal from the Florida River to meet high demands during the summer months. The city of Aztec, New Mexico, approximately 39 miles downstream from the Durango site, has rights to about 850 acre-feet of the Animas River water which are distributed for domestic requirements in the city and two other water-user organizations (USBR, 1980). The city of Farmington, New Mexico, has rights to about 16,950 acre-feet per year from the Animas River (USBR, 1979a) for both municipal use and selling to the Lower Valley Water Users Association and the Navajo Tribal Utility Authority (USBR, 1980).

Since 1884, 30 damaging floods have occurred in the Durango area. The largest flood recorded at the gauging station occurred on October 5, 1911, with a peak discharge of 25,000 cfs. This flood resulted from continuing heavy rains that totalled over four inches in three days at a precipitation-measuring station in the upper watershed of the Animas River (USCOE, 1977). The second largest flood recorded at the Durango gauge was 20,000 cfs. This flood occurred in late June of 1927 as a result of heavy rains and snowmelt. Other major floods on the Animas River occurred in September, 1927, June, 1949, and May, 1941 with peak flows of

14,000, 12,700, and 10,500 cfs, respectively. Estimated flood peaks for the 2.33, 10, 25, 50, and 100-year recurrence intervals, and for a general Probable Maximum Flood (PMF) based on a 24-hour Probable Maximum Precipitation (PMP), for the Animas River at the Durango site are listed in Table 4.2. Methods used to estimate these flood peaks are discussed in Appendix F, Water Resources Information, in the DEIS.

Table 4.2 Estimated peak flood flows for the Animas River at the Durango site

Flood type	Peak flow (cfs)[a]	Water surface elevation (feet)
2.33-year	7,600	6,471
10-year	15,000	6,474
25-year	17,000	6,475
50-year	20,000	6,476
100-year	23,000	6,478
General PMF, 24-hour	271,800	6,518

[a]Cubic feet per second.
Ref. FBDU, undated.

The average elevation of the Animas River in the vicinity of the tailings piles is approximately 6460 feet; bases of the piles are at an elevation of about 6490 feet. During a 100-year flood, the bases of the tailings piles would be above the flood-crest stage, but they would be subject to flood waters during a PMF. The water surface elevations corresponding to the 100-year flood and the PMF are 6478 and 6518 feet, respectively.

The U.S. Army Corps of Engineers has determined that 5.1 acres of the Durango site lie within the floodplain of the Animas River and Lightner Creek (see Appendix J, Floodplain and Wetlands Assessment, in the DEIS).

A discussion of the Animas River's fluvial geomorphology and predicted channel stability is presented in Section 4.5.6 and Section F.1.5, Appendix F, Water Resources Information, in the DEIS.

The topography of the Durango site is such that all surface drainage from the tailings piles, mill site, and the raffinate ponds area ultimately ends up in the Animas River.

Water in the Animas River at Durango is a calcium bicarbonate or calcium bicarbonate sulfate type, generally ranging in hardness from moderately hard to very hard. Concentrations of ammonia, total iron, total manganese, total lead, combined radium-226 and radium-228, and gross alpha all exceeded either State of Colorado or EPA drinking water standards at least once during 1982 (see Table F.11, Appendix F, Water Resources Information, in the DEIS).

The heavy metal concentrations are believed to be from natural sources and from abandoned and existing mining operations near the river's headwaters. Concentrations of nutrients (nitrogen and phosphorus) indicate that domestic and agricultural use has influenced water quality of the river.

Bodo Canyon site

The Bodo Canyon drainage area is in an ephemeral drainage basin that covers approximately 4.5 square miles bordered by Smelter Mountain on the north, Carbon Mountain on the south, the Animas River on the east, and the drainage divide between Ridges Basin and Bodo Canyon on the west (see Figure F.1, Appendix F, Water Resources Information, in the DEIS). The upper slopes on the north and south sides of the Bodo Canyon drainage area have gradients up to 20 percent and drain into small canyons and subbasins; the Bodo Canyon site is one of these small, gently sloping subbasins near the upper west end of the drainage area. All surface water from Bodo Canyon drains directly into the Animas River from two main intermittent drainages, one on the south side of the site (main drainage) and one to the north of the site (north drainage). Almost all of the Bodo Canyon site's surface area slopes gently toward a gully at the north-central part of the site where a small embankment was originally constructed to capture surface drainage and form a watering pond for livestock. There are no other major streams, lakes, springs, or irrigation ditches in Bodo Canyon.

To evaluate the flooding potential of the drainages on the north and south sides of the Bodo Canyon site, the watershed of 245 acres above the site was divided into three sub-watersheds of 52, 118, and 75 acres, respectively (see Figure F-1, Appendix F, in the DEIS). The first two of these watersheds contribute to the tributaries of the north drainage and the third contributes to the main drainage. The PMFs in these drainages were used to determine the lowest elevations suitable for placement of embankments. Surface-water flows for estimated PMFs for these sub-watersheds are listed in Table 4.3. The six-hour local PMP for these areas is estimated to be 10.7 inches (NOAA, 1977). The six-hour PMP for small drainage areas, such as at the Bodo Canyon and Long Hollow sites, produces the same magnitude flood peaks as PMPs of longer duration and is used in this analysis.

Concentrations of sulfate, total dissolved solids, total iron, total manganese, total lead, total mercury, gross alpha, and combined radium-226 and radium-228 in the Animas River and at surface-water sampling stations downstream from the Bodo Canyon site all exceeded either state or EPA drinking-water standards at least once during 1982 (see Tables F-11 through F-13, Appendix F, Water Resources Information, in the DEIS).

Table 4.3 Drainage areas and PMF peaks for the Bodo Canyon site sub-watersheds

Sub-watershed	Drainage area (acres)	PMF Peak (cfs)[a]
1	52	1138
2	118	2707
3	75	1740

[a]Cubic feet per second.

Surface waters from the north and main Bodo Canyon drainages are classified as magnesium sulfate to mixed cation-sulfate types. The water is moderately to very hard and slightly to moderately saline.

Long Hollow site

The Long Hollow site is within the drainage basin of the La Plata River and is located at the headwaters of the Long Hollow ephemeral drainage system. There are no perennial streams or lakes on the Long Hollow site; however, there are two small stock ponds near the north end of the site.

To evaluate the flooding potential of the Long Hollow site, and to estimate maximum water flows for diversion-ditch designs, the watershed above the site was divided into five sub-watersheds (see Figure F-2, Appendix F, in the DEIS). The drainage areas and estimated PMF peaks for these sub-watersheds are listed in Table 4.4. Since the Long Hollow watersheds are within six miles of the drainage basin of Bodo Canyon, it was assumed that the six-hour local PMP for these two areas would be the same (10.7 inches).

Table 4.4 Drainage areas and PMF peaks for the Long Hollow site sub-watersheds

Sub-watershed	Drainage area (acres)	PMF Peak (cfs)[a]
1	130	2285
2	57	907
3	112	2312
4	38	814
5	184	3480

[a]Cubic feet per second.

The quality of ephemeral surface waters near the Long Hollow site is unknown; however, because the area is used extensively for grazing sheep, any runoff may have high nitrogen and phosphorous concentrations. Shallow ground water together with surface runoff at Long Hollow is a source of streamflow that is generally classified as a magnesium-sulfate to mixed cation-sulfate type which contains high concentrations of both total dissolved solids and hardness ranging from 5080 to 12,900 milligrams per liter (mg/l) and 3249 to 5109 mg/l, respectively (see Table F-34, Appendix F, Water Resources Information, in the DEIS). Total iron, total manganese, total dissolved solids, total sulfate, and dissolved sulfate concentrations all exceed the Federal and state drinking water standards.

4.6.2 Ground water

Durango site

The subsurface conditions and ground-water characteristics described in this section are based on recent field investigations conducted for the DOE at the Durango site (BFEC, 1983). A detailed discussion of the hydrogeology and the results of the field investigations are presented in Appendix F, in the DEIS and the Addendum to Appendix F in this FEIS.

Mancos Shale, which underlies the tailings piles and mill site area, contains small quantities of ground water in sandstone lenses and in fractured or weathered sections. Directly overlying the shale are zero to 60 feet of unconsolidated alluvium, colluvium, and man-made fill. A gravel layer at the base of these materials generally is water bearing. Ground water may also occur within the alluvium and colluvium as localized perched lenses. Near the mill site, up to 35 feet of man-made material have been deposited, including as much as 25 feet of smelter slag. These deposits generally contain little or no water.

The alluvial and colluvial aquifer is recharged by infiltration of incident precipitation and surface runoff and by inflow from Lightner Creek and the Animas River during periods of high flow. Discharge from the aquifer is to the Animas River during periods of low flow. Hydraulic conductivities for the Lightner Creek alluvium and colluvium range from approximately 260 to 380 feet per day (9.2×10^{-2} to 1.3×10^{-1} centimeters per second) while those for the Animas River alluvium and colluvium range between 6.1 and 35 feet per day (2.2×10^{-3} and 1.2×10^{-2} centimeters per second).

Analysis of ground-water samples collected from the Lightner Creek alluvium and colluvium show concentrations of uranium, selenium, and sulfate above those for upgradient wells. The respective increases in concentrations of these parameters from upgradient to downgradient wells is 23 to 102 micrograms per liter (ug/l) for uranium, <0.01 to 0.05 milligrams per liter (mg/l) for selenium, and 174 to 1160 mg/l for sulfate. The corresponding drinking-water standards for selenium and sulfate are 0.01 and 250 mg/l, respectively. There is no comparable drinking-water standard for uranium. Analysis of samples collected from the Animas River alluvium beneath the mill site and large tailings pile areas also show elevated concentrations above background for uranium (from <0.001 to 5.6 mg/l), arsenic (from <0.01 to 0.132 mg/l), molybdenum (from <0.05 to 0.23 mg/l), vanadium (from <0.05 to 10.8 mg/l), and selenium (from 0.047 to 1.6 mg/l) (BFEC, 1983).

As originally mapped by Zapp (1949), the bedrock beneath the raffinate ponds area is offset by a northeast-trending, normal fault (see Figure 4.2). The Point Lookout Sandstone underlies the western side of the fault line and the Menefee Formation on the eastern side. Coal and sandstone beds within the Menefee Formation and brecciated fault zone contain ground water. The Point Lookout Sandstone is composed mainly of shale at this locality and contains only minor quantities of ground water. Recharge to these aquifers and other deeper aquifers is from leakage from overlying or underlying aquifers and from infiltration of incident precipitation and snowmelt in outcrop areas. Estimated hydraulic conductivities for the Menefee Formation, Point Lookout Sandstone, and the fault zone are 0.89 feet per day (3.1×10^{-4} centimeters per second), 6.2×10^{-3} feet per day (2.2×10^{-6} centimeters per second), and 4.4 feet per day (1.6×10^{-3} centimeters per second), respectively (BFEC, 1983).

Analysis of ground-water samples collected from wells completed in the bedrock beneath the raffinate ponds area indicate that contaminants have migrated downward into the fault zone but have not yet penetrated the adjoining Point Lookout Sandstone (BFEC, 1983).

A review of analytical data collected since publication of the Bendix study indicated evidence of contamination of water-bearing zones in the Menefee Formation downgradient of the fault. The contamination has been defined in only one well (No. 02). Additional discussion of ground-water contamination in the raffinate ponds area is presented in Section F.3.1 of the Addendum to Appendix F, Water Resources Information, and Section 6.5.2 of this FEIS.

Up to 47 feet of colluvium, alluvium, and man-made fill overlie the bedrock surface in the raffinate ponds area. A gravel layer ranging in thickness from zero to seven feet directly overlies the bedrock and is usually water-bearing. This aquifer is similar to the alluvial gravel described in the area of the tailings piles and mill site; however, the gravels are only saturated near the raffinate ponds area and along the northeast-trending fault mapped by Zapp (1949). Hydraulic conductivities range between 19.9 and 22.9 feet per day (7.0×10^{-3} and 8.1×10^{-3} centimeters per second) for this aquifer.

Ground-water samples collected from this gravel aquifer downgradient from the raffinate-ponds area contain elevated concentrations of uranium, chromium, selenium, and vanadium relative to samples from the upgradient wells. The respective concentrations of these parameters at upgradient and downgradient wells were 16 microg/l and 1.2 mg/l for uranium; <0.01 and 0.286 mg/l for chromium; <0.01 and 6.8 mg/l for selenium; and <0.05 and 0.25 mg/l for vanadium. The drinking-water standards for chromium and selenium are 0.05 and 0.01 mg/l, respectively; drinking-water standards do not exist for uranium and vanadium. There are no known ground-water users in the vicinity of the mill site or the raffinate ponds (BFEC, 1983).

Bodo Canyon

The subsurface conditions and ground-water characteristics described in this section are based on field investigations conducted for the DOE at the Bodo Canyon site (Dames & Moore, 1983).

The Cliff House Sandstone crops out on and underlies the Bodo Canyon site. Sandstone lenses in this unit and coal and sandstone beds within the underlying Menefee Formation yield ground water to wells. The depth to the Menefee Formation at the Bodo Canyon site is estimated to range from about 150 to 300 feet. Field packer tests indicate that the hydraulic conductivity of these units varies from less than 2.8×10^{-4} to 4.3×10^{-1} feet per day (1.0×10^{-7} to 1.5×10^{-4} centimeters per second). Recharge to the bedrock aquifer is by leakage from an overlying shallow alluvial aquifer system and from infiltration of incident precipitation and snowmelt in outcrop areas to the north. Ground-water flow is controlled by the surface topography and structural geology with flow generally to the northeast (see Figures F-5 and F-6, Appendix F, Water Resources Information, in the DEIS).

Analyses of ground-water samples from monitoring wells completed in the Cliff House Sandstone and Menefee Formation indicate that the water is generally a sodium-bicarbonate type and very hard. The analytical results also show concentrations of sulfate, total dissolved solids, ammonia, total iron, total manganese, total barium, total lead, hexavalent chromium, combined radium-226-228, gross alpha, and gross beta above the Federal primary and secondary drinking-water standards. Re-sampling has confirmed elevated levels of sulfate, TDS, manganese, and iron.

The shallow aquifer system, as noted, occurs within the upper fractured and weathered bedrock units, and in the surficial unconsolidated alluvial and colluvial materials overlying the site. The surficial materials are generally composed of silts and clays with occasional stringers of fine sand. Laboratory testing of these materials indicates hydraulic conductivities ranging from 2.8×10^{-5} to 8.5×10^{-4} feet per day (1.0×10^{-8} to 3.0×10^{-7} centimeters per second).

Field packer tests conducted on the upper fractured and weathered bedrock units indicate hydraulic conductivities between 0.20 and 5.6 feet per day (7.0×10^{-5} and 2.0×10^{-3} centimeters per second). The shallow aquifer is recharged by infiltration of incident precipitation and snowmelt. Ground-water flow within the shallow aquifer system is controlled by both the land and bedrock surface topographies. Ground water migrates through the surficial alluvium and weathered bedrock toward the Animas River where it is eventually discharged.

Analysis of ground-water samples collected from the shallow aquifer indicate that concentrations of sulfate, total dissolved solids, hexavalent chromium, total iron, total lead, total manganese, gross alpha, and combined radium 226-228 exceed state or Federal drinking-water standards. Re-sampling has confirmed elevated levels of sulfate, manganese, and TDS. The water is classified as a calcium-bicarbonate type and is very hard (greater than 180 milligrams $CaCO_3$ per liter). There are currently no known downgradient ground-water users in the vicinity of the Bodo Canyon site. The aquifers beneath the site, however, are capable of producing limited quantities of water for domestic or stock-watering purposes.

Long Hollow site

The Long Hollow site is located within a ground-water discharge area. A local shallow aquifer system within both the unconsolidated colluvial and alluvial deposits and a highly fractured zone within the Upper Lewis Shale discharges within the proposed stabilization area. The shallow aquifer system is recharged by infiltration of incident precipitation and snowmelt, particularly from the high ground to the north and the west of the site. There is also some recharge from the east. The ground-water flow is controlled by local surface topography with flow tending to be downward and laterally to the valley bottom where it is discharged. Ground-water discharge is through seepage into the Long Hollow valley bottom and by evapotranspiration. The principal areas of ground-water discharge would be directly beneath the tailings if they were relocated to the Long Hollow site for stabilization. Field hydraulic conductivities measured in the fractured zone of the Lewis Shale range from less than 1.4×10^{-3} feet per day (4.9×10^{-7} cm/sec) to 2.3 feet per day (8.1×10^{-4} cm/sec), with an average value of approximately 0.5 feet per day (1.8×10^{-4} cm/sec). Two stock-watering ponds at the north end of the Long Hollow site have been constructed to capture surface-water runoff. It is possible that these ponds, in wet years, may receive some discharge from the shallow alluvial aquifer system; however, it is more likely that the ponds contribute water to the shallow system that discharges to the Long Hollow drainage channel farther downstream.

Ground water within the Long Hollow area varies from a magnesium sulfate to a mixed cation-sulfate type. The water is typically moderately to very saline, ranging from 5080 to 12,900 mg/l total dissolved solids. The shallow aquifer beneath the site is locally capable of yielding limited quantities of water for domestic or stock-watering purposes.

The shallow aquifer system is underlain by more than 600 to 800 feet of low permeability Lewis Shale, which impedes downward ground-water migration. The deep aquifer system includes all water-bearing units underlying the Lewis Shale. A deep test well drilled by Ranchers Exploration and Development Corporation encountered only small quantities of ground water in the Cliff House and Point Lookout Sandstones, and in the Menefee Formation. The deep aquifers are recharged in their outcrop areas by infiltration of incident precipitation and snowmelt. Some recharge also occurs by leakage from overlying or underlying strata. The water flow in these aquifers is controlled by regional head differences, the regional structure, and stratigraphic changes in the formations. Ground water in these aquifers is thought to be discharged to the San Juan River in northwestern New Mexico. Information on the uses or quality of ground water contained in the deep aquifers directly beneath the Long Hollow site is not available.

4.7 ECOSYSTEMS

4.7.1 Vegetation

The vegetation of the three alternate disposal sites differs appreciably. Detailed descriptions of plant community compositions are provided in Appendix G, Ecological Information, in the DEIS and are summarized in the following subsections. Data for these descriptions were obtained by reviewing published and unpublished literature, contacting government agencies, and conducting field surveys which included quantitative sampling.

Durango site

The Durango site is highly disturbed, and contains only a limited vegetative cover and habitat. Patches of smooth brome (*Bromus inermis*, Manchar Selection) occur across the area as remnants of past revegetation-stabilization efforts. Alfalfa (*Medicago sativa*) and Kentucky bluegrass (*Poa pratensis*) are minor constituents of this vegetation. Revegetation efforts have required irrigation and, because of substrate sterility and instability, have only been partially successful (FBDU, 1981). Riparian scrub along the Animas River adjacent to the site is composed primarily of narrowleaf cottonwood (*Populus angustifolia*) and boxelder (*Acer negundo*) with understory thickets of willow (*Salix* sp.) and river alder (*Alnus tenuifolia*). Vegetation on the upper slopes of Smelter Mountain adjacent to the tailings consists of scattered Utah juniper (*Juniperus osteosperma*), boxelder, Gambel oak (*Quercus gambelii*), skunk bush (*Rhus trilobata*), and Oregon (holly) grape (*Mahonia repens*); rubber rabbitbrush (*Chrysothamnus nauseosus*) and big sagebrush (*Artemisia tridentata*) are predominant on the lower, gentler slopes south of the tailings.

Bodo Canyon site

The Bodo Canyon site and surrounding portions of Bodo Canyon support a diverse assemblage of plant communities and habitats used by numerous bird, reptile, and mammal species. The lower slopes and valley floors are primarily occupied by big sagebrush and rubber rabbitbrush communities, with lesser amounts of grassland (*Poa* sp. and *Agropyron* sp.). Steeper, rockier slopes contain pinyon (*Pinus edulis*) - Utah juniper woodland, and upland areas with deeper soils support thickets of Gambel oak. Vegetation of the disposal site is composed primarily of bluegrass-dominated (*Poa* sp.) meadow with minor amounts of western wheatgrass (*Agropyron smithii*), but big sagebrush and rubber rabbitbrush communities with a bluegrass understory are also present. The road transportation corridor to the Bodo Canyon site crosses mountain shrub communities of Gambel oak and skunk bush in the narrow canyon and big sagebrush and rubber rabbitbrush near the site in the broader valley floor. The conveyor route crosses pinyon-Utah juniper woodlands and broad southern exposures of grass and mountain shrub communities.

Long Hollow site

The Long Hollow site is largely a colluvial basin that has been used as a sheep pasture, but also includes several rocky slopes near the site's perimeter. The basin primarily contains grassland (*Poa* sp., *Hordeum jubatum*, *Bouteloua gracilis*, *Sitanion hystrix*, *Bromus tectorum*, *Agropyron smithii*) vegetation, and has been heavily grazed. Other vegetation units include stockponds with cattail-dominated (*Typha* sp.) perimeters and small springs with cattail and bulrush (*Scirpus* sp.) the principal species. Sodic soils near the southern boundary of the disposal site are indicated by black greasewood (*Sarcobatus vermiculatus*); numerous weedy species (e.g., white top, *Cardaria draba*; Canada thistle, *Cirsium arvense*; bull thistle, *C. vulgare*) dominate the vegetation. Big sagebrush and rubber rabbitbrush-dominated communities occur on slopes above the grassland. Mountain shrub (true mountain mahogany, *Cercocarpus montanus*; cliff fendlerbush, *Fendlera rupicola*; squaw-apple, *Peraphyllum ramosissimum*) and Gambel oak shrub communities occur on slopes above the sagebrush near the boundary of the area being considered for the disposal site. Pinyon-juniper woodland, with intervening areas of big sagebrush and rubber rabbitbrush are best developed on the steeper slopes on the west side of the disposal site. Vegetation along the transportation corridor consists primarily of big sagebrush, black sagebrush, and rubber rabbitbrush communities. However, the corridor parallels a big sagebrush shrub pinyon-juniper woodland ecotone as it approaches the Long Hollow area.

Bodo Canyon borrow area

The vegetation at the borrow area in Bodo Canyon consists primarily of sagebrush shrub with minor stands of pinyon-juniper woodland. Principal plant species of this vegetation include big sagebrush, rubber rabbitbrush, western wheatgrass, and Utah juniper.

4.7.2 Terrestrial wildlife

The diversity and abundance of wildlife at the three alternate disposal sites are related to the proximity of the site to human activities, present and past land use, and vegetation characteristics. The major wildlife species known to be in the vicinities of the alternate sites are described in the following subsections and more comprehensive descriptions of the areas' fauna are provided in Appendix G, Ecological Information, in the DEIS. Data for these descriptions were obtained by reviewing published and unpublished literature, contacting government agencies, and conducting field surveys which included quantitative sampling.

Durango site

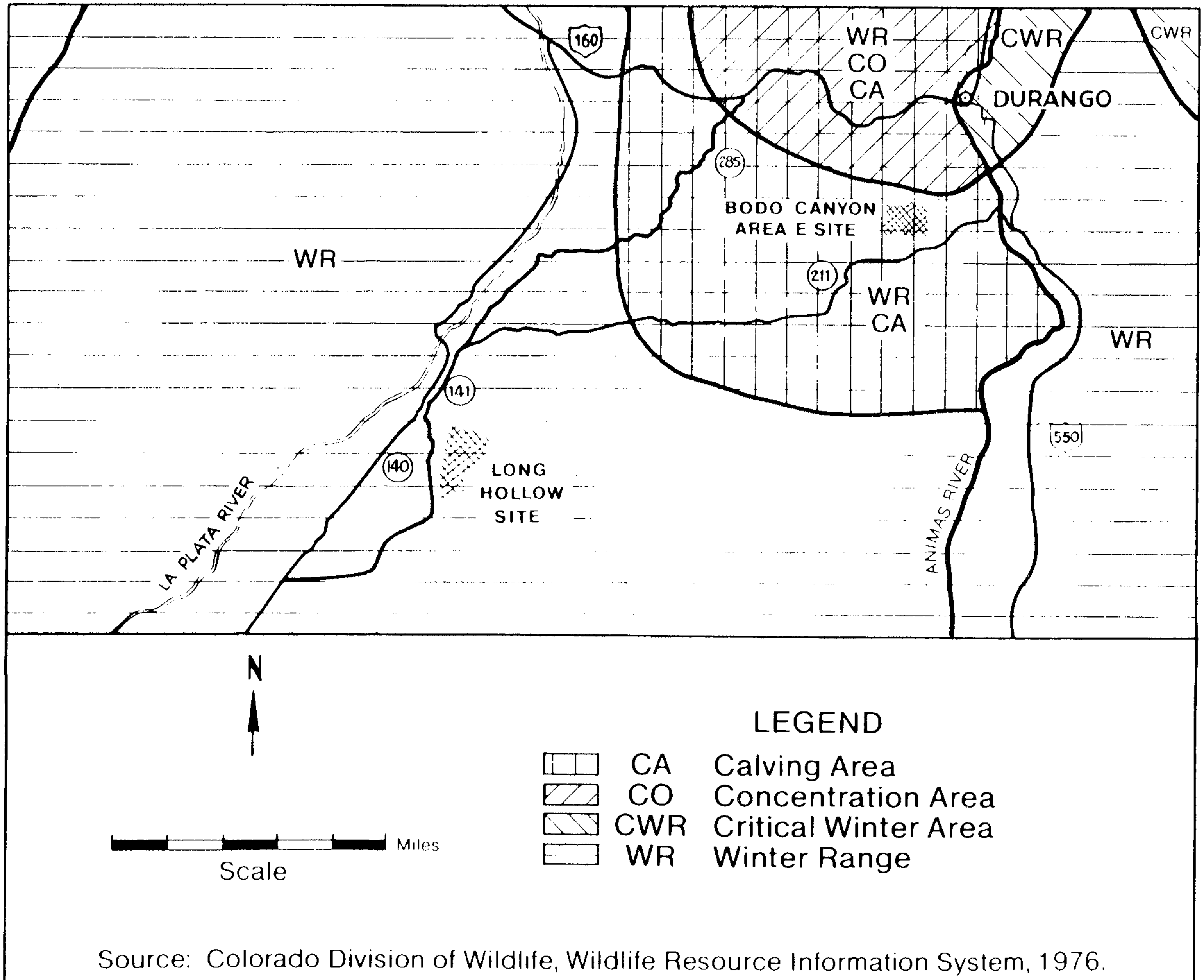
Wildlife use of the Durango site is limited because of its disturbed nature and close proximity to the roads and highways. However, wintering bald eagles (*Haliaeetus leucocephalus*) occur along the Animas River, and mule deer (*Odocoileus hemionus*) cross the area while using adjacent upland habitat and the Animas River. Various small mammals and birds, including cottontail (*Sylvilagus* sp.), deer mice (*Peromyscus maniculatus*), black-billed magpie (*Pica pica*), and northern flicker (*Colaptes auratus*), occur on the Durango site.

Bodo Canyon site

The Bodo Canyon site, as part of the Bodo State Wildlife Area (see Figure 3.5), is owned and managed by the Colorado Division of Wildlife (CDW), primarily as winter range for elk (*Cervus elaphus*) and mule deer. The entire property provides summer and winter range for elk and mule deer and the Bodo Canyon disposal site is further classified as critical winter deer range. Both species have their young on the property, including the Bodo Canyon site; however, calving and fawning areas are extensive in their distribution rather than being concentrated. Elk and deer habitats are shown in Figures 4.3 and 4.4, respectively.

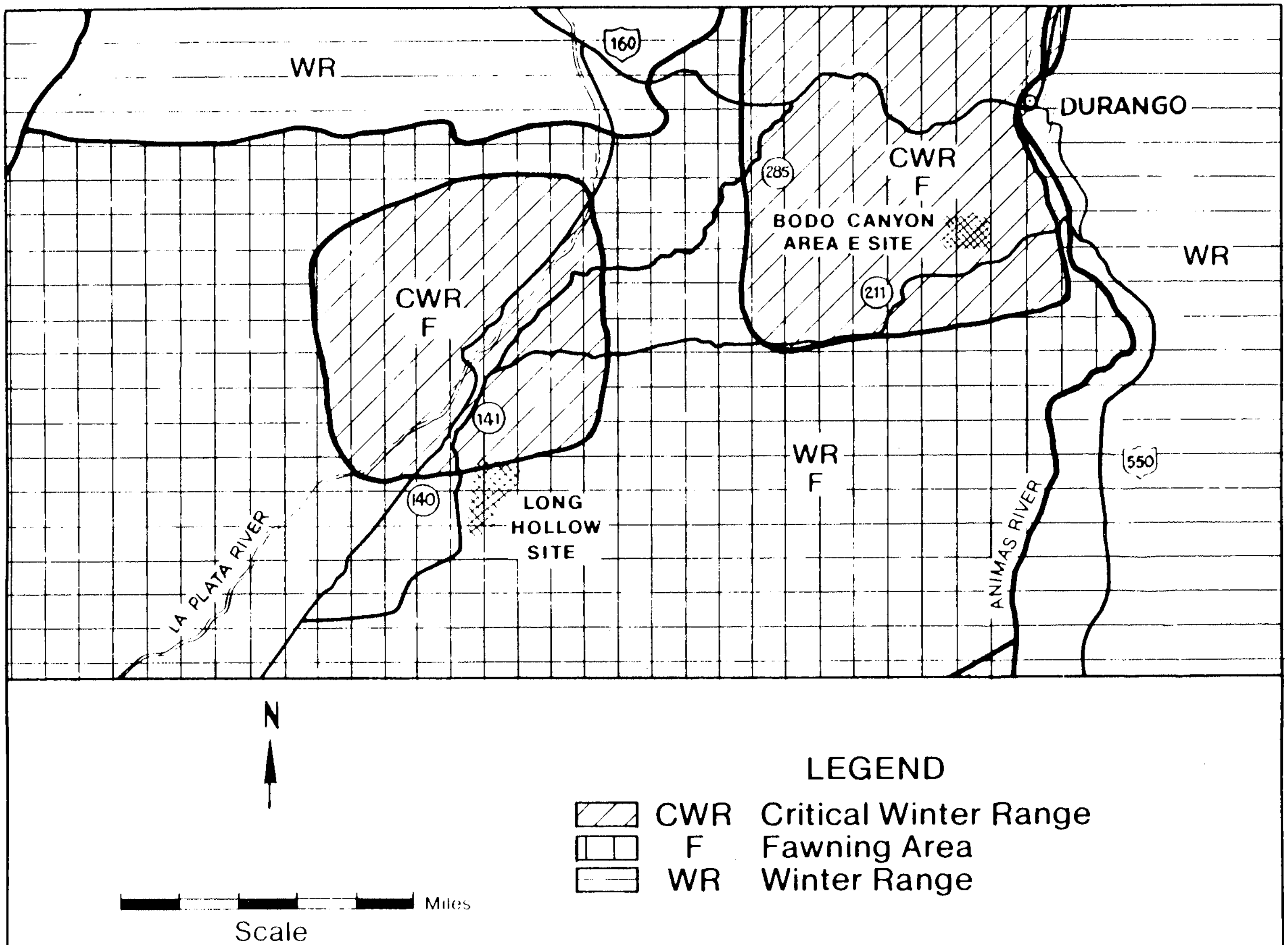
The area currently supports 300 head of elk in the winter and 150 to 175 in the summer (Clark, 1984). Of these, at least 40 elk use the area near the Bodo Canyon site for part of the year (Zgainer, 1982).

An estimated 400 deer winter on the Bodo Wildlife Area (Clark, 1984). Of these, approximately 150 deer use the area near the Bodo Canyon disposal site (Zgainer, 1982). During the winter, deer and elk rest in pinyon-juniper habitat north of the site



Source: Colorado Division of Wildlife, Wildlife Resource Information System, 1976.

FIGURE 4.3
ELK HABITAT TYPES



Source: Colorado Division of Wildlife, Wildlife Resource Information System, 1976.

FIGURE 4.4
DEER HABITAT TYPES

and feed during early morning hours on the south-facing slopes which overlook the Bodo Canyon road transportation corridor (County Road 211). This favorable winter habitat for deer and elk has attracted high concentrations of both species during the winter months. The conveyor route crosses generally open, south- facing slopes with small areas of pinyon-juniper habitat. Both golden (*Aquila chrysaetos*) and bald eagles utilize the area and golden eagles sometimes nest in the area. Occasional ferruginous hawks (*Buteo regalis*) winter in the area while the peregrine falcon (*Falco peregrinus*) is seen occassionally during migration. Prairie falcons (*F. mexicanus*) have nested about one mile from the site in recent years. Numerous small mammals, birds, reptiles, and amphibians also occur in the area of the site and along the transportation routes. Lists of observed species are included in Appendix G, Ecological Information, in the DEIS.

Long Hollow site

Areas near the Long Hollow sites are used as summer and winter range by deer and elk and both species have their young here. About 80 elk were observed in the area by CDW during the fall of 1981 (Gresh, 1981). Subsequently, elk numbers were estimated to be 100 head in summer and even more in winter (Gresh, 1984). Elk and deer habitats are shown in Figures 4.3 and 4.4, respectively.

The Long Hollow area also provides habitat for the same raptors listed in Section 4.2.3 for the Bodo Canyon site. Other animals observed in the vicinity of the site include leopard frogs (*Rana pipiens*), horned lizards (*Phrynosoma* sp.), red-winged blackbiras (*Agelaius pohoeniceus*), mallards (*Anas platyrhynchos*), turkey vultures (*Cathartes aura*), cottontails (*Sylvilagus* sp.), and pocket gophers (*Thomomys* sp.) (FOCERI, 1978).

Bodo Canyon borrow area

Sagebrush shrub and pinyon-juniper woodland within the borrow area provide habitat for mule deer and elk. Big sagebrush, rubber rabbitbrush, western wheatgrass, and Utah juniper also support populations of small mammals, reptiles, and birds.

The more common species of other wildlife in the borrow areas as well as the Bodo Canyon site include coyote (*Canis latrans*), red fox (*Vulpes vulpes*), desert cottontail (*Sylvilagus audubonii*), rock squirrel (*Spermophilus variegatus*), white-footed deer mouse (*Peromyscus maniculatus*), northern tree lizard (*Urosaurus ornatus*), eastern fence lizard (*Sceloporus undulatus*), black-billed magpie, American robin (*Turdus migratorius*), green-tailed towhee (*Pipilo chlorurus*), western meadowlark (*Sturnella neglecta*), chipping sparrow (*Spizella passerina*), Brewer's sparrow (*S. breweri*), and Brewer's blackbird (*Euphagus cyanocephalus*).

4.7.3 Aquatic biota

Except for the marginal aquatic habitat found in two small stockponds on the Long Hollow site, the only other aquatic ecosystems that would potentially be affected by the remedial-action activities are those of the Animas River. Productivity varies considerably throughout the length of this river (Japhet, 1983). Reaches above Durango are generally unproductive, primarily because of poor water quality created by mine drainage. However, as the river approaches Durango, water quality improves as a result of increased dilution from tributaries not affected by mine drainage. From Durango to approximately 10 miles downstream, the Animas River provides good habitat for game fish. Habitat quality deteriorates to the New Mexico state line. Because of the proximity to Durango and the existence of good habitat for game fish, the Animas River from Durango downstream for approximately 10 miles is considered to be most sensitive to activities associated with the remedial action program.

The Animas River, immediately below Durango, supports a valuable sport fishery of Snake River cutthroat trout (*Salmo clarki* ssp.), brown trout (*S. trutta*), and rainbow trout (*S. gairdneri*) (Japhet, 1983). Because heavy metal contamination (caused by upstream mining operations) and siltation of the river's substrate has precluded natural reproduction of game fish, this sport fishery is maintained by a CDW fish stocking program. The introduced fish exhibit respectable growth and, in particular, the brown trout are considered to be among the more rapid growing in the State of Colorado (Japhet, 1983). The accelerated growth of these fish is indicative of food availability, particularly stoneflies (Plecoptera) and caddisflies (Trichoptera). Quality of the Animas River sport fishery 10 miles downstream from Durango degrades considerably because of siltation, high summer water temperatures, and low summer velocities. Fish species commonly occurring in this lower reach include bluehead sucker (*Catostomus discobolus*), flannelmouth sucker (*C. latipinnis*), carp (*Cyprinus carpio*), and occasional brown trout that drift down from the upper reaches.

4.7.4 Endangered and threatened species

Endangered or threatened species that could potentially be affected by remedial actions are listed in Table 4.5. Designation by the Federal government provides protection under the Endangered Species Act of 1973 (16 USC 1531-1543: 87 Stat. 884). Species of fish and wildlife designated as endangered or threatened by the State of Colorado also occur in the vicinity as do two plant species of special concern listed by the Colorado Natural Heritage Inventory (CNHI, 1983). The New Mexico endangered and threatened list includes several species that occur in the San Juan River system, of which the Animas River is a tributary.

Several animal species listed by the U.S. Fish and Wildlife Service (USF&WS, 1983a) as endangered or threatened have potential to occur in the Durango area (Table G-12, Appendix G, Ecological

Table 4.5 Listed and candidate endangered or threatened wildlife and plant species with the potential to occur in the vicinity or to be affected by remedial actions

Species	Status	Potential to occur in vicinity[a]
Wildlife:		
Black-footed ferret (Mustela nigripes)	Endangered, Federal[b] and Colorado[c]	3
Peregrine falcon (Falco peregrinus)	Endangered, Federal[b] and Colorado[c]	1
Bald eagle (Haliaeetus leucocephalus)	Endangered, Federal[b] and Colorado[c]	1
Ferruginous hawk (Buteo regalis)	Candidate for Federal listing[d]	1,4
Swainson's hawk (B. Swainsoni)	Candidate for Federal listing[d]	2,4
Spotted bat (Euderma maculatum)	Candidate for Federal listing[e]	2
Colorado squawfish (Ptychocheilus lucius)	Endangered, Federal[b], Colorado[c], and New Mexico[f]	3
Bonytail (Gila elegans)	Endangered, Colorado[c] and New Mexico[f]	3
Roundtail chub (G.robusta robusta)	Endangered, New Mexico[f]	3
Plants:		
Spineless hedgehog cactus (Echinocereus triglochidiatus) var. inermis)	Endangered, Federal[b] and Colorado[g]	2
Mesa Verde cactus (Sclerocactus mesae-verdae)	Threatened, Federal[b] and Colorado[g]	2
Spurless small-flowered columbine (Aquilegia micantha var. mancosara)	Candidate for Federal listing[h]	3
Mancos milkvetch (Astragalus humillimus)	Endangered Federal[i]	3

Table 4.5 Listed and candidate endangered or threatened wildlife and plant species with the potential to occur in the vicinity or to be affected by remedial actions (Concluded)

Species	Status	Potential to occur in vicinity[a]
Pleianth atriplex (*Atriplex pleiantha*)	Candidate for Federal listing[h]	3
no common name (*Penstemon parviflorus*)	Candidate for Federal listing[j]	3

[a]Key:
1 - Occurs in vicinity (specifically near Durango and Bodo Canyon sites).
2 - Could occur in vicinity, but none observed to date.
3 - Unlikely to occur in vicinity.
4 - Infrequent winter visitor

[b]USF&WS, 1983a.
[c]CWC, 1983.
[d]USF&WS, 1982.
[e]USF&WS, 1982.
[f]Hubbard et al., 1978.
[g]CNHI, 1983.
[h]USF&WS, 1980.
[i]USF&WS, 1985.
[j]USF&WS, 1983b.

Information, of the DEIS). However, one of these, the black-footed ferret (Mustela nigripes), is associated with prairie dogs (Cynomys sp.) and is unlikely to be present at any of the alternative sites because of the lack of prairie dog towns.

Potential nesting habitat for peregrine falcons, an endangered species, exists within one mile of the Bodo Canyon site. CDW records indicate this species nested in the area as recently as 1975 (Gresh, 1981) although other information indicates this site was last used in 1963 (USBR, 1980). Furthermore, peregrine falcons released (or hacked) about three miles from the Bodo Canyon site at Perrins Peak could possibly use the nesting site. Perrins Peak has been a successful hack site with 28 birds released from 1980 through 1984 (Button, 1985). Five to six pairs of peregrine falcons are now nesting in the Durango area with the closest pair being about 20 miles away from the Bodo Canyon site. Peregrine falcons have been observed hunting at the Bodo Canyon site (Ellis, 1985). These birds were presumably migrants or from the hacking station as the Bodo Canyon site is well out of the 10-mile feeding range of nesting peregrines. Conversations with officials at both CDW and USF&WS indicate there is a strong possibility that the historic nest site on the Bodo Canyon property eventually will be reoccupied as a result of the release program.

There are some historical bald eagles nest sites in the Durango area that are not used at the present time. These historic sites are not located on the alternate disposal sites (Zgainer, 1984). Bald eagles commonly winter in the Durango area and one was seen near the Bodo Canyon site during the winter of 1982. Some of these wintering bald eagles undoubtedly hunt on the Bodo Canyon and Long Hollow areas.

The spotted bat (Euderma maculatum) is presently being considered for listing as either endangered or threatened (USF&WS, 1982). The range of this species includes the region around Durango but only one collection of this bat is known for western Colorado (Browns Park, Moffat County) and no observations were made during field studies for this EIS. Spotted bats have been found at scattered localities in western North America in a wide variety of habitats including ponderosa pine, pinyon-juniper woodland, and desert (CDW, 1984).

The San Juan River, into which the Animas River flows, is within the historic range of three endangered fish species (see Table 4.5). These species include the Colorado endangered bonytail (Gila elegans), the New Mexico listed roundtail chub (G. robusta robusta), and the Federal, Colorado, and New Mexico endangered Colorado squawfish (Ptychocheilus lucius). The roundtail chub rarely occurs in the San Juan-Colorado hydrologic subregion (Tyus et al., 1982) and, thus, is not listed in Colorado.

Several candidate and listed plant species have potential to occur in the vicinity of the Durango, Bodo Canyon, and Long Hollow sites (see Table 4.5). The spineless hedgehog cactus (Echino-

cereus triglochidiatus var. *inermis*) and the Mesa Verde cactus (*Sclerocactus mesae-verdae*) are listed as endangered and threatened, respectively, by the USF&WS (1983a). In addition, several plant species are under review for threatened or endangered listing (see Appendix G, Ecological Information, in the DEIS for more information on these species). None of the species was observed during field investigations for this DEIS. In addition, the CNHI (1983) list includes plant species that are rare in Colorado, are vulnerable to disturbance, require more information regarding their status, or require periodic monitoring. CNHI-listed plant species that, according to Harmon (1980), have potential to occur in the Bodo Canyon area are large flowered collomia (*Collomia grandiflora*), hedgehog cactus (*Echinocereus fendleri* var. *fendleri*), monument plant (*Frasera albomarginata*), wavey-leaf oak (*Quercus pauciloba*; syn. *Q. undulata*), and woodland star (*Lithophragma parviflora*). The status for all of these species except woodland star is that more information is required concerning their regional distribution. The CNHI recommends periodic monitoring for the woodland star.

4.8 RADIATION

The radiation environment at and near the Durango site, Bodo Canyon site, Long Hollow site, and the transport corridor is summarized in this section.

The radiological units of measure for activity are picocuries (pCi) or microcuries (microCi) per liter (l) or gram (g). Radiological dose rates and external-gamma exposures are presented in millirem per year (mrem/yr) or microentgens per hour (microR/hr). For purposes of this EIS, the roentgen and rem will be considered equivalent when considering gamma radiation.

The radiation environment currently at the Durango site, the Bodo Canyon site, the Long Hollow site, and the truck transport corridor has been obtained from the literature and from field survey programs. A more extensive discussion of the radiation environment is provided in Appendix H, Radiological Information, of the DEIS and in the Addendum to Appendix H in this FEIS.

4.8.1 Durango site

The environmental radiological levels for the Durango site and the surrounding area have been characterized in previous studies (FBDU, 1977, 1981; Haywood et al., 1980). Radioactive airborne particulate concentrations were measured along the eastern edge of the site (Haywood et al., 1980), four samples having been collected and analyzed for their uranium-238, thorium-230, radium-226, and lead-210 content. The concentrations ranged from 4.2×10^{-6} to 36×10^{-6} picocuries per liter (pCi/l) for uranium-238, 6.2×10^{-6} to 140×10^{-6} pCi/l for thorium-230, 5.4×10^{-6} to 100×10^{-6} pCi/l for radium-226, and 15×10^{-6} to pCi/l for lead-210 (see Table H-3, Appendix H, in the DEIS).

Radon-222 flux measurements were made at Durango using the accumulation-can method (Marple, 1978). Ten measurements were taken at four locations on the small tailings pile ranging from 73 to 870 picocuries per square meter-second (pCi/m^2s). The mean of these measurements plus or minus one standard deviation was 401 ± 233 pCi/m^2s.

Several studies to determine ambient air radon concentrations near the Durango site have been undertaken (Schearer and Sill, 1969; FBDU, 1977, 1981). The most extensive of these studies was conducted by Schearer and Sill during 1967 and 1968. The study involved collection and analysis of 48-hour continuous samples every three weeks for one year at two locations on the tailings piles and six locations off the piles (Schearer and Sill, 1969, Figure 2, p. 83). Thirty measurements made at the two locations on the piles yielded a range from 3.8 to 34.0 pCi/l with an average of 16 pCi/l. A total of 75 measurements made at five locations off the piles yielded an average ambient air radon concentration of 0.51 pCi/l with a range of 0.09 to 1.3 pCi/l. The sixth off-pile location, across the Animas River from the sewage-treatment plant, was determined to be statistically different from the other off-pile locations (Schearer and Sill, 1969), yielding an average concentration of 1.4 pCi/l with a range of 0.44 to 2.3 pCi/l. Schearer and Sill (1969) attributed this difference to local wind patterns and concluded that the other five locations represented background radon levels.

The FBDU study (1977) involved collection and analysis of a smaller number of 24-hour continuous air samples performed over a period of one to two months. They reported an average background ambient air radon concentration for the city of Durango of 1.2 pCi/l with a range of 0.8 to 1.4 pCi/l. The locations of these background stations are not clearly stated in FBDU (1981). Selection of the background stations is complicated by the presence of off-site tailings material. FBDU (1981) used a continuous radon monitor to measure background ambient air radon in Durango, whereas Track-Etch detectors were used to make background measurements for the Bodo Canyon site. These different measurement techniques are probably one of the reasons why the measured background in Durango is four times higher than that for the Bodo Canyon site. Other reasons include: (1) the presence of windblown radioactively contaminated particulates in Durango and not in Bodo Canyon, and (2) the amount of snow cover in Bodo Canyon during the time Track-Etch detectors were being used since moisture in the ground decreases the radon flux from soil.

External gamma radiation (EGR) levels have also been measured and found to decrease with distance from the tailings piles (see Figure H-3, Appendix H, Radiological Information, in the DEIS). Maximum EGR levels were 760 microroentgen per hour (microR/hr) on the small tailings pile and 470 microR/hr on the large pile (FBDU, 1981). At a distance of 0.1 mile from the edge of the tailings piles, the EGR level ranged from 25 to 35 microR/hr; EGR levels fell to background levels of 8 to 13 microR/hr (Haywood et al., 1980) 0.2 mile to the northeast, one mile to the north, and 1.4

miles to the southeast. Background external gamma exposure rates were also measured with an energy-compensated Geiger-Mueller tube one meter above the ground surface at 19 locations scattered throughout western Colorado (Haywood et al., 1980) where EGR levels ranged from seven to 22 microR/hr and averaged 14 microR/hr.

Gamma-exposure levels do not decrease uniformly with direction or distance from the tailings piles (see Figure H-3, Appendix H, in the DEIS). The variation in gamma levels may be the combined effects of windblown tailings and the use of tailings as fill material at various off-site locations.

Background concentrations of uranium-238 and thorium-230 were measured in surface-soil samples collected from the same 19 locations at which external gamma exposure rates were measured (Haywood et al., 1980). Uranium-238 concentrations ranged from 0.3 to 1.2 picocuries per gram (pCi/g) and averaged 0.6 pCi/g, thorium-230 concentrations ranged from 0.5 to 3.4 pCi/g and averaged 1.4 pCi/g.

The estimated concentrations of uranium-238, thorium-230, and radium-226 in the tailings piles are 103 pCi/g, 1070 pCi/g, and 973 pCi/g, respectively. These concentrations result in total inventories of 145 curies for uranium-238, 1500 curies for thorium-230, and 1400 curies for radium-226.

Analyses of sediments (Haywood et al., 1980, Table 2, pp. 12-14) collected from dry washes, Lightner Creek, and the Animas River in the vicinity of the Durango site indicate that some waterborne transport of tailings material has occurred. Radium-226 concentrations in Animas River sediments ranged from 2.2 to 35 pCi/g; those at 15 centimeters below the surface in the dry washes ranged from 8.1 to 370 pCi/g and were generally higher than concentrations at the surface. Radium-226 concentrations in sediments sampled during 1982 near the Bodo Canyon site and in downstream drainage ranged from 0.5 to 1.9 pCi/g (see Table H-10, Appendix H, in the DEIS).

Samples of the bricks lining the lower inner surfaces of the smelter stack remaining at the Durango site were collected and evaluated for contamination. Loose surface material was scraped from the brick samples and analyzed for radium-226 concentrations using gamma spectroscopy. The scraped bricks were also analyzed to estimate the levels of fixed contamination on the brick surface. Results of the analyses showed approximately 75 pCi/g in the loose material, and 10 pCi/g in the bricks (DOE, 1984).

4.8.2 Bodo Canyon site

Radiation levels currently existing at the Bodo Canyon site have been determined from recent monitoring programs. The monitoring programs included the sampling of air particulates, ambient air radon concentration, external gamma radiation, soil, and biota. The five sampling locations (three at the Bodo Canyon site and two at remote stations) for the air particulates and ambient-air radon concentration measurements are indicated in Figure 4.5.

Results of analyses for radioactive air particulates sampled quarterly during the year-long sampling period at the Bodo Canyon site (Sampler Nos. 1, 2, and 3) are presented in Table H-5, Appendix H, Radiological Information, in the DEIS, and the results for the remote stations (Sampler Nos. 4 and 5) are presented in Table H-14.

Ambient-air radon-222 concentrations measured at sampling stations 1 through 5, using Track-Etch methods over a period of six months, averaged 0.25±0.01 pCi/l, 0.23±0.01 pCi/l, 0.23±0.01 pCi/l, 0.46±0.02 pCi/l, and 0.24±0.01 pCi/l, respectively (Table H-6, Appendix H, in the DEIS). All of the values obtained for the five locations were below one pCi/l. Bodo Canyon was snow-covered during much of the time that the Track-Etch detectors were in the field. Radon emanation is reduced by both snow cover and frozen ground. It is expected that the measured concentrations would have been greater had the measurements been made during completely snow-free periods of time. However, the data obtained were sufficient to show that Bodo Canyon contains typical background levels of radionuclides. Additional Track-Etch data for the Bodo Canyon site are presented in Section H.4.1 in the Addendum to Appendix H in this FEIS.

A general survey of terrestrial and cosmic external radiation levels was conducted for this EIS using a pressurized ionization chamber (JEG, 1983). Measurements were taken on September 27, 1983, at three monitoring stations surrounding the Bodo Canyon site and a fourth location near the center of the site. The values for the four locations were 16.0, 16.1, 15.2, and 15.5 microR/hr, respectively. The mean value plus or minus one standard deviation was 15.7±0.4 microR/hr.

Surface-soil samples (to a depth of five centimeters) were collected at the locations shown in Figure 4.5 out to a distance of about 1500 meters from the center of the Bodo Canyon site. These locations varied from the eight compass directions normally used because of difficult accessibility and terrain conditions. All of the samples were radiochemically analyzed for radium-226. Samples collected 1500 meters from the center were also analyzed for thorium-230, uranium-238, and lead-210. The surface-soil radionuclide concentrations found at the Bodo Canyon site are in secular equilibrium, with the exception of slightly elevated concentrations of lead-210, probably due to atmospheric deposition. The surface-soil concentrations ranged as follows: uranium-238, 0.8 to 1.6 picocuries per gram dry weight (pCi/g); thorium-230, 1.0 to 1.9 pCi/g; radium-226, 0.7 to 2.3 pCi/g; and lead-210, 1.3 to 3.1 pCi/g. These isotope concentrations are consistent with the approximately one pCi/g average for surface soils of the contiguous United States (LASL, 1978).

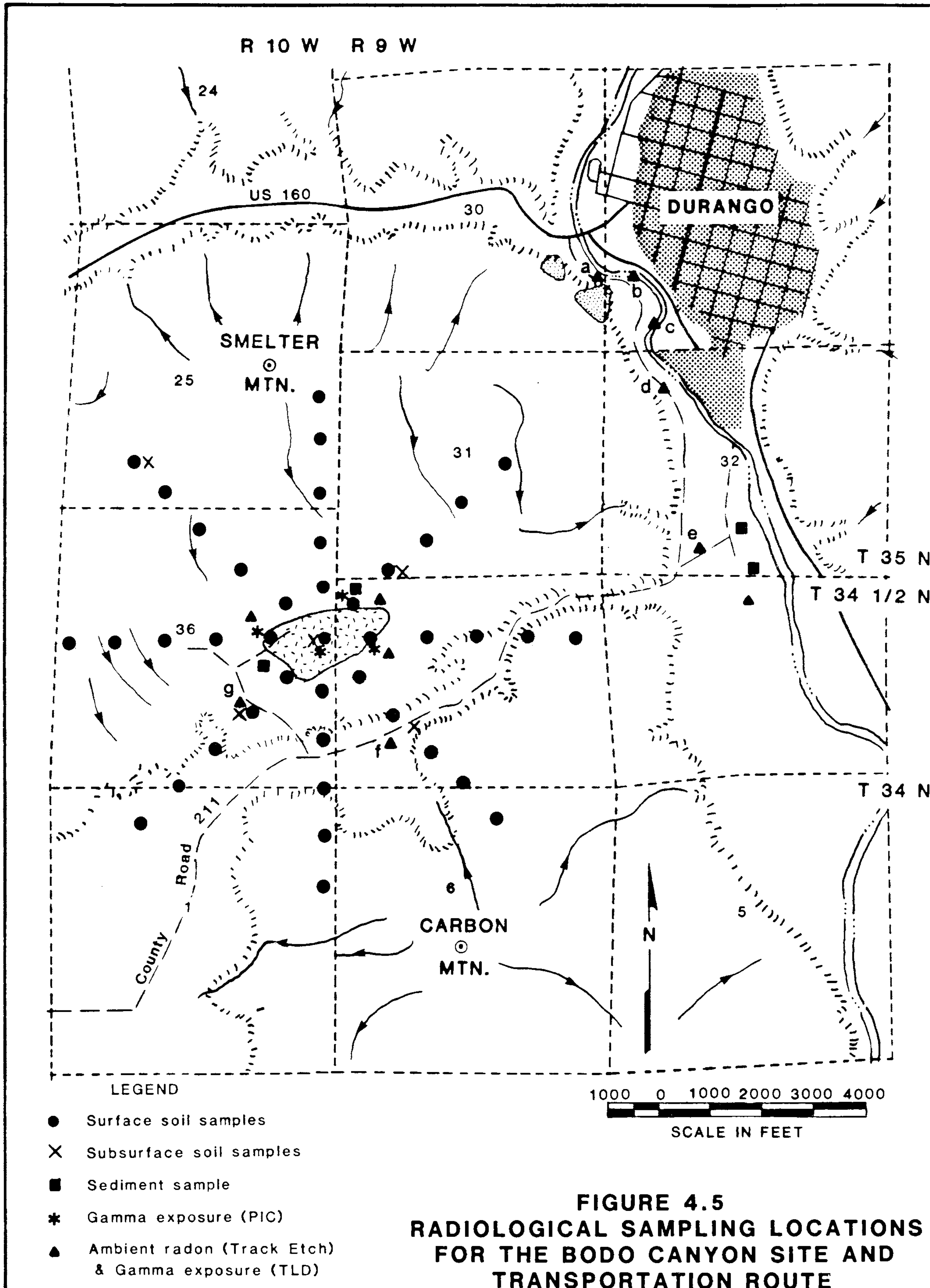


FIGURE 4.5
RADIOLOGICAL SAMPLING LOCATIONS FOR THE BODO CANYON SITE AND TRANSPORTATION ROUTE

Surface-soil samples were also taken from the Bodo Canyon site at the locations of the air-particulate samplers (see Figure 4.5). The surface-soil concentrations ranged as follows: uranium-238, 0.9 to 2.0 pCi/g; thorium-230, 1.3 to 2.4 pCi/g; radium-226, 1.0 to 1.8 pCi/g; and lead-210, 0.7 to 4.2 pCi/g.

Radionuclide concentrations were measured in sediment samples collected from the bottoms of intermittent streams at the four locations shown in Figure 4.5. The concentrations in these samples ranged as follows: uranium-238, 0.8 to 1.5 pCi/g; thorium-230, 1.0 to 1.6 pCi/g; radium-226, 0.5 to 1.9 pCi/g; and lead-210, 1.2 to 3.6 pCi/g.

Vegetation samples were collected three times and from three different locations surrounding the Bodo Canyon site. They were sampled in September of 1981, June of 1982, and August of 1982. The results showed vegetation concentrations ranging from 8.4 x 10^{-6} to 185 x 10^{-6} microcuries per kilogram (microCi/kg) wet weight for uranium-238; 7.3 x 10^{-6} to 250 x 10^{-6} microCi/kg wet weight for thorium-230; and 0.74 x 10^{-6} to 34 x 10^{-6} microCi/kg wet weight for radium-226. The polonium-210 and lead-210 concentrations were considerably higher, ranging from 37 x 10^{-6} to 1230 x 10^{-6} microCi/kg wet weight for polonium-210, and 76 x 10^{-6} to 1239 x 10^{-6} microCi/kg wet weight for lead-210.

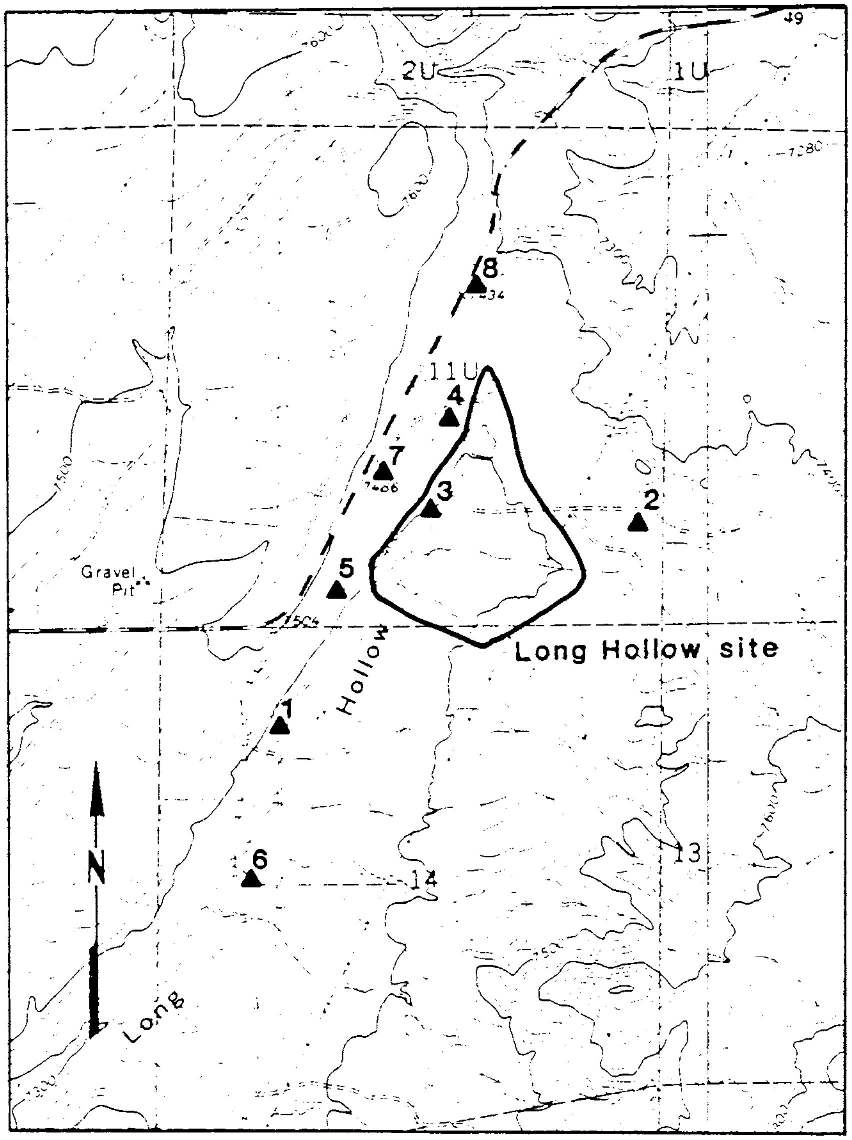
The results of analysis on the flesh portion of rabbits (grab sampled) showed a similar pattern with the averages for uranium-238, thorium-230, and radium-226 being 0.36 x 10^{-6}, 0.27 x 10^{-6}, and 0.75 x 10^{-6} microCi/kg wet weight, respectively. Results indicated higher averages of 4.3 x 10^{-6} microCi/kg wet weight for polonium-210 and 13.3 x 10^{-6} microCi/kg wet weight for lead-210.

4.8.3 Long Hollow site

A general survey of terrestrial and cosmic external radiation levels was conducted for the Long Hollow site (JEG, 1983). The gamma exposures measured at the eight locations shown in Figure 4.6 ranged from 15.7 to 16.5 microR/hr with a mean of 16.1$\pm$0.3 microR/hr (see Table H-13, Appendix H, Radiological Information, in the DEIS). Track-Etch data obtained from December 15, 1983, to March 19, 1984, show concentrations of radon ranging from 0.28 to 0.53 pCi/l. The concentrations of radionuclides in the soil and vegetation at Long Hollow are expected to be similar to those at Bodo Canyon.

4.8.4 Durango site haul road

Using the Track-Etch method (Knoll, 1979), ambient-air concentrations of radon-222 along the proposed haul-road route between the tailings piles and County Road 211 were monitored for a six-month period by Argonne National Laboratory (ANL). Five monitor-



BASE MAP REFERENCE: USGS 7½ MINUTE TOPOGRAPHIC QUADRANGLE MAPS. "BASIN MOUNTAIN, COLORADO," DATED 1963 AND "KLINE, COLORADO," DATED 1968.

0 1/2 1 Mile

SCALE

LEGEND

▲2 Sample location and number.

FIGURE 4.6 LOCATION OF EXTERNAL GAMMA RADIATION MEASUREMENTS FOR THE LONG HOLLOW SITE

ing stations (see Figure 4.5) were located along this route, and the average radon concentrations for locations A through E were 6.2, 10.1, 3.6, 0.8, and 0.6 pCi/l, respectively, (Terradex Corporation, 1983).

4.9 LAND USE

Lands in the region (southwest Colorado and northwest New Mexico) are used primarily for resource conservation, recreation, and livestock grazing. Durango, Colorado, and Farmington, New Mexico, are the region's primary cities, but a number of smaller towns, communities, and settlements are scattered throughout the area. The region has experienced rapid population growth over the past 20 years, resulting in conversion of land to urban uses, primarily through development of former agricultural lands. This trend is expected to continue for the forseeable future because of population growth projected for the area, especially La Plata County.

The primary landowner in the region is the Federal Government, which controls the San Juan National Forest to the north of Durango and holds in trust the large Indian reservation lands to the south and west of Durango. The lands are held for the Southern Utes and the Ute Mountain Utes (lands located in both Colorado and New Mexico) and the Navajo (in New Mexico). Private lands are second in extent, followed by state, county, and municipal lands. The 1972 land ownership patterns in La Plata County are indicated in Table 4.6 and are the most current data available. However, ownership patterns have not changed appreciably since the data in Table 4.6 were compiled.

Table 4.6 Land Ownership Patterns - La Plata County, 1972

Owner	Acres	Percent
Federal nonreservation	410,749	38.5
Reservation (total)	193,569	18.2
Southern Ute	177,450	16.7
Ute Mountain Ute	16,119	1.5
Private	443,648	41.6
State	14,980	1.4
County and municipal	3,420	0.3
Total	1,006,366	100.0

Ref. USBR, 1979b.

4.9.1 Durango site

All 126 acres of the Durango site are owned by Hecla Mining Company. Lands in the immediate vicinity of the site are owned by the city of Durango (which operates the nearby sewage treatment plant), the Colorado Department of Natural Resources (which controls the Colorado Division of Wildlife's Bodo Wildlife Area), and private interests. Land ownership is depicted in Figure I-3, Appendix I, Information on Populations, Socioeconomics, and Land Use, in the DEIS.

Historic land use

The Durango site was used for a gold, silver, and lead smelter from 1880 to 1930. In 1942, a mill was built to furnish vanadium to the Federal Government during World War II; reprocessing of the vanadium tailings to recover uranium for the Manhattan Project started in 1943. The mill operated until 1946 and was then shut down until 1949 when it was reopened to provide uranium for sale to the Atomic Energy Commission. The mill continued to operate until it was closed permanently in March, 1963. The site was purchased by Ranchers Exploration and Development Corporation in 1976 and 1977. Hecla Mining Company is the current owner after the acquisition of Ranchers by Hecla in 1984.

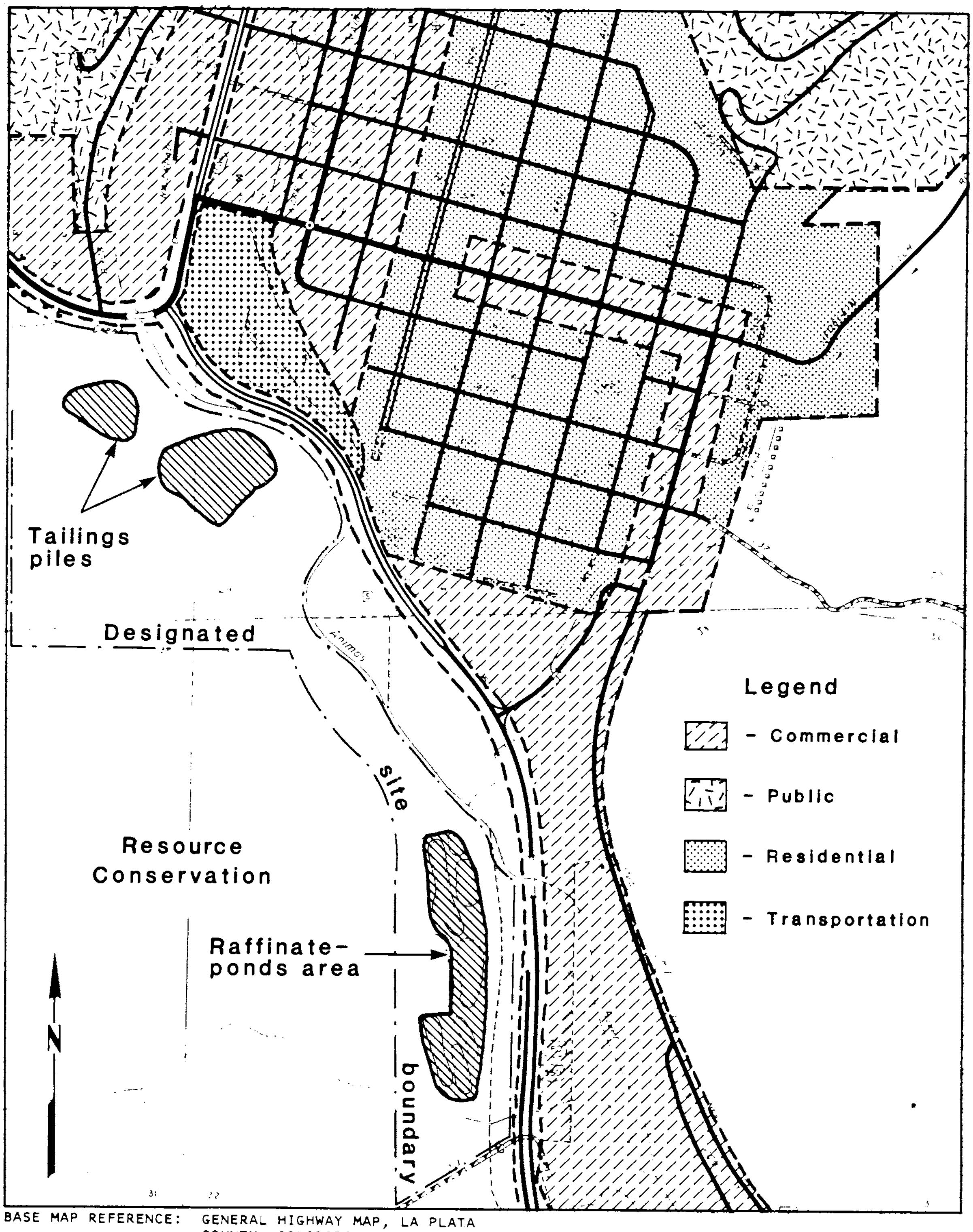
Land use in the vicinity of the Durango site has changed very little since World War II. Lands in downtown Durango, northeast of the Durango site, have been developed since the late 1800s. The major land-use changes near the site have occurred in the Animas River valley. These lands have been converted to urban uses through the construction of the sewage-treatment plant located across the Animas River south of the site, and construction of a commercial center southeast of the site. Land use within the Bodo Wildlife Area west and southwest of the site changed from livestock grazing to resource conservation and recreation in the early 1970s.

Present land use

Land use in the vicinity of the Durango site (Figure 4.7) is primarily commercial, residential (in the city of Durango), and open space (Bodo Wildlife Area). Other prominent uses include transportation (U.S. Highways 160 and 550, and the Durango-Silverton railroad yard), utility (Durango sewage-treatment plant), and industrial (Bodo Industrial Park). The site is about 0.25 mile from the "central business district" of Durango that has about 400 hotel and motel rooms, employment of 3500, and about 660 residents (FBDU, 1981). A riverside park is under construction across the river adjacent to the sewage treatment plant.

Potential future land use and development

Because of the proximity to U.S. Highways 550 and 160, lands within the Animas River valley corridor are probably best suited economically for commercial and industrial developments. Recreational uses that relate to the Animas River as a scenic or boating



BASE MAP REFERENCE: GENERAL HIGHWAY MAP, LA PLATA COUNTY, COLORADO, DATED 1976

0 500 1000 1500 Feet
SCALE

FIGURE 4.7 LAND USE IN THE VICINITY OF THE DURANGO SITE

resource may also be well suited. The suitability of these uses to the area is evidenced by the construction of the Bodo Industrial Park and the shopping center south of the site and the short bikeway recently constructed on the east bank of the Animas River. The existence of the Bodo Wildlife Area precludes private development west and southwest of the site. It is unlikely that any use of the 126-acre Durango site would be made without Federal removal of the tailings and contaminated materials. The calculated cost of about $16 to $28 million to remove the tailings and other contaminated materials from part or all of the site (see Section 5.13), if incurred by a private industry, would be far higher than land values common to the area (a maximum of about $65,000 per acre for relatively level land and $1000 for steeply sloped land). Based on values at the nearby Bodo Industrial Park, it would not be worthwhile for a private individual to pay about $16 to $28 million to prepare the site in order to derive a maximum worth ranging from $2.8 to $4.6 million from ownership of the parcel. An appraisal of the value of the Durango site is being prepared by the U.S. Army Corps of Engineers.

4.9.2 Bodo Canyon site

Almost all of Bodo Canyon, including the Bodo Canyon site, has been deeded to the State of Colorado, Division of Wildlife, by the Nature Conservancy. The Nature Conservancy purchased the land now known as the Bodo Canyon Wildlife Area from the Bodo family and in deeding the land to the Division of Wildlife, attached restrictions to the deed. These restrictions require management of the land for wildlife protection. Should the land be used for other purposes, the deed restrictions call for ownership to revert back to the Nature Conservancy. The nearest private land to the Bodo Canyon site is the Bodo Industrial Park, approximately one mile east at the mouth of Bodo Canyon. To the west, in the Ridges Basin and Rafter J subdivision areas, lands are privately owned. To the south are private lands and the Southern Ute Indian Reservation. To the north are private lands along U.S. Highway 160.

Historic land use

Lands within the Bodo Wildlife Area were used for livestock grazing before being converted to resource conservation uses in the early 1970s. Lands to the west and northwest of the Bodo Wildlife Area have also historically been used for grazing; however, low-density residential uses have recently been instituted. To the east are Durango and the U.S. Highway 550 corridor, the uses of which have historically been and are now urban, commercial, and industrial. To the south are Southern Ute Reservation lands that have historically been used only for light grazing and hunting.

Present land use

Lands within the Bodo Wildlife Area are used as open space and conservation lands. Electric transmission lines are also located in the area, a distribution substation is located southwest of the Bodo Canyon site, and radio transmission towers are located to the northeast on Smelter Mountain. Hiking, hunting, and picnicking are permitted in the Bodo Wildlife Area but overnight camping is not. Current estimated recreational use of the Bodo State Wildlife Area is shown in Table 4.7.

Lands to the west of the Bodo Wildlife Area are used primarily for grazing and scattered residential dwellings. To the east and north of the preserve are the Animas River valley and the Durango urban area. The nearest residence is about 0.5 mile southwest of the site on County Road 211.

Potential future land use and development

Land use within the Bodo Wildlife Area (including the proposed stabilization area) is unlikely to change from resource conservation over the foreseeable future because of the state's ownership of the land, unless the U.S. Department of the Interior's proposed Animas-La Plata Project is implemented. The Animas-La Plata Project would utilize flows from the Animas and La Plata Rivers to fill two off-stream reservoirs that would provide water for irrigation as well as municipal and industrial use. One reservoir would be located in Ridges Basin on lands controlled by the Colorado Division of Wildlife (see Figure I-6, Appendix I, Information on Populations, Socioeconomics, and Land Use, in the DEIS) but would not inundate either the Bodo Canyon or Long Hollow sites addressed in this document. If the Animas-La Plata Project is constructed, land use in the Bodo Wildlife Area, particularly to the west of the Bodo Canyon site, would change to more intensive water-based recreation. Part of the Bodo Canyon site would be upgraded and improved, and 3.6 miles of Ridges Basin Road would be inundated. Approximately three miles of new road would be constructed along the northwest part of the Ridges Basin Reservoir to provide access to the proposed recreation area and to the Ridges Basin Pumping Plant (USBR, 1980). Raw-water pipelines would be constructed from the pumping plant on the Animas River to the Ridges Basin Reservoir and from the reservoir to the Durango M&I water-treatment plant east of Durango on College Hill. Locations of the major features proposed for the Animas-La Plata Project in the Bodo Canyon and Ridges Basin areas are shown in Figure I-6, Appendix I, Information on Populations, Socioeconomics, and Land Use in the DEIS. Secondary land-use changes, such as commercial or second-home development, would probably accompany the Animas-La Plata Project if it is built. Construction of the Animas-La Plata Project, however, is not certain[a], nor is successful completion of the land

[a]The U.S. Congress approved $1.0 million in 1985 to begin field data collection and final design in 1986 contingent upon reaching an agreement between the Department of the Interior and the States of Colorado and New Mexico for cost sharing.

Table 4.7 Recreational use (days) of the Bodo State Wildlife Area

Recreational activity	Estimated use[a]
Big game hunting	2950
Small game hunting	600
Non-consumptive wildlife use	7100
Miscellaneous[b]	1200
Total	11,850

[a]Estimated use provided by M. Zgainer, Area Wildlife Supervisor, CDW, Durango, after consultation with local CDW employees and Robert Clark, Senior Wildlife Biologist, Montrose, Colorado.

[b]Includes jogging, hiking, photography, geological study, and other non-wildlife related activities.

exchange agreements that would have to be executed between the Bureau of Reclamation and the Colorado Department of Natural Resources (CDNR) to allow the project to be built on what is now CDNR land. The form that these agreements ultimately may take would greatly influence land-use potential within and near the Bodo Canyon site and its environs.

The Southern Ute Indian Reservation to the south will probably not experience extensive development in the foreseeable future because of generally rugged topography, but will continue to be lightly used for grazing and hunting. Residential development will probably continue to the west and northwest of the Bodo Wildlife Area. It is expected that Durango will continue to grow in population, and that commercial and industrial development along U.S. Highway 550 will continue.

4.9.3 Long Hollow site

The Long Hollow site is currently under private ownership; most of the lands in the vicinity are also privately owned. However, 80 acres of Southern Ute tribal land are just to the northeast of the site and additional acreages are located about 0.5 mile to the south and southwest. Several other small parcels (40 acres or less) of tribal or Federal land are within two miles of the Long Hollow site.

Historic land use

Lands at the Long Hollow site and its vicinity have been used for sheep and cattle grazing since the area was first opened for homesteading in 1919. Prior to this date, the area may have been used by the Southern Utes (CASA, 1983). Because of generally steep slopes and sparse vegetation, occasional cattle grazing and hunting have probably been the only historical uses of the upland areas to the east. A low-density residential subdivision (Shenandoah) is planned for development approximately two miles north-northeast of Long Hollow. Two existing residences are located along County Road 141 to the west of the Long Hollow site. The residences are approximately 0.75 mile and two miles away. This alternate disposal site generally coincides with the site proposed in 1978 by Ranchers Exploration and Development Corporation for reprocessing and stabilization of the Durango tailings.

Present land use

The Long Hollow site is currently used as a gathering, lambing, and grazing area for sheep during the spring and fall. Most of the area around the site is used for rangeland, grazing, or hay pasture. Two natural-gas pipelines are located near the site and one electric transmission line runs through the east side of it. To the north and northwest of the site are agricultural-experiment lands owned by Fort Lewis College. To the south and east are steep-sloped lands that are used for grazing and hunting.

Potential future land use and development

Most of the Long Hollow site and its vicinity, except for hilly areas to the southeast, are suitable for low-density residential developments such as those being built to the north of Long Hollow. Most of these lands are also suitable for livestock grazing and pasture. No zoning regulations are in effect for the area, nor have any particular uses been designated by the La Plata County. The general policy, although not officially adopted by the County Commissioners, is that land-use development be compatible with nearby land uses (Hoch, 1983). Although this concept of compatibility has not been defined, it appears that the primary land-use developments in the future in the Long Hollow vicinity will be low-density residential.

The Animas-La Plata Project, if implemented, would greatly affect land use in the Long Hollow vicinity. Lands near the reservoir would become prime for recreation-related development. The proposed Long Hollow tunnel of the Animas-La Plata Project would run beneath lands adjacent to the Long Hollow site.

4.9.4 Bodo Canyon borrow site

The Bodo Canyon borrow site is within the Bodo Wildlife Area and has the same historical, present, and future land uses, and land use potential as the Bodo Canyon site.

4.10 AMBIENT SOUND LEVELS

Humans can hear sound over a wide range of pressures. The decibel (dB) is used to express these sound levels over a wide physical range. The human ear does not perceive sound at low frequencies in the same manner that it does at higher frequencies. Sounds at low frequency do not seem as loud as those of equal intensity at higher frequencies. The A-weighting network is provided in sound analysis systems to simulate the human ear. A-weighted sound levels are expressed in units of decibels and are used throughout this section.

Ambient sound levels have not been measured at any of the alternative disposal sites, but have been estimated according to typical values of ambient sound levels that have been measured in similar situations (National Academy of Sciences, 1977). The estimated sound levels were determined by considering existing land uses and the area's population density.

The Colorado Revised Statute 25-12-101-103 is being changed to set noise limits at the boundaries of the property on which the noise-producing activity occurs. Any noise above the limits shown in Table 4.8 will be a misdemeanor under the revised statute.

Table 4.8 Colorado noise limits

Zone	7:00 a.m. to next 7:00 p.m. dBA	7:00 p.m. to next 7:00 a.m. dBA
Residential	55	50
Commercial	60	55
Light industrial	70	65
Industrial	80[a]	75

[a]Because the noise-production activities on the property are scheduled for daytime operation only, it is the 80-dBA standard at the property line that must be met during construction and operation of the facility.

Durango site

The predominant land uses in the vicinity of the Durango site are transportation and commercial. Of interest to noise impact estimates are U.S. Highways 550 and 160, secondary roads, the Durango-Silverton railroad, and the residential areas northeast of the site. Based on population estimates by FBDU (1981) for Durango, the population density in the area within 0.5 mile of the site is equivalent to about 7500 people per square mile. As indicated in Table 4.9, this population density would equate to an ambient day-night sound level (L_{dn}) of about 60 decibels. However, because of the city's more rural atmosphere, it is estimated that average ambient sound levels during daytime hours are probably closer to 55 decibels and between 45 and 50 decibels at night. Since highway traffic contributes significantly to area sound levels, it is estimated that during daytime hours when traffic is heaviest, the day-night sound levels experienced by populations residing to the northeast of the Durango site range from about 60 dB for homes nearest to U.S. Highways 550 and 160 to 50 dB for locations farther away.

Table 4.9 Typical values of day-night sound levels, L_{dn}[a]

Land use description	Population density (people/mi^2)	L_{dn}-dB
Rural, undeveloped	20	35
Rural, partially developed	60	40
Quiet suburban	200	45
Normal suburban	600	50
Urban	2,000	55
Noisy urban	6,000	60
Very noisy urban	20,000	65

[a]Day-night sound level (L_{dn}) is an EPA description of environmental sound. It is the average of daytime and nighttime A-weighted sound levels with nighttime sound given a penalty of 10 decibels.

Ref. National Academy of Sciences, 1977.

Bodo Canyon site

The Bodo Canyon area is rural, undeveloped, and unpopulated. On the basis of zero population density, the day-night sound levels near the stabilization area will be less than 35 dB.

Long Hollow site

Sound levels for the Long Hollow site are similar to those for the Bodo Canyon area except for County Road 141 that runs along the west side of the site. Traffic on this road is light and estimated ambient sound levels adjacent to the road should range from about 45 to 50 dB.

Transportation route

Sound levels along the transportation routes from the Durango site to either Bodo Canyon or Long Hollow are similar to those described for each of these latter two sites. Near County Road 211 in Bodo Canyon and near the conveyor route, the day-night sound levels should be less than 35 dB; near County Road 141 in Long Hollow, the sound levels should range from 45 to 50 dB.

4.11 SCENIC, HISTORIC, AND CULTURAL RESOURCES

4.11.1 Brief histories

The history of human settlement in the region is primarily one of American Indian cultures. Humans have inhabited the area for at least 10,000 years, but only in about the last 120 years have persons of European origin lived in the area.

The city of Durango was incorporated in 1881, soon after the Denver and Rio Grande Railroad decided to establish a depot in its current location across the Animas River from where the tailings piles are now located. The major employer in the city during its early years was the lead smelting operation on the Durango site. In 1881, the city's population was about 3000 (Ayres, 1961). Durango's original downtown core along Main Street remains today essentially unchanged from the late 1800s when it was a main trading center for southwest Colorado.

The Durango site was used for mineral processing (originally precious metal and lead smelting, then vanadium and uranium milling and recovery) almost continuously between 1880 and 1963, when it was closed. In 1976 and 1977, Ranchers Exploration and Development Corporation of Albuquerque, New Mexico, purchased the site from the Vanadium Corporation of America, which had operated the uranium recovery plant between 1949 and 1963. In 1984, Hecla Mining Company acquired Ranchers Exploration and Development Corporation.

The Bodo Canyon site was probably used for grazing livestock since early settlement of the Durango area until the early 1970s when control of the property was deeded to the Colorado Department of Natural Resources, Division of Wildlife. The area is now used for conservation (winter range for deer and elk), hiking, and hunting. No events of historical significance are known to have occurred on the site although prehistoric sites and artifacts have been located on and around the Bodo Canyon site (see Section 4.11.3).

4.11.2 Scenic qualities

Durango site

The vicinity of the Durango site is in transition from a rural livestock-grazing area to a commercial-retail area near the southern city limits of Durango. Recent upgrading and realignment of U.S. Highway 550 has encouraged the development of Bodo Industrial Park to the south of the site. Expansion of the Durango-Silverton Railroad, across the Animas River from the site, has also added commercial-retail development in southern Durango. The Durango site is located in an area of considerable visual diversity.

The site lies adjacent to the Animas River at the base of Smelter Mountain, which rises 1300 feet above the valley floor, amidst newly constructed commercial developments. The tailings piles abut Smelter Mountain; the larger of the two piles, as well as the stack from the demolished smelter, are visible from almost any point in Durango, especially along U.S. Highway 550. Portions of the piles are covered with grass, but erosion is evident. Topographic screening and low-growing vegetation covering the raffinate ponds area reduce its visibility from Durango and local roads.

To rate the scenic quality of the Durango site, the Bureau of Land Management (BLM) Visual Inventory and Evaluation system (BLM, 1978a) was used (see Appendix I, Information on Populations, Socioeconomics, and Land Use, Section I.5.2, in the DEIS). The rating system employs a scale of 0 to 33, with higher ratings (19 and above) indicating that special management attention is required. The Scenic Quality Rating Unit (BLM, 1978b) for the Durango site was rated 11 on this scale, a low score indicating that no special management attention is required. The Animas River Valley extending from Durango north to Silverton has been proposed for listing on the National Register of Natural Landmarks (Arkins, 1985). The Register recognizes geological and ecological features of national significance.

Bodo Canyon site

The Bodo Canyon site is located in an area that is part of, and visually representative of, the upland areas of the Colorado Plateau physiographic province (BLM, 1978a). This province, which covers southeast Utah, northern Arizona, northwest New Mexico, and western Colorado, is characterized by high topographic relief. Plateaus, mesas, and rounded mountains are common. Vegetation is primarily a sagebrush and grass association with scattered pinyon pine and juniper.

Topographic relief in Bodo Canyon is relatively high and landforms are generally more rounded rather than jagged. However, the site and its environs may be of above average visual quality because of the presence of high quality vistas and diversity of line, form, color, and texture.

The BLM Visual Resource Inventory and Evaluation system (BLM, 1978a) was used to rate the scenic quality of the Bodo Canyon site. The Bodo Canyon Scenic Quality Unit (BLM, 1978b) was rated 16 on this scale, a medium score indicating that no special management attention is required.

Long Hollow site

The Long Hollow site is located in a moderately broad, shallow valley with gently rolling to nearly flat terrain at the western base of Basin Mountain. Much of the surrounding area, including the site itself, is used for livestock pasture and is covered with grasses, sagebrush, and pine. The primary points from which the site is visible are from along County Road 141 (Wildcat Canyon Road), close to the west of the site. The site is generally about 30 feet in elevation below these vantage points. A viewer looking across the site sees, as background, Basin Mountain and the nearby foothills that begin to rise about 0.5 mile away. This background is characterized by low, rounded foothills; tan, brown, and green colors; and moderate texture. This type of view is common to both the Durango area and to the physiographic province.

The scenic quality of the Long Hollow site was also evaluated using the BLM Visual Resource Inventory and Evaluation System (BLM, 1978a). The total score for the Long Hollow Scenic Quality Rating Unit (BLM, 1978b) is 13, which is a low-to-medium score indicating that no special management attention is required.

4.11.3 Places of archaeological, historical, or cultural significance

The Animas River valley may contain a number of paleontologic resources and cultural sites because of the likelihood that it served as a prehistoric watering area for animals, and hunting and settlement area for early human inhabitants. No sites of archaeologic or paleontologic significance are known to exist on the Durango site. A cultural resource survey of the Durango site was performed in 1984. The survey identified two historic structures, the 200-foot-high brick smelter stack and the former smelter superintendent's house. The smelter stack was constructed during 1880-1881 and is eligible for inclusion on the National

Register of Historic Places (NRHP). The former superintendent's house is not eligible for inclusion on the NRHP (Sudler, 1984).

An intensive cultural resource inventory of the Bodo Canyon site and vicinity was conducted in October, 1981 (Nickens and Associates, 1981), resulting in the identification of 24 prehistoric sites and 10 isolated artifacts. Additionally, one site and two isolated finds were recorded just outside the site boundary. A prereconnaissance literature search also identified five prehistoric sites that had been previously recorded. Nine of the sites are eligible for nomination to the NRHP, and 15 more were recommended for testing for the presence of significant subsurface deposits before a determination for eligibility to the NRHP could be made (see Appendix I, Section I.5.3.3 in the DEIS). The isolated finds are not considered eligible for listing in the NRHP. Six archaeological sites in the vicinity of the Bodo Canyon alternate disposal site were tested for subsurface deposits in the fall of 1984 (Fuller, 1985). Five of the sites are associated with the Basketmaker III period (600-700 A.D) of the Anasazi culture. The SHPO determined that two of the sites are eligible for nomination to the NRHP (Wildeson, 1985). This brings the total number of sites in the Bodo Canyon area to 10 which are eligible for nomination to the NRHP.

An intensive cultural resource inventory of the Long Hollow site was conducted during September, 1983 (CASA, 1983), resulting in the identification of three sites and two isolated finds (Appendix I, Section I.5.4.3, Information on Populations, Socioeconomics, and Land Use, in the DEIS). One of the sites may be eligible for inclusion on the NRHP but requires more information before a determination of eligibility can be made. The other two sites are considered not eligible for nomination as are the isolated finds.

In the fall of 1984 an intensive cultural resources survey was conducted along the transportation corridor extending from the raffinate ponds area through the lower part of County Road 211 (Hammack, 1985). Five of the sites were related to small coal mines and the smelter which were operated from roughly 1880 through 1930. None of the six sites were determined by the SHPO to be eligible for nomination to the NRHP (Wildeson, 1985).

Eighteen cultural resource sites have been identified primarily along the Long Hollow transportation corridor which may be affected by Alternatives 4 and 5 . Three of these sites are associated with historic homesteads or camp sites. The other 15 sites are affiliated with prehistoric use of the area, primarily during the Basketmaker III Anasazi period (500-800 A.D.).

Table 4.10 lists the cultural resource sites which may be affected by remedial actions under the various action alternatives.

Table 4.10 Cultural resource site status[a]

Alternative	Cultural resource site number	Resource description	Probable cultural affiliation	SHPO determination[b]
2	5LP1479	Brick smelter smoke stack	Industrial, late 1800's-early 1900's	Eligible
3a and 3b	5LP1479	Brick smelter smoke stack	Industrial, late 1800's-early 1900's	Eligible
	5LP478	Habitation	Basketmaker III	Eligible
	5LP481	Habitation, burned pit house	Basketmaker III	Eligible
	5LP483	Habitation	Basketmaker III	Eligible
	5LP1096	Ceramic and lithic scatter	Basketmaker III	More data needed
	5LP1097	Lithic and tool scatter	Archaic	Eligible
	5LP1100	Habitation	Basketmaker III	Eligible
	5LP1102	Hearth and possible habitation	Archaic	Eligible
	5LP1104	Lithic scatter	Possibly Basket-maker III	Eligible
	5LP1108	Lithic and ceramic scatter, possible habitation	Basketmaker III	More data needed
	5LP1114	Lithic scatter	Archaic	Eligible
	5LP1115	Lithic scatter and habitation	Archaic or Basketmaker II	Eligible

Table 4.10 Cultural resource site status[a] (Continued)

Alternative	Cultural resource site number	Resource description	Probable cultural affiliation	SHPO determination[b]
4 & 5	5LP1479	Brick smelter smoke stack	Industrial, late 1800's- early 1900's	Eligible
	5LP172	Habitation, burned structure, lithic and ceramic scatter	Basketmaker III	Not determined
	5LP173	Habitation, masonary walls, lithic and ceramic scatter	Basketmaker III	Not determined
	5LP192	Harper home- stead	Historic - 1930's	Not determined
	5LP461	Campsite, trash dump	Historic - 1920's	Not determined
	5LP462	Fire hearth, lithic scatter	Prehistoric - unknown	Not determined
	5LP481	Habitation, burned pit house	Basketmaker III	Eligible
	5LP482	Habitation, hearths	Basketmaker III	Not determined
	5LP494	Unknown	Unknown	Not determined
	5LP496	Lithic scatter	Prehistoric	Not determined
	5LP504	Lithic and ceramic scatter	Basketmaker III	Not determined
	5LP563	Historic corral	Historic - 1920's	Not determined
	5LP579	House, trash scatter	Historic - 1930's Historic - Unknown	Not determined

Table 4.10 Cultural resource site status[a] (Concluded)

Alternative	Cultural resource site number	Resource description	Probable cultural affiliation	SHPO determination[b]
4 & 5 (Cont'd)				
	5LP581	Ranch buildings	Historic - unknown	Not determined
	5LP608	Masonry structures, ceramic scatter	Basketmaker III	Not determined
	5LP610	Storage pit, lithic and ceramic scatter	Basketmaker III	Not determined
	5LP1101	Lithic and ceramic scatter	Basketmaker III	Not determined
	5LP1370	Ceramic and lithic scatter	Basketmaker III	More data needed

[a]Cultural resource sites included in this table are: (1) either eligible for nomination to the National Register of Historic Places (NRHP) or require more data before eligibility can be determined, and (2) within several hundred feet of areas that would be disturbed in one or more of the alternatives. Cultural resource sites which have been determined to be ineligible for the NRHP are not listed.

[b]The Colorado State Historic Preservation Officer (SHPO), in consultation with the DOE, has determined that these cultural resources are either eligible for nomination to the NRHP or that more data are needed prior to determining eligibility.

4.12 SOCIOECONOMIC CHARACTERISTICS

4.12.1 Populations

The population of La Plata County increased from 19,999 in 1970 to 27,424 in 1980, an average annual increase of 3.6 percent for the decade and the highest growth rate of any decade since 1930 (USDC, 1973, 1982a). Most of the county's population (53.3 percent) lives in rural agricultural and ranching areas scattered throughout the county. The median age of La Plata County residents was 27.6 for 1980 versus 28.6 for Colorado. Females constituted 49.7 percent of the county's population. The State of Colorado's populations projections indicate that the county's population could increase to about 53,000 people by the year 2000, an increase of nearly 94 percent (Colorado Division of Local Government, 1981).

According to the 1980 census (USDC, 1982a), 3072 La Plata County residents (11.2 percent of the total population) were of Spanish origin in 1980, and 1122 persons (4.1 percent of the county's 1980 population) were American Indians. The sources of demographic information in subsequent sections are the decennial census counts (USDC, 1973, 1982a) unless otherwise noted.

City of Durango

Durango, the county seat and regional trade center, had a 1970 population of 10,333 and a 1980 population of 11,426, which indicate an average growth rate of one percent per year and a declining share of the county's population that had an annual growth rate of 3.6 percent for the same period. There were 1563 Durango residents of Spanish origin and 184 American Indians in 1980, 13.7 and 1.6 percent, respectively, of the Durango population. The median age of Durango's residents was 27.1 years. Like La Plata County, females comprised 49.7 of the city' population.

Durango site vicinity

An estimated 10,655 persons lived within three miles of the Durango site in 1980 (FBDU, 1981). No one lived within 0.1 mile of the site, or within three miles to the south, southeast, and southwest. Most lived in Durango, north to northeast of the site where average residential densities generally decreased with distance. Average population density in the northeast quadrant within less than 0.5 mile of the Durango site was about 12 persons per acre. Beyond 0.5 mile, the average density decreased to three persons per acre within 2.5 miles. The estimated population distribution during 1980 is indicated in Table 4.11. The population distribution at distances greater than three miles would closely resemble the population distribution described below for the Bodo Canyon site since the Bodo Canyon site is located about 1.5 miles air distance from the Durango site.

Table 4.11 Estimated 1980 population distribution

Direction	Distance (miles from Durango mill site											Total
	0.1	0.2	0.3	0.4	0.5	0.75	1.0	1.5	2.0	2.5	3.0	popluation
N	0	0	6	8	14	77	234	883	1,470	554	0	3,246
NNE	0	0	46	57	85	132	0	944	723	1,636	500	4,123
NE	0	51	102	105	118	427	0	0	0	540	115	1,458
ENE	0	38	102	164	167	594	0	14	0	0	0	1,079
E	0	0	71	170	176	176	135	0	0	0	0	552
ESE	0	0	0	77	0	0	0	0	0	0	0	77
SE	0	0	0	0	0	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0	4	10	0	0	14
WNW	0	0	0	0	0	18	16	12	0	0	0	46
NW	0	0	6	10	20	4	0	0	0	0	0	40
NNW	0	0	2	10	8	0	0	0	0	0	0	20
Total	0	89	335	601	588	1,387	250	1,857	2,203	2,730	615	10,655

Ref. FBDU, 1981.

Bodo Canyon site

The nearest residence to the Bodo Canyon site is approximately 0.75 mile to the southwest where the Colorado Division of Wildlife leases or rents a ranch house. Also, the Division of Wildlife maintains a shop at the residence and workers are present daily throughout the spring, summer, and fall work season. Other than this single residence, the nearest residents reside in Durango and Wildcat Canyon northeast and northwest of the site, respectively. The total population within a 50-mile radius from the Bodo Canyon site in 1980 is estimated to have been 108,866 persons or about 14 persons per square mile. An estimated 14,695 persons lived within five miles of the site, 10,924 of whom lived to the north. The largest population center was Farmington, New Mexico, about 40 miles south-southwest of Bodo Canyon. Table 4.12 is a tabulation of the population distribution within this 50-mile radius.

Long Hollow site

The area around the Long Hollow site is relatively uninhabited. A lone residence is approximately 3500 feet west-southwest of the site on County Road 141. Another residence is located about 1.75 miles to the west. New residences are planned to be constructed in the proposed "Shenandoah" small-acreage housing development approximately two miles north of the site. The potential population of these residences is unknown; however, it is very small when compared to the population distribution around the Durango site. Because of the relatively close proximity (about 6.5 air miles) to the Bodo Canyon site, it is expected that a population wheel for a 50-mile radius around the Long Hollow site would closely resemble the one for Bodo Canyon (Table 4.12). The main exception would be that Durango's population concentration would be shown at a distance of 10 to 15 miles from Long Hollow rather than the zero to five miles as is depicted for Bodo Canyon.

Population projections

The state's population projections for La Plata County indicate continued high growth rates, from a 1980 census estimate of 27,424 to a year 2000 population of 53,100 (Colorado Division of Local Government, 1981), an average annual growth rate of 3.4 percent over the 1980 to 2000 period. This high rate of growth is expected to occur primarily because of projected growth in the tourist and mining industries in La Plata County.

Another population projection was simulated using a version of an economic assessment model (BREAM) developed for the U.S. Bureau of Reclamation (USBR, 1981). This version of the BREAM model was used to estimate population changes for La Plata County based on a number of important factors affecting demographic and economic change (see Appendix I, Information on Populations, Socioeconomics, and Land Use, in the DEIS). Population projec-

Table 4.12 Population distribution within a 50-mile radius of the Bodo Canyon site

Direction	Distance (miles)										Total
	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50	
N	10,924	414	1,085	15	10	28	4	0	68	1,171	13,179
NNE	1,498	125	380	480	90	191	24	9	807	25	3,629
NE	206	72	120	118	66	71	15	6	7	5	686
ENE	20	10	21	38	41	7	4	5	6	4	156
E	20	100	100	1,787	85	30	50	50	744	3,647	6,613
ESE	926	177	691	948	194	156	72	17	111	5	3,297
SE	125	261	72	869	146	175	34	0	10	118	1,810
SSE	245	194	5	44	25	30	965	567	47	30	2,152
S	25	216	328	72	560	401	5,752	11,222	307	392	19,275
SSW	2	5	7	20	30	100	1,963	2,273	31,393	87	35,880
SW	0	5	51	196	88	345	452	50	303	2,096	3,586
WSW	154	354	172	185	54	11	25	158	46	10	1,169
W	70	120	5	5	27	120	326	3,585	5,137	699	10,094
WNW	220	319	100	60	1,267	271	186	726	1,459	616	5,224
NW	220	0	0	10	10	70	344	15	3	0	672
NNW	40	0	0	0	0	50	0	811	0	3	904
Total	14,695	2,372	3,137	4,847	2,693	2,056	10,216	19,494	40,448	8,908	108,866

tions produced in the simulation indicated an average annual rate of population growth over the 1980 to 2020 period in La Plata County of only 1.85 percent, for the year 2020 population of 57,215. This relatively conservative rate of population growth could be approximately correct since (1) the state's projections did not take the 1980 to 1982 recession into account, (2) the state's projections assumed that the high rate of growth during the 1970s would continue unabated in the future, which is viewed as unlikely, and (3) increasing labor force participation rates will tend to reduce the population that can be supported at a given level of employment.

4.12.2 Governmental structures

La Plata County is governed by three County Commissioners, elected from separate districts to three-year overlapping terms. The Board exercises broad powers, including final authority over all county programs, rezoning approvals, and approval of special district service plans.

Durango is governed by a five-member City Council, each elected to four-year terms from separate districts. One is elected mayor by the Council. The Council has overall responsibility for city government affairs, including finances, rezonings, and city management.

The city and county cooperate in providing a number of services, including the airport, landfill, and library services.

A third important governmental entity is the Southern Ute Tribal Council, consisting of six members and a Chairman elected by registered tribal members. The Council oversees all activities on reservation lands, and is responsible for all tribal activities. A Tribal Court enforces tribal laws; felony crimes are handled by the FBI.

4.12.3 Economic structure

La Plata County's economy is diverse and grew rapidly during the 1970's, primarily because of growth in employment in the tourist-serving industries, manufacturing, and mining. Annual unemployment rates declined steadily from the high 7.5 percent during the 1975 recession to 4.4 percent in 1981. The county economy was relatively resistant to the 1981 to 1982 recession, with unemployment rates during 1982 rising to about 5.5 percent (Colorado Division of Employment, 1981).

Tourism is important to the La Plata County economy. Durango's proximity to the San Juan Mountains, skiing facilities, and other outdoor recreation features makes it a center for tourist activity. The Durango-Silverton narrow-gauge railway is an important local tourist attraction which serves approximately 170,000 people annually out of the approximately 750,000 to 1,200,000 annual visitors to Durango (Durango Chamber of Commerce, 1985). Mesa Verde National Park, located 36 miles west of Durango, recorded 516,865 visitor days in 1984 (Hedyer, 1985). Purgatory ski area is another major tourist attraction 25 miles north of Durango which had 306,156 skier visits in 1984 (Durango Chamber of Commerce, 1985).

The most prominent economic sectors in La Plata County are services, retail trade, state and local government, and agriculture; each of these sectors comprised a higher proportion of La Plata County's 1980 employment than the statewide average. Employment in services and retail trade indicates the importance of tourism to the La Plata County economy. Employment in the services sector was the largest of all sectors in 1980, accounting for 22.7 percent of the county's total employment. By comparison, the average for Colorado was 17.8 percent. Retail trade employment was 18.6 percent of all employment, compared to 15.4 percent for the state (USDC, 1982b). Agricultural employment (including both proprietors and wage and salary workers) represented 6.2 percent of total county employment in 1980, compared to 3.2 percent statewide (USDC, 1982b). Mining and manufacturing are far less prominent in La Plata County than in the state. Tourism related employment in 1984 amounted to 2926 jobs in Durango in 1984 (see Appendix N, Tourism Information, in this FEIS).

Per capita income in La Plata County was $6,453 in 1979 (1979 dollars), compared to $9,114 statewide (USDC, 1981). Projections of personal income using BREAM indicate that by 1985 total personal income in La Plata County will increase by 17.9 percent above 1979 levels. Per capita income is projected to increase by 6.8 percent in real terms over 1979 levels. The primary nongovernmental sources of personal income have been services and retail trade. Tourism accounted for $58 million in personal income at Durango in 1984 (see Appendix N, Tourism Information, in this FEIS).

La Plata County's primary revenue source is property taxes; other revenue sources are charges for services, interfund transfers, and "other" revenues (La Plata County, 1982). The city of Durango has a tax structure that depends primarily on the sales tax, which allows a relatively low reliance on property taxes (the 1982 rate was 4.54 mills).

4.12.4 Work force

The number of people employed in La Plata County increased from 7039 to 12,527 from 1970 through 1980, an increase of about 56 percent over the 10-year period. The workforce represented about 37 percent of the county's population in 1970, whereas it was almost 46 percent in 1980. The sectoral employment for La Plata County is compared to that for the State of Colorado in Table 4.13. A study performed by the U.S. Travel Data Center (1980) concluded that 2566 La Plata County jobs were directly related to the travel industry.

Table 4.13 Sectoral employment[a] of La Plata County and the State of Colorado (percent of total)

Sector	1970 La Plata County		1970 Colorado (percent only)	1980 La Plata County		1980 Colorado (percent only)
Total employment	7,039	(100.0)	(100.0)	12,527	(100.0)	(100.0)
Proprietors	1,499	(21.3)	(11.0)	2,161	(10.4)	(10.4)
Farm	677	(9.6)	(3.4)	592	(4.7)	(1.9)
Nonfarm	822	(11.7)	(7.6)	1,569	(4.5)	(8.5)
Wage and salary	5,540	(78.7)	(89.0)	10,366	(82.7)	(89.6)
Farm	217	(3.1)	(21.1)	185	(1.5)	(1.3)
Nonfarm	5,323	(75.6)	(86.9)	10,181	(81.3)	(88.3)
Agricultural services, forestry, fisheries, and other	(b)		(0.3)	63	(0.5)	(0.5)
Mining	78	(1.1)	(1.5)	83	(0.7)	(2.4)
Construction	154	(2.2)	(4.6)	627	(0.7)	(5.1)
Manufacturing	213	(3.0)	(12.0)	484	(5.0)	(12.0)
Transportation and public utilities	359	(5.1)	(5.3)	506	(4.0)	(5.2)
Wholesale trade	124	(1.8)	(4.6)	348	(2.8)	(5.1)
Retail trade	1,052	(14.9)	(14.3)	2,325	(18.6)	(15.4)
Finance, insurance, and real estate	167	(2.4)	(4.2)	488	(3.9)	(5.4)
Services	1,538	(21.8)	(15.4)	2,843	(22.7)	(17.8)
Government and government enterprise	1,635	(23.2)	(24.6)	2,414	(19.3)	(19.3)
Federal civilian	256	(3.6)	(4.7)	408	(3.3)	(3.5)
Federal military	102	(1.4)	(6.4)	408	(3.3)	(3.5)
State and local	1,277	(18.1)	(13.5)	1,925	(15.4)	(12.8)
Unemployment rate (percent of labor force)[c]	5.6	3.5	4.5	3.5		

[a]Employment data are on a place-of-work basis.
[b]Less than 10.
[c]The unemployment rate is on a place-of-residence basis (Colorado Division of Employment, 1981).

Ref. USDC, 1982b.

4.12.5 Housing and community structures

Housing

The number of housing units in La Plata County increased from 6989 to 12,154 between 1970 and 1980. Of the 12,154 total units in 1980, 10,993 were year-round units with the remainder being seasonal units (generally, vacation homes occupied seasonally). Of the 10,983 year-round units, 6703 were single family detached, 2592 were multi-family, and 1698 were mobile homes or trailers. Durango's 4335 year-round units included 2788 single family detached, 1417 multi-family, and 130 mobile homes or trailers. Seasonal units totalled 29 (USDC, 1982c).

The county's 1980 year-round housing vacancy rate was 11.3 percent, and Durango's year-round housing vacancy rate was 5.0 percent (USDC, 1982c). The average number of persons per occupied household was 2.7 in 1980, a significant drop from 1970's 3.2 average. In addition, there are approximately 1750 hotel units in Durango. No statistics are published regarding hotel vacancies; contacts with several of the larger hotels in the area indicate vacancy rates of about 30 percent during winter, fall, and spring, with very few vacancies during the summer tourist season.

Community services

Education. Public education in La Plata County is provided by three school districts, headquartered in the incorporated communities of Durango, Bayfield, and Ignacio. There are also three private grade schools in Durango and a private high school. The largest district, Durango School District 9-R, had a total of 3764 students in November, 1981, 3.3 percent higher than in 1980 and 1.9 percent higher than in 1979. This indicates a stable or slowly rising school-age population. The district maintains seven elementary schools (grades K-6), two junior high schools, and one high school. Two of the grade schools, Sunnyside and Florida Mesa, had enrollments near or above their physical capacities. However, the overall grade school system capacity exceeded enrollment by a safe margin. The capacity of the junior high schools totals 1300 students, and the high school can accommodate 1000 students. Both the junior and senior high schools are operating well below these capacities (Durango School District 9-R, 1981). The system employed 263 classroom teachers for a student-teacher ratio of 14 to one.

The Bayfield Ten Joint R School District had a November, 1981, total enrollment of 593 students. The district operates one elementary, one middle, and one high school. Enrollment has been increasing and within about two years physical capacity will have to be enlarged. The district has 37 teachers for a student-teacher radio of 16 to one.

The Ignacio Eleven Joint School District had a November, 1981, enrollment of about 800 students and a combined physical capacity at its grammar, middle, and high schools of 1000. Enrollment has been stable over the recent past. With 60 teachers, the district has a student-teacher ratio of 13 to one.

Fort Lewis College in Durango had an enrollment of 3312 in the fall of 1981. Enrollment may reach 4000 over the intermediate range future.

Police and fire protection. Police protection in La Plata County is provided by city, county, and state law enforcement agencies. Durango's police department services areas within the city limits. It employs 20 patrolmen, four detectives, and five administrative personnel. Four 24-hour patrols are provided on weekdays and seven on weekends. No additional staff or equipment purchases are anticipated. Although on a per-capita basis, staffing levels are above the western states average for cities of Durango's size, the department is considered by some officials to be short-handed.

The La Plata County Sheriff's Department employed 30 officers in 1983 with five more expected to be added when the new criminal justice center, located to the south of the Durango site, opens in 1984. The department provides 24-hour patrol in the unincorporated area, and is adequately staffed relative to demand (Frye, 1983). The Colorado State Highway Patrol maintains an office in Durango staffed with six state troopers who provide police protection for La Plata County. In general, the State Highway Patrol covers traffic-related problems in the county, but it also has a mutual aid agreement with the La Plata County Sheriff's Office for nontraffic incidents. The staff is considered adequate relative to demands for service (Sanburg, 1983).

The City of Durango has a full-time staff of firefighters of 15 and a volunteer staff of three. It operates a rescue truck and four pumpers, one of which has a 100-foot ladder. Its service area is the incorporated area, but mutual aid agreements are in effect with nearby fire protection districts. The Insurance Services Office fire-insurance rating for Durango is 6, which is above average for a city of Durango's size.

The Animas Fire Protection District maintains a mutual-aid agreement for the Bodo Canyon area with the State of Colorado. The Durango and Long Hollow sites are within the Animas Fire Protection District's jurisdiction. The district operates five substations, and one is under construction. The station downtown would respond to calls from the Durango and Bodo Canyon sites, and possibly the Long Hollow site. This station is staffed by 10 volunteer firefighters, five of whom have emergency medical training. This station has a 260-gallon mini-pumper with rescue capability. The Durango West station would respond to incidents in the Long Hollow area. The Durango West station is staffed by 10 volunteers, two of whom have emergency medical training. Equipment includes a 260-gallon mini-pumper with rescue capability and a 750-gallon class A pumper. Response time to the Durango, Bodo Canyon, or Long Hollow sites is estimated at 10 minutes. The district has adequate staffing, but its ability to purchase new equipment is limited (Carmen, 1983). The Insurance Services Office fire-insurance rating for most of the district it serves is 9.

Health care. La Plata County has two hospitals, Mercy Medical Center and La Plata Community, both of which are located in Durango. Mercy Medical Center has 110 beds with an occupancy rate of 80 percent; it offers 24-hour emergency room and trauma service in addition to standard clinical facilities and provides ambulance service to the Bodo Canyon and Long Hollow areas.

The La Plata Community Hospital is a general acute-care hospital with 51 beds and an average occupancy rate of 72 percent; it offers general medical, surgical, and obstetric services, and has a 24-hour emergency room. Mental health services are provided at the Southwest Mental Health center in Durango, which functions as the regional mental health care service center.

Water supply. Durango has the largest water system in La Plata County, servicing not only city residents, but selling water to neighboring water districts and companies in the surrounding developed areas. The city obtains its water from the Animas and Florida Rivers with a pumping system that has a rated capacity of about 7.8 million gallons per day (mgd). The capacity of its water-treatment system is 12 mgd, capacity for storage of treated water is 7.2 million gallons, and the city owns a reservoir for untreated water with a 75.6 million-gallon capacity (Rogers, 1983). Therefore, the city has an adequate water system for the next several years. Average daily demand is about five mgd. Other central water systems in La Plata County use wells for their water source.

4.12.6 Tax and assessment structures

The city of Durango has a tax structure that depends primarily on the sales tax. The city's 1982 budget was $8,585,300. The leading expenditure categories were the Police Service Department ($1,221,790) and the Public Works Department ($1,043,152). Budgeted city revenues were equal to expenditures; the primary income categories are sales and use taxes ($2,475,000) and utility charges ($1,681,000). The city's property tax, at 4.54 mills was expected to yield only $203,660, or 2.3 percent of all revenues (City of Durango, no date).

La Plata County's 1982 general fund budget was $3,066,803. General government and public safety expenditures accounted for 59 percent of the total. The county's primary revenue source was expected to be property taxes, with $1,286,174 in expected yield for 1982 (La Plata County, 1982).

The property tax rate applicable at the Durango site is $70 per $1000 valuation, and the property's valuation for tax purposes is about $200 per acre, or about $25,000. The Bodo Canyon site is under public ownership and is not subject to taxation. The Long Hollow site is assessed at approximately $40 per acre, and taxed at a rate of $64 per $1000 valuation.

Land at the Durango site currently has very little market value, since the site has very few uses because of the presence of the tailings. Properties in the vicinity of the site have land values as high as $65,000 per acre (the approximate value of lots in the Bodo Industrial Park immediately to the south). The value of the relatively level land at the Durango site, if the tailings and other contaminated materials were removed, would probably be well below $65,000 per acre, because the site is not serviced by roads or utilities (Class, 1983). Since the area around the Bodo Canyon site is under public ownership, no comparable sales data are available upon which to base a land value assessment. Lands in the vicinity of the Long Hollow site are on the market for between $1000 and $4000 per acre, depending on a number of factors (Lamiere, 1983).

Retail sales in La Plata County outside Durango are subject to a state sales tax of 3.5 percent plus a county sales tax of two percent. Sales in the city of Durango are subject to an additional two percent tax.

4.12.7 Transportation networks

The main transportation routes in the Durango area are U.S. Highway 550, the major north-south highway, and U.S. Highway 160 that carries traffic to points east and west of Durango. County Road 211 (Bodo Canyon Road) intersects U.S. Highway 550 just south of the raffinate ponds area at the Durango site and extends westward through Bodo Canyon into Ridges Basin (Ridges Basin Road) where it connects with County Road 141 about two miles northeast of the Long Hollow site (see Figure I-2, Appendix I, Information on Populations, Socioeconomics, and Land Use, in the DEIS).

Current traffic volume data do not exist for County Road 211 through Bodo Canyon. The only data for County Road 141 show 901 average daily trips (ADTs) (one trip every 1.6 minutes) in July, 1981, for a counter location 100 yards west of the U.S. Highway 160 intersection. Traffic counts in 1982 indicated volumes on U.S. Highway 550 ranged from 12,500 to 14,600 ADTs at counter locations near the Durango site and 8650 ADTs on U.S. Highway 160 near the junction with U.S. Highway 550.

The terminal and roundhouse for the Durango-Silverton narrow-gauge railway are located at the south end of Durango within one mile of the Durango site. This railroad is the only rail service to or from Durango and is a major tourist attraction; this rail service is not connected to regional rail lines.

4.12.8 Public concerns about the remedial action project

The notice of intent to prepare an EIS and hold public scoping meetings was published in the Federal Register (46 FR 30383-30385, June 8, 1981). This notice was also given ample publicity by the DOE in the Durango local newspaper and in local radio and television announcements.

These scoping meetings were held at the Durango County Fairgrounds, in Durango, as follows:

- o June 30, 1981, at 2:00 p.m. (seven speakers expressed concerns).
- o June 30, 1981, at 7:00 p.m. (three speakers expressed concerns).
- o July 1, 1981, at 9:00 a.m. (nine speakers expressed concerns).

At these meetings the public was given an opportunity to express opinions and concerns about the tentative project plans. The DOE also requested that written comments be submitted by July 13, 1981.

The matters of concern mentioned most frequently during the public scoping meetings and in written submissions were the following:

- o What are the radiological effects on physical health of the proposed action? Concerns were expressed on the release of radioactive dust during construction and the effects of transportation accidents.
- o What are the effects of increased truck traffic on public roads? Concerns were expressed that U.S. Highway 160 and County Road 141 would become unsafe for residents because of contamination, congestion, and high accident risks.
- o What will be the effects of the remedial actions on air quality? Concerns were expressed that blowing dust from the actions would contaminate an even larger area than now exists.
- o What will be the effects on surface and ground water? Concerns were expressed that wells and springs in Long Hollow could become contaminated.
- o What will be the effects on the local economic structure and land use? Concerns were expressed that the local economy would suffer hardship by loss of tourist trade if the tailings stay where they are. Commentors suggested that land values would decrease if tailings moved to Long Hollow; ranchers may not be able to sell land or borrow money. It was suggested that all proposed alternatives might affect lands belonging to the Southern Ute Tribe.
- o What are the effects on costs to the taxpayers? Concerns were expressed that remedial action costs will be too expensive, and government funds could be spent on better things. It was suggested that the tailings should be reprocessed even if it were not profitable -- the money would help finance the project and reduce government spend-

ing. The need for any of the proposed remedial actions was questioned.

- o What will be the effects on wildlife? Concern was expressed that wildlife value has to be considered if tailings are moved to Bodo Canyon.

- o What will be the effects on water resources if the tailings are reprocessed? Concern was expressed that water for reprocessing would have to be taken from the La Plata River, which is already overcommitted.

- o What will be the effects of the visual and noise-level acceptability of the proposed actions? Concern was expressed that excessive noise and visual impacts caused by removing the tailings piles could hurt Durango's tourist economy.

These concerns have been addressed in this statement.

4.12.9 Tourism

Situated in a mountain valley setting, Durango is surrounded by abundant natural beauty. It is located on a travel route connecting visitors in route to or from California, the Grand Canyon, Salt Lake City, or Denver to other destination areas. Approximately an eight-hour drive from Denver or a four-hour drive from Albuquerque, it is considered a retail center for southwestern Colorado. In addition to the western historic flavor preserved down the main street of Durango, area attractions include a ride on the Durango-Silverton Narrow Gauge Railroad, Purgatory Ski Area, Mesa Verde, and the following points of interest: Four Corners Monument, Aztec National Monument, Lowry Indian Ruins, Yucca House National Monument, Escalante Ruins Historical site, Tamarron Resort, Weminuche Wilderness and nearby reservoirs, lakes, and streams.

The primary interest of most visitors in the summer is a visit to Mesa Verde or a ride on the Narrow Gauge Railroad. Other summer activities include chuck wagon style dinners at area dude ranches, a variety of galleries and cultural activities, wagon tours of the Durango Historic District, rafting on the Animas River, fishing, hiking or picnicking in the nearby San Juan National Forest, and various water sports on Vallecito Reservoir.

Winter visitors arrive to ski at nearby Purgatory Ski Area and may ride the narrow Gauge Railroad to Cascade Canyon and back. Cross-country skiing and other winter snow activities are also available to satisfy any level of expertise. A mid-winter snow carnival attracts out-of-area expert skiers for a variety of competitive and non-competitive events.

Big game hunting and fishing are important recreational aspects of Durango. In 1980 there were an estimated 255,182 fishing days (one fishing-day is equal to one person fishing for any part of the one day) in La Plata County. In 1983, rifle, archery, and muzzle loading hunters accounted for an estimated 51,998 recreational days (one person hunting for any part of one day) in La Plata County.

Table 4.14 displays attendance at the main Durango area tourist attractions. It can be seen that skiing at Purgatory exhibited the most rapid growth. Riding the Narrow Gauge Railroad is the most popular attraction although Mesa Verde generates more visitor days. See Appendix N, Tourism Information, in this FEIS for further information.

Table 4.14 Major tourist attractions and attendance Durango and vicinity 1980 - 1984

Year	Purgatory ski area[a]	Durango-Silverton Narrow Gauge Railroad[a]	Mesa Verde National Park[b]
1980	176,944	103,000	528,927
1981	250,631	124,353	588,847
1982	278,911	149,395	602,968
1983	305,589	153,121	604,055
1984	306,156	169,759	516,865

[a]Ref. Durango Chamber of Commerce, 1985.
[b]Ref. Heyder, 1985.

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5.0 ENVIRONMENTAL CONSEQUENCES

5.1 INTRODUCTION

In assessing the impacts for each alternative, the following issues are basic to all alternatives except Alternative 1 (no action):

- All of the action alternatives would limit the release of radioactively contaminated materials from any of the three sites to within the Environmental Protection Agency (EPA) standards (40 CFR Part 192).

- All of the action alternatives would effectively isolate the radioactively contaminated materials from natural dispersion, such as by wind or water, and from inadvertent human use over the period specified in the EPA standards. However, Alternative 2 would require a much greater level of maintenance to assure long-term stability.

- All of the action alternatives would improve the existing conditions at the Durango site. The potential health and environmental hazards that are a result of the present configuration of the radioactively contaminated materials at the Durango site would be reduced to near background levels.

- This study addressed the maximum realistic impacts; it is expected that the actual impacts would be less.

5.2 IMPACTS OF RELEASES OF RADIATION

The above background radiological impacts resulting from each of the alternatives are assessed in this section. The methods and data used to perform these assessments are described in Appendix H, Radiological Information, in the DEIS, and in the Addendum to Appendix H in this FEIS. The impact assessment includes estimates of the resulting organ-specific radiation doses and health effects on both the remedial-action workers assigned to the Durango or alternate sites and the general population within 80 kilometers (approximately 50 miles) of the Bodo Canyon site. Radiation doses and health effects are also estimated for transportation workers in the appropriate remedial-action alternatives.

5.2.1 Exposure pathways and health effects

Potential exposure pathways by which individuals could be exposed to radioactive materials during this project are shown in Figure 5.1. The pathways of greater concern are enclosed by a dotted line. The significant pathways at the Durango site would be inhalation of radon-222 (radon) daughter products and the direct exposure to gamma radiation from unstabilized uranium-mill tailings.

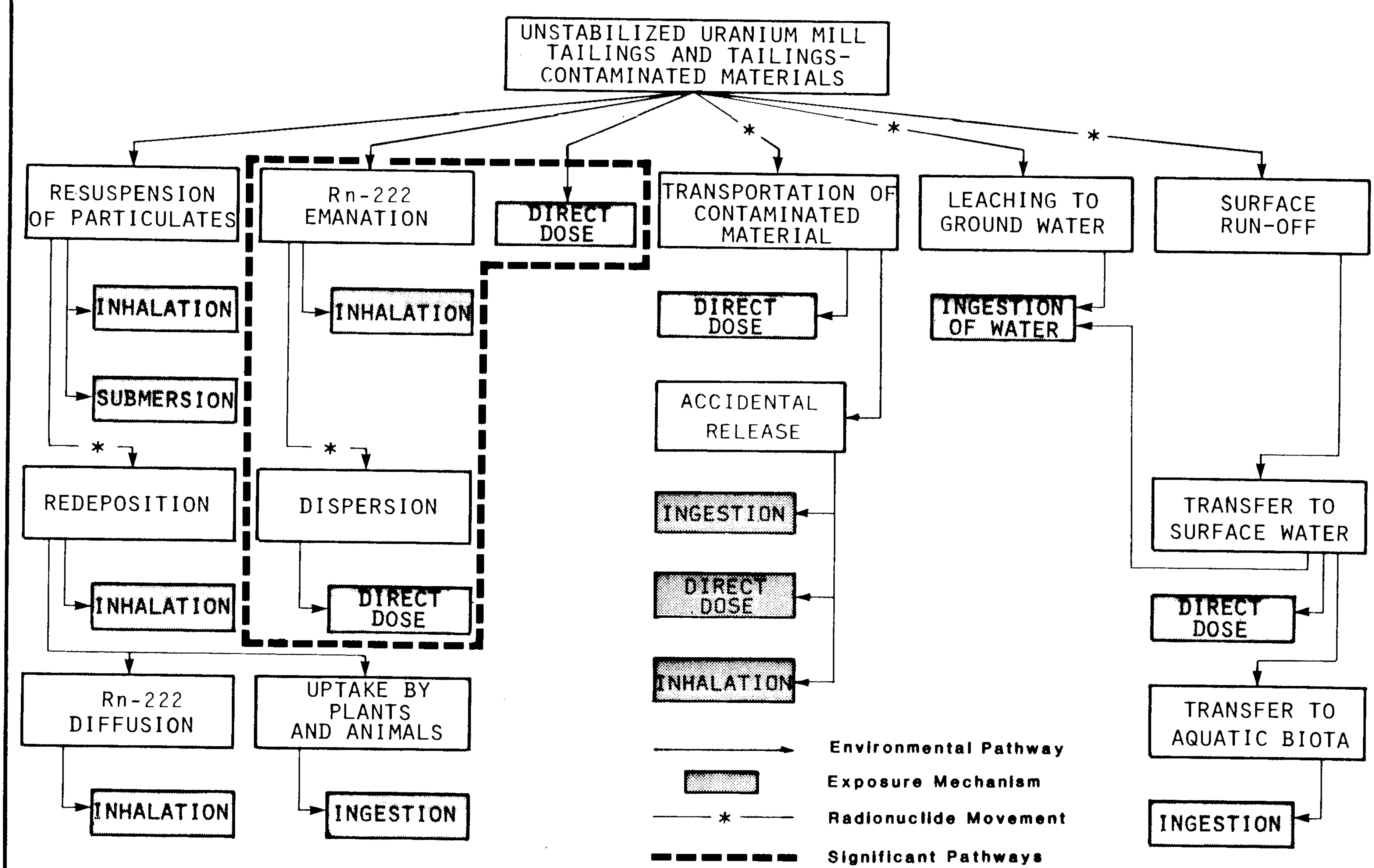

FIGURE 5.1 POTENTIAL RADIATION EXPOSURE PATHWAYS TO THE GENERAL PUBLIC AND REMEDIAL-ACTION WORKERS

The other pathways shown on Figure 5.1 would not be nearly as important at the Durango site as radon inhalation and direct exposure but are included in this analysis for completeness. The inhalation of and submersion in resuspended particulates from the tailings would result in relatively small radiological exposures among workers on the pile, as is shown in Appendix H, Radiological Information, in the DEIS, Section H.3.2, and in the Addendum to Appendix H in this FEIS, and even smaller exposures to the off-site public. The pathway shown as transportation of contaminated material would result in relatively small exposures to onlookers along transportation routes, as is also shown in Appendix H, Section H.3.3, in the DEIS. However, both of these less important pathways are treated in the impacts analyses of this section.

Three other less important pathways are not treated: (1) the ingestion and uptake by plants and animals of windblown particulates from the pile, (2) the ingestion of ground water that has been in contact with (or has leached from) the pile, and (3) the ingestion of surface waters that might have been in contact with the pile. In the first case, ingestion of food products and animal flesh is judged to be insignificant since agricultural and grazing lands are not in the vicinity of the Durango site. In the case of ground water, while monitoring wells in the immediate vicinity of the tailings show elevated concentrations of radionuclides (BFEC, 1983), water from these wells is not consumed. Similarly, surface-water samples taken from the Animas River show slightly elevated concentrations of radium (radium-226 and radium-228) above the EPA drinking water standards. Drinking water for the Durango area, however, is taken upstream from the Durango site, and there is no downstream use of surface water in the vicinity of the site.

The health effects from radon emanation arise from the inhalation of radon-daughter products. Exposure to radon-daughter products is normally measured in terms of a unit called the "working level" (WL). In these analyses, however, the unit of exposure used is the rem. The unit of cumulative exposure is the working-level month (WLM), i.e., the exposure of a worker to air containing one WL for a period of 170 hours. Continuous exposure of a member of the general public to one WL for one year results in approximately 50 WLM of exposure (24 hours/day x 365 days divided by 170 hours/WLM). One WLM is roughly equivalent to a dose commitment to the lungs of 15 rems (NRCP #77, 1984).

The health effects from direct-external-gamma radiation are calculated by considering the measured or predicted dose and the size of the population exposed. The units for expressing these values are the rem (where, for radiation considered here, one rem is approximately equal to one roentgen) and the man-rem. A man-rem (or person-rem) is the product of the average radiation dose commitment multiplied by the number of people receiving that dose; it is the population dose commitment unit used in this analysis. The output of the MILDOS computer code used in this analysis was also made in these units.

Estimates of excess cancer deaths because of radiation exposure were made using the following risk factors:

- o Three hundred lung cancer deaths in the exposed population for each 1,000,000 person-WLM of dose commitment from inhalation of radon-daughter products (EPA, 1982).

- o One hundred twenty cancer deaths in the exposed population for each 1,000,000 man-rems of dose commitment from exposure to gamma rays (National Academy of Sciences, 1980; Cohen, 1981).

In all the dose calculations, the average radioactivity level less the normal background level was used for impact evaluation.

5.2.2 Impacts during remedial action

Radiation doses to remedial-action workers and to the general population out to 80 kilometers were calculated using the MILDOS computer program (NRC, 1981). The MILDOS program provides estimates of potential radiation exposure to individuals in the vicinity of a uranium mill tailings disposal site. The inputs to this program consist of population-distribution, meteorological, and radionuclide data. The meteorological data used are presented in Appendix D, Meteorological and Air-Quality Information, in the DEIS and the population data used are discussed in Appendix I, Information on Populations, Socioeconomics, and Land Use, in the DEIS.

Several types of radionuclide emission rates were used; the emission rate of radon from the surface (radon flux), particulates made airborne by wind erosion, and particulates becoming airborne during the construction activity. EPA particulate emission factors for open conveyors were used to predict fugitive dust emissions for Alternative 3b because emission factors for pipe conveyors have not been developed. This approach probably results in the overestimation of radiological health effects for Alternative 3b. Surface radon-222 releases were inferred from reported radium-226 concentrations (FBDU, 1981) using the relation that one picocurie per gram of radium-226 results in one picocurie per square meter per second of radon-222.

Wind-eroded radiological particulate releases would depend on the areas of radioactively contaminated material exposed during the remedial actions. These areas were estimated from a previous work (FBDU, 1981). MILDOS contains wind suspension factors based on various experiments. During the remedial actions, some contaminated particulates (dust) would be picked up and dispersed by the wind. This process and the amount of such release are described in Section H.3 of Appendix H, Radiological Information, in the DEIS.

Estimates of the excess dose commitment to the general public within an 80-kilometer radius for a 100-year period are presented in Table 5.1 for each of the alternatives; the potential excess

Table 5.1 Estimates of the population dose commitments[a] to the general public within an 80-kilometer radius for 100 years (including remedial action) and expected excess cancer deaths

Organ	Population dose commitment (man-rem)					
	Alternative 1 (No action)	Alternative 2 (On-site stabilization)	Alternative 3a (Stabilization at Bodo Canyon, truck transport)	Alternative 3b (Stabilization at Bodo Canyon, conveyor transport)	Alternative 4 (Stabilization at Long Hollow)	Alternative 5 (Reprocessing at Long Hollow)
Whole body	191	25	47	172	29	93
Bone	724	51	108	394	213	224
Lung	21	27	66	241	31	94
Bronchial epithelium	66,000	969	1050	1050	996	2620
Effect	**Expected excess deaths**					
Cancer from whole-body gamma ray exposure	2.29×10^{-2}	2.95×10^{-3}	5.62×10^{-3}	$2.0\ 6 \times 10^{-2}$	3.50×10^{-3}	1.11×10^{-2}
Lung cancer from doses to the bronchial epithelium	1.32	1.94×10^{-2}	2.10×10^{-2}	2.10×10^{-2}	1.99×10^{-2}	5.25×10^{-2}
TOTAL	1.34	2.23×10^{-2}	2.66×10^{-2}	4.16×10^{-2}	2.34×10^{-2}	6.36×10^{-2}

[a]Population doses are calculated for a 100-year period.

cancer deaths associated with these dose commitments are also presented. The 100-year time period includes time for the remedial actions plus normalization time. These estimates were made using the methods outlined above and described in detail in Appendix H, in the DEIS. The expected excess cancer deaths were obtained by multiplying the risk factors described in Section 5.2.1 by the dose commitments.

Excess cancer deaths to the general population during 100 years from whole-body gamma ray exposure are 0.023, 0.0029, 0.0056, 0.0206, 0.0035, and 0.011 persons for Alternatives 1, 2, 3a, 3b, 4, and 5, respectively. Statistically, about one person in six nationally will die of cancer from causes not associated with remedial action (DOE, 1983a) or about 18,000 people among the 108,866 people who live within 80 kilometers of the Bodo Canyon site. During the remedial actions, exposure to radiation is projected to result in excess cancer deaths, principally from lung cancer. The total excess bronchial dose over a 100-year period for Alternative 1 (no action) is 66,000 man-rem per 100 years. The excess bronchial doses for Alternatives 2, 3a, 3b, 4, and 5 for the same 100-year period are 969, 1050, 1050, 996, and 2622 man-rem, respectively. These exposures would result in 1.32, 0.019, 0.021, 0.021, 0.020, and 0.053 projected excess lung cancer deaths for Alternatives 1, 2, 3a, 3b, 4, and 5, respectively, over 100 years. The excess doses from Alternatives 2 through 5 are about one to four percent of the dose resulting from the no-action alternative.

Estimates of the 50-year excess dose commitments to the remedial-action workers during the remedial action are presented in Table 5.2 for each of the alternatives; the potential excess cancer deaths associated with these dose commitments are also shown. The excess dose commitments range from 108 to 909 man-rem for the whole body and 333 to 2800 man-rem for the bronchial epithelium. The expected excess deaths among workers range from 0.0066 to 0.056. The largest excess dose commitments result from Alternative 5, 909 man-rem for the whole body and 2800 man-rem for the bronchial epithelium, and the largest total expected excess deaths, 0.165, also result from Alternative 5.

In Alternatives 3a, 4, and 5, individuals adjacent to the truck transportation route might be exposed to gamma radiation from passing trucks carrying contaminated materials. The doses were calculated using the computer code TRANSDOS which is described in Section H.2.3 of Appendix H, Radiological Information, in the DEIS.

Doses resulting from the transportation of material are significantly less than those described above. A person located at a distance of 100 meters from the transportation route would receive a dose of 1.2×10^{-5} millirem (mrem) from a truck with contaminated material traveling at 23 miles per hour (Section H.3.3, Appendix H, in the DEIS). The maximum dose estimated to be received by workers transporting the material is 10.8 mrem per day or 2.6 rem for the year.

Table 5.2 Estimates of the occupational dose commitments to the remedial-action workers and expected excess cancer deaths

Organ	Occupational dose commitment (man-rem)				
	Alternative 2[a] (Durango)	Alternative 3a[b] (Bodo Canyon truck transport)	Alternative 3b[c] (Bodo Canyon conveyor transport)	Alternative 4[d] (Long Hollow)	Alternative 5[e] (Reprocessing)
Whole body	108[f]	263[f]	362[f]	310[f]	909[f]
Bronchial epithelium[g]	333	840	1120	987	2800
Effect	**Expected excess deaths**				
Cancern from whole body gamma ray exposure	1.30×10^{-2}	3.16×10^{-2}	4.34×10^{-2}	3.72×10^{-2}	1.09×10^{-1}
Lung cancer from doses to the bronchial epithelium	6.6×10^{-3}	1.68×10^{-2}	2.2×10^{-2}	1.97×10^{-2}	5.60×10^{-2}
Total	1.97×10^{-2}	4.8×10^{-2}	6.58×10^{-2}	5.69×10^{-2}	1.65×10^{-1}

[a]Based on 44,300 hours of worker exposure (Table A-6, Appendix A in the DEIS).
[b]Based on 108,400 hours of worker exposure at the Durango and Bodo Canyon sites (Table A-11, Appendix A in the DEIS).
[c]Based on 227,910 hours of worker exposure at the Durango and Bodo Canyon sites (Table A-31, Addendum to Appendix A, in this FEIS).
[d]Based on 127,500 hours of worker exposure at the Durango and Long Hollow sites (Table A-17, Appendix A in the DEIS).
[e]Based on 374,420 hours of worker exposure at the Durango and Long Hollow sites (Tables A-[20], A-21, and A-22, Appendix A in the DEIS).
[f]For the population dose commitments to the whole body, the values for the action alternatives are conservative. The values are based on a radium soil concentration of 973 pCi/g (Section H.1.1, Appendix H in the DEIS).
[g]Doses due to inhalation of particulates are at most 25 percent of the dose shown for bronchial epithelium. Since respirators (dust masks) will be required for workers, the dose will be further reduced to negligible levels.

5.2.3 Impacts after remedial action

The only pathway of significance after remedial action would be radon emissions from the reclaimed pile. Particulate releases, should they occur, would involve only cover material with its background concentrations of naturally occurring radiation. Similarly, gamma radiation from the pile would be equivalent to the local naturally occurring background radiation. Radon flux from the pile would conform to the EPA standard, i.e., 20 picocuries or less per square meter per second. This is about 20 times greater than the natural flux as estimated from radium concentrations (see Table H-7, Appendix H, Radiological Information, in the DEIS) and a one picocurie per square meter per second (pCi/m^2sec) radon flux due to a radium-226 concentration of one picocurie per gram (pCi/g).

5.2.4 Radiological impacts of accidents

Two accident scenarios were considered for Alternatives 2, 3a, 4, and 5. Since trucks would be used for transporting contaminated materials for these action alternatives, the first accident scenario considers the overturning of a truck carrying tailings material. The one-hour whole-body doses to individuals at distances of 0.1, 0.5, 1.0, 1.5, and 2.0 km from this accident would be very small (approximately one-billionth of background), ranging from 5.9×10^{-8} to 2.3×10^{-10} millirem (see Table H-23, Appendix H, in the DEIS).

The second accident scenario considered for the action alternatives was that of waterborne transport. This scenario assumed that a truckload of tailings would be dumped into the Animas River. Transport of the tailings by suspension was assumed to be the mechanism of dispersion. Once in the river, the tailings slug would be subject to longitudinal dispersion that would lower the concentration as the slug moved downstream. The maximum concentration of radium-226 in the Animas River at 10, 100, and 1000 meters would be 7800, 2466, and 770 pCi/l, respectively. As radium-226 would be in an insoluble form, the concentrations at 10, 100, and 1000 meters from the spill would be below the maximum permissible concentration (MPC) of 30,000 pCi/l as set forth in NRC's Standards for Protection Against Radiation, 10 CFR Part 20.

For Alternative 5, the same two accident scenarios are appropriate for tailings transportation. In addition, two accident scenarios were considered for accidents involving transport of the uranium slurry by truck from the Long Hollow reprocessing site to a mill such as at Blanding, Utah. The impacts are negligible for a spill of the slurry on land, compared to the already small impact of a tailings spill, because of the high moisture content of the slurry which prevents wind dispersion of the uranium precipitate. For a spill of the slurry into the Animas River, the high uranium concentration in the slurry material would cause the instantaneous concentrations at 10, 100, and 1000 meters downstream to exceed the MPC in water for insoluble natural uranium. However, since the MPCs are for continuous releases to the environment, it is reasonable to average the instantaneous concentrations over time. For an averaging time of 24 hours, the average concentration in water at points 10, 100, and 1000 meters downstream were 11,000, 3500, and 1100 pCi/l, respectively, well below the 30,000 pCi/l allowable MPC for continuous releases.

5.3 IMPACTS ON AIR QUALITY

The impacts on air quality for each of the remedial-action alternatives have been assessed using the VALLEY atmospheric dispersion model appropriate in mountain and valley terrain. The Colorado Air Pollution Control Division recommended the use of the VALLEY model as a screening technique in the Durango region (Colorado Department of Health, 1981). A discussion of the use of this model is contained in Appendix D, Meteorological and Air-Quality Information, in the DEIS, Sections D.2.1 and D.2.12, and in Section D.3.16 of the Addendum to Appendix D in this FEIS. Short-term (24-hour) effects on total suspended particulate (TSP) matter were predicted assuming worst-case meteorological conditions suggested by the Environmental Protection Agency (EPA, 1977b). These conditions are a wind speed of 2.5 meters per second under extremely stable atmospheric conditions. The long-term (annual) effects of the various alternatives on the TSP air quality were predicted with the VALLEY model using 1982 meteorological data from the meteorological monitoring stations in Durango and Bodo Canyon.

Emission rates of fugitive particulate matter for each earthmoving activity for each alternative were calculated using formulas accepted by the EPA and the State of Colorado (EPA, 1977a; Colorado Department of Health, 1981). Assumptions used in the emissions calculations have included reasonably available control measures, such as water spray, in accordance with the Colorado Air Quality Control Regulations. The calculated emission rates were used in the model to predict the maximum concentrations for each alternative and each site. A discussion of the details of the modeling assumptions is given in Appendix D, Section D.3.16, in this FEIS. The resulting maximum expected concentrations would be the sum of the maximum ambient background concentration discussed in Section 4.4 and the predicted maximum concentrations from the model.

The annual air pollutant concentrations resulting from vehicular exhaust emissions were estimated by scaling the VALLEY model concentration results for particulate emissions at the Durango site. The vehicles considered were all diesel-powered construction equipment, such as bulldozers, motor graders, scrapers, compactors, loaders, on-site trucks, and backhoes. Exhaust emissions from trucks routinely traveling between the mill site and disposal site were also calculated. Emissions from employees' vehicles were considered to be inconsequential relative to the nearly continuous truck traffic and diesel-powered construction equipment. Results of these analyses are presented in subsequent paragraphs for each of the remedial-action alternatives.

Alternative 1 - no action

The existing tailings piles have a fugitive emission from blowing dust. This is a variable emission because surface crusting, precipitation and wind velocity will produce varying effects at different times. The concentrations for TSP at this location were monitored during 1982 and are presented in Section 4.4 and Table D-8, Appendix D in the DEIS, as indicators of what would continue with no action. The TSP monitoring program was conducted from January, 1982, through March, 1983. The highest 24-hour concentration measured was 142 micrograms per cubic meter (microg/m^3) which occurred on May 11, 1982, and the annual geometric mean for 1982 was 40.5 microg/m^3. For comparison, the primary and secondary 24-hour National Ambient Air Quality Standards (NAAQS) are 260 and 150 microg/m^3, respectively, and the primary and secondary annual standards are 75 and 60 microg/m^3, respectively. Colorado air-quality standards for particulates are identical to the national standards.

Alternative 2 - on-site stabilization

Air-quality impacts during stabilization at the Durango site would be associated with the earthmoving activities and the equipment utilized in those activities. The diesel-powered construction vehicles would produce exhaust emissions of carbon monoxide, hydrocarbons, nitrogen oxides, sulfur dioxide, and particulates; these emissions, as estimated from EPA emission factors (EPA, 1977a), would be 6.1, 2.4, 26.4, 2.0, and 1.7 tons per year, respectively (see Table D.26, in the Addendum to Appendix D, Meteorological and Air-Quality Information, in this FEIS). These emissions would be substantially less than fugitive dust emissions, and resultant concentrations would in all cases be well below Federal ambient air quality standards.

The greatest emissions would be fugitive dust related to earthmoving activities. Fugitive dust emissions from these activities are estimated to be 96.1 tons per year and a maximum of 0.40 ton per day. Fugitive dust emissions were calculated for material moved by bulldozer and front-end loader, and transported by front-end loaders and trucks, assuming a total of 1.6 million cubic yards of material would be stabilized. The highest annual average and 24-hour average concentrations off the site are predicted to be 34 and 133 microg/m^3, respectively (see Table D.37, in the Addendum to Appendix D in this FEIS). Predicted fugitive dust impacts decrease rapidly with distance from their source.

Maximum expected concentrations resulting from on-site stabilization would be the predicted concentration plus background concentration (see Table D-8, Appendix D in the DEIS) or 74 and 275 microg/m^3, respectively, for annual and 24-hour averages (see Table D.38 in the Addendum to Appendix D in the FEIS). Maximum expected concentrations and the NAAQS are shown in Table 5.3. The primary NAAQS were established to protect public health; the secondary NAAQS were established to protect public welfare. The predicted effect of on-site stabilization would produce concentrations that are about equal to the primary annual standard and slightly above the primary 24-hour standard.

Table 5.3 Estimated maximum fugitive dust concentrations with on-site stabilization and National Ambient Air Quality Standards

	Annual average concentration (microg/m^3)	24-hour average concentration[a] (microg/m^3)
Maximum predicted off-site concentration	74	275
Primary NAAQS[b]	75[c]	260
Secondary NAAQS[b]	60[c,d]	150

[a]Not to be exceeded more than once per year.
[b]Colorado Ambient Air Quality Standards are the same as the National Ambient Air Quality Standards (NAAQS).
[c]Geometric mean.
[d]For guidance to achieve 24-hour standard.

Alternative 3a - stabilization at Bodo Canyon with truck transport

Air-quality impacts from this alternative would be temporary and would result from excavation operations at the Durango site, transporting the contaminated materials to the Bodo Canyon site, and the stabilization activities at the Bodo Canyon site.

Diesel-powered construction equipment operating at the Durango and Bodo Canyon sites would produce exhaust emissions of carbon monoxide, hydrocarbons, nitrogen oxides, sulfur dioxide, and particulates. Using EPA emission factors (EPA, 1977a), the exhaust emissions at the Durango site are estimated to be 2.1, 0.7, 9.1, 0.7, and 0.6 tons per year, respectively (see Table D.26 in the Addendum to Appendix D, Meteorological and Air-Quality Information, in the FEIS). Exhaust emissions at the Bodo Canyon site are estimated to be 10.3, 3.9, 44.3, 3.4, and 2.9 tons per year for carbon monoxide, hydrocarbons, nitrogen oxides, sulfur dioxide, and particulates, respectively. These emissions would be substantially less than fugitive dust emissions, and resultant concentrations would in all cases be well below Federal ambient air quality standards.

Fugitive dust emissions from earthmoving activities at both the Durango and Bodo Canyon sites are estimated to be 136.6 and 96.0 tons per year, respectively. The transportation corridor between the two sites would generate an additional 480 tons per year of particulate emissions. Since the gravel-surfaced haul road would be treated with a water or chemical dust palliative, it is assumed that the particulate emissions would be evenly distributed over the 3.5-mile corridor length (see Section D.3.17, Addendum to Appendix D, in this FEIS) to predict a conservative upper limit of the impacts. This emission rate is about 0.6 ton per day per mile. Because of the temporary nature of these emissions at any given location, the corridor emissions were not modeled.

Maximum predicted annual and 24-hour concentrations of particulate matter off the Durango site, created by activities at the site, are approximately 29 and 128 microg/m^3, respectively (see Table D.37, Addendum to Appendix D, Meteorological and Air-Quality Information, in this FEIS). Concentrations fall off rapidly at increasing distances away from the piles.

Maximum predicted annual and 24-hour concentrations of particulate matter off the Bodo Canyon site are approximately 40 and 233 microg/m^3, respectively (see Table D.37 in the Addendum to Appendix D in this FEIS).

The maximum expected concentrations (predicted concentrations plus background concentrations) resulting from stabilization in Bodo Canyon are summarized in Table 5.4 (see Table D.38 in the addendum to Appendix D in this FEIS). The Colorado standards and NAAQS are also presented for comparison. The maximum expected effects at the Durango site are almost equal to the Federal primary annual standard, and slightly above the 24-hour standard. The maximum expected effects at the Bodo Canyon site are somewhat below the Federal annual standard, but substantially above the 24-hour standard close to the site.

Table 5.4 Estimated maximum off-site concentrations of particulate matter with stabilization activities at Bodo Canyon with truck transport

	Annual average concentration (microg/m^3)	24-hour average concentration microg/m^3)
Durango site excavation activities	70	270
Bodo Canyon activities	56	310
Primary NAAQS[a]	75[b]	260[d]
Secondary NAAQS[a]	60[b,c]	150[d]

[a]Colorado Ambient Air Quality Standards are the same as the National Ambient Air Quality Standards (NAAQS).
[b]Geometric mean.
[c]For guidance to achieve 24-hour standard.
[d]Not to be exceeded more than once per year.

Alternative 3b - stabilization at Bodo Canyon with conveyor transport

Air-quality impacts from this alternative would be temporary and would result from excavation operations at the Durango site, transporting the contaminated materials to the Bodo Canyon site, and the stabilization activities at the Bodo Canyon site.

Diesel-powered construction equipment operating at the Durango and Bodo Canyon sites would produce exhaust emissions of carbon monoxide, hydrocarbons, nitrogen oxides, sulfur dioxide, and particulates. Exhaust emissions at the Durango site are estimated to be 3.0, 1.2, 12.6, 1.0, and 0.8 tons per year, respectively. Exhaust emissions at the Durango site would be slightly higher than those for Alternative 3a due primarily to the extensive use of two Sauerman scrapers for loading the tailings onto the conveyor. Impacts from these exhaust emissions would be negligible and easily within all air quality standards. Exhaust emissions at the Bodo Canyon site would be 6.3, 2.3, 26.9, 2.1, and 1.8 tons per year for carbon monoxide, hydrocarbons, nitrogen oxides, sulfur dioxide, and particulates, respectively. These emissions would be substantially less than fugitive dust emissions, and resultant concentrations would in all cases be well below Federal ambient air quality standards.

Fugitive dust emissions from earthmoving activities at the Durango and Bodo Canyon sites are estimated to be 33.1 and 127.8 tons per year, respectively. EPA emission factors for open conveyors were used to calculate the expected emissions because emission factors for pipe conveyors have not been developed. This approach probably results in overestimation of the conveyor fugitive dust impacts. The truck transportation corridor between the two sites would generate an additional 43 tons per year of particulate emissions. Particulate emissions along the conveyor corridor would be approximately two tons per year. Because of the temporary nature of these emissions at any given location, the corridor emissions were not modeled.

Maximum predicted annual and 24-hour concentrations of particulate matter off the Durango site are approximately 12 and 46 microg/m^3, respectively (see Table D.37 in the Addendum to Appendix D, Meteorological and Air-Quality Information, in this FEIS).

Maximum predicted annual and 24-hour concentrations of particulate matter at the Bodo Canyon site are approximately 52 and 264 microg/m^3, respectively (see Table D.37 in the Addendum to Appendix D in this FEIS).

The maximum expected concentrations (predicted concentration plus background concentration) resulting from stabilization in Bodo Canyon with conveyor transport are summarized in Table 5.5 (see Table D.38 in the Addendum to Appendix D in the FEIS). The Colorado standards and NAAQS are also presented for comparison. Annual and 24-hour concentrations at the Durango site would be well below the Federal standards. At the Bodo Canyon site, annual concentrations would be slightly below the Federal standard, but maximum 24-hour concentrations will be well above the 24-hour standard.

Table 5.5 Estimated maximum off-site concentrations of particulate matter with stabilization activities at Bodo Canyon with conveyor transport

	Annual average concentration (microg/m^3)	24-hour average concentration (microg/m^3)
Durango site excavation activities	52	188
Bodo Canyon site	68	341
Primary NAAQS[a]	75[b]	260[d]
Secondary NAAQS[a]	60[b,c]	150[d]

[a]Colorado Ambient Air Quality Standards are the same as the National Ambient Air Quality Standards (NAAQS).
[b]Geometric mean.
[c]For guidance to achieve 24-hour standard.
[d]Not to be exceeded more than once per year.

Alternative 4 - stabilization at Long Hollow

Air-quality impacts from Alternative 4 would be temporary and would result from site preparation activities at the Long Hollow site, excavation operations at the Durango site, transporting contaminated materials to the Long Hollow site, and the stabilization activities at the Long Hollow site.

Diesel-powered construction equipment operating at the Durango and Long Hollow sites would produce exhaust emissions of carbon monoxide, hydrocarbons, nitrogen oxides, sulfur dioxide, and particulates. Using EPA emission factors (EPA, 1977a), the exhaust emissions at the Durango site are estimated to be 3.1, 1.0, 13.6, 1.1, and 1.0 tons per year, respectively (see Table D.26, in the Addendum to Appendix D, Meteorological and Air-Quality Information, in this FEIS). The annual air-pollutant concentrations from these emissions at the Durango site are calculated to be less than 3.4 microg/m^3 for all criteria pollutants. Exhaust emissions at the Long Hollow site are estimated to be 12.0, 4.7, 52.4, 4.0, and 3.4 tons per year, respectively. These emissions would be substantially less than fugitive dust emissions, and resultant concentrations would in all cases be well below Federal ambient air quality standards.

Fugitive dust emissions from earthmoving activities at the Durango and Long Hollow sites are estimated to be 135.4 tons per year and 165.0 tons per year, respectively. The transportation corridor between the two sites would generate an additional 1416 tons per year of particulate emissions. Since the gravel-surfaced haul road would be treated with a water or chemical dust palliative, it is assumed that the particulate emissions would be evenly distributed over the 11-mile corridor length (see Section D.3.17, in the Addendum to Appendix D, Meteorological and Air-Quality Information, in the FEIS) to predict a conservative upper limit of the impacts. This emission rate is about 0.5 ton per day per mile. Because of the temporary nature of these emissions at any given location, the emissions were not modeled.

The maximum predicted annual and 24-hour concentrations of particulate matter off the Durango site are about 29 and 125 microg/m^3, respectively (see Table D.37, in the Addendum to Appendix D in this FEIS). Concentrations fall off rapidly at increasing distances away from the piles.

The maximum predicted annual and 24-hour concentrations of particulate matter off the Long Hollow site are approximately 48 and 201 microg/m^3, respectively (see Table D.37, in the Addendum to Appendix D in this FEIS).

The maximum expected concentrations (predicted concentrations plus background concentrations) resulting from stabilization in Long Hollow are summarized in Table 5.6 (see Table D.38, in the Addendum to Appendix D, in this FEIS). In the absence of on-site data for Long Hollow, Bodo Canyon background concentrations were used for Long Hollow. At the Durango site, concentrations would be slightly above the Federal 24-hour standard, but slightly below the annual standard. At Long Hollow, concentrations would be above the 24-hour standard and below the annual standard. The Colorado standards and NAAQS are also presented for comparison. The maximum expected effects at the Durango site are about 99 and 80 percent of the Federal primary annual and 24-hour standards, respectively.

Table 5.6 Estimated maximum off-site concentrations of particulate matter with stabilization activities at the Long Hollow site

	Annual average concentration (microg/m^3)	24-hour average concentration (microg/m^3)
Durango site excavation activities	70	267
Long Hollow activities	64	278
Primary NAAQS[a]	75[b]	260[d]
Secondary NAAQS[a]	60[b]	150[d]

[a]Colorado Ambient Air Quality Standards are the same as the National Ambient Air Quality Standards (NAAQS).
[b]Geometric mean.
[c]For guidance to achieve 24-hour standard.
[d]Not to be exceeded more than once per year.

Alternative 5 - reprocessing and stabilization at Long Hollow

Air-quality impacts from the reprocessing activities would result from tailings removal and site reclamation at Durango; tailings reprocessing, waste disposal, and site restoration at Long Hollow; and transport of contaminated materials between sites. There would also be the dismantling of the process mill at Naturita and transport to Long Hollow, as well as excavation of material from borrow areas near the sites and the hauling of materials for reprocessing.

Diesel-powered construction equipment operating at the Durango and Long Hollow sites would produce exhaust emissions of carbon monoxide, hydrocarbons, nitrogen oxides, sulfur dioxide, and particulates. At the Durango site, using EPA emission factors (EPA, 1977a), these exhaust emissions are estimated to be 5.2, 1.5, 22.4, 1.7, and 1.3 tons per year, respectively (see Table D.26, in the Addendum to Appendix D, Meteorological and Air-Quality Information, in this FEIS). Exhaust emissions at the Long Hollow site are estimated to be 15.7, 5.1, 67.2, 5.0, and 4.2 tons per year, respectively. These emissions would be substantially less than fugitive dust emissions, and resultant concentrations would in all cases be well below Federal ambient air quality standards.

Fugitive dust emissions from earthmoving activities at both the Durango and Long Hollow sites are estimated to be 58.2 and 78.0 tons per year, respectively. The transportation corridor between the two sites would generate an additional 370 tons per year of particulate emissions. Since the gravel-surfaced haul road would be treated with a water or chemical dust palliative, it is assumed that the particulate emissions would be evenly distributed over the 11-mile corridor length (see Section D.3.17, in the Addendum to Appendix D, in this FEIS) to predict a conservative upper limit of the impacts. This emission rate is about 0.1 ton per day per mile. Because of the temporary nature of these emissions at any given location, the emissions were not modeled.

The maximum predicted annual and 24-hour concentrations of particulate matter off the Durango site are about 12 and 58 microg/m^3, respectively (see Table D.37, in the Addendum to Appendix D, in this FEIS). Concentrations fall off rapidly at increasing distances away from the piles.

The maximum predicted annual and 24-hour concentrations of particulate matter off the Long Hollow site are approximately 13 and 43 microg/m^3, respectively (see Table D.37, in the Addendum to Appendix D, in this FEIS).

The maximum expected concentrations (predicted concentrations plus background concentrations) resulting from reprocessing and stabilization in Long Hollow are summarized in Table 5.7 (see Table D.38, in the Addendum to Appendix D, in this FEIS). The Colorado standards and NAAQS are also presented for comparison. The maximum expected effects at the Durango site and Long Hollow site are well below the Federal primary annual and 24-hour standards.

Table 5.7 Estimated maximum off-site concentrations of particulate matter with reprocessing and stabilization activities at the Long Hollow site

	Annual average concentration (microg/m^3)	24-hour average concentration (microg/m^3)
Durango site excavation activities	52	200
Long Hollow activities	29	120
Primary NAAQS[a]	75[b]	260[d]
Secondary NAAQS[a]	60[b,c]	150[d]

[a]Colorado Ambient Air Quality Standards are the same as the National Ambient Air Quality Standards (NAAQS).
[b]Geometric mean.
[c]For guidance to achieve 24-hour standard.
[d]Not to be exceeded more than once per year.

5.4 IMPACTS ON TOPOGRAPHY AND SOILS

5.4.1 Impacts on topography

The no-action alternative (Alternative 1) would have no impact on topography.

Alternative 2 would affect the Durango site, the borrow areas in Bodo Canyon, and the quarry site west of the raffinate ponds area. Contaminated soils from the raffinate ponds and other areas would be excavated, relocated to the mill site, and blended into the tailings during recontouring of the tailings piles. The two steeply sloped and flat-topped tailings piles would be reshaped against Smelter Mountain into an area of about 38 acres (see Figures 3.2 and 3.3). The reshaped pile would have slopes of 3 horizontal to 1 vertical. Areas where contaminated materials are excavated at the Durango site would be backfilled with borrow materials from Bodo Canyon, graded to smooth out the irregular surfaces, and vegetated. At the borrow areas in Bodo Canyon, the present gentle slopes would be flattened and the deep erosion gullies would be removed. Slopes around the borrow areas would be recontoured to blend with the surrounding terrain and revegetated.

Both options of Alternative 3 would affect the Durango site, the Bodo Canyon site, the borrow areas in Bodo Canyon, and the quarry site west of the raffinate ponds area. All of the tailings and other contaminated materials would be removed from the Durango site which would return the site to a level compatible with the surrounding terrain. The tailings piles and mill site areas would revert to a relatively flat bench along the west bank of the Animas River. After removal of contaminated materials, the raffinate ponds would be recontoured. These and other areas where contaminated materials are excavated would be backfilled with materials imported from Bodo Canyon, graded to smooth out irregular surfaces, and vegetated. At the Bodo Canyon site, partial below-grade stabilization of the contaminated materials would result in changing approximately 38 acres (excluding the 3 horizontal to 1 vertical embankment slopes) from a shallow drainage basin to a relatively flat-topped mound with a surface elevation of approximately 7110 to 7115 feet above mean sea level. The surface would undulate slightly to provide drainage. Maximum elevation changes occur along the north side of the stabilization area where the north embankment is located (see Figure 3.6). Here, ground surface elevations would be raised about 65 feet, from approximately 7035 feet at the bottom of the drainage channel to 7110 feet at the rim of the stabilized mound. Existing slopes within the borrow areas would be flattened and the erosion gullies eliminated by excavation operations. Grading along the conveyor route would result in topographic alterations of a few feet at some locations as part of Alternative 3b.

Alternative 4 would affect the Durango site, the Long Hollow site, and the Bodo Canyon borrow areas. Topographic changes at the Durango site and Bodo Canyon borrow areas would be the same under Alternative 4 as those described for Alternative 3**[a]**. At the Long Hollow site, partial below-grade stabilization would result in changing an 80-acre area from a gently sloped, U-shaped valley into a gently undulating, revegetated surface that would be about four feet higher in elevation along its center line than at its edges to provide surface drainage (see Figure 3.12). The earthen embankment, constructed at the south end of the stabilization area, would have a revegetated downstream slope of 5 horizontal to 1 vertical. Maximum crest height of the embankment would be about 35 feet above the Long Hollow drainage channel.

Alternative 5 would alter the topography of the Durango site, the Bodo Canyon borrow areas, the Long Hollow site, and the quarry site. Topographical changes at the Durango and Bodo Canyon areas occurring as a result of Alternative 5 would be similar to those described for Alternatives 3a and 4. At the Long Hollow site, approximately 205 acres of gently sloped, U-shaped valley terrain would be cleared and graded to accommodate leach tanks and evaporation ponds related process equipment. Following reprocessing, the stabilization area would consist of a gently undulating surface covering 195 acres. The maximum height of the embankment area would be 18 feet above the existing grade at the Long Hollow site with exterior slopes of 5 horizontal to 1 vertical.

5.4.2 Impacts on soils

No soils would be affected by Alternative 1 (no action).

Estimated total quantities of soil materials that would be used during construction operations for each of the remedial-action Alternatives 2, 3a, 3b, 4, and 5, as well as the types and quantities of materials that would be imported to each site are listed in Table 5.8.

Table 5.8 Estimated quantities of soil and imported materials used during remedial action operations

	Quantity[a] (cubic yards)						
	Alternative 2	Alternatives 3a and 3b		Alternative 4		Alternative 5	
Material	Durango	Durango	Bodo Canyon	Durango	Long Hollow	Durango	Long Hollow
Total soil used in remedial action	611,800	187,000	1,153,000	187,000	1,211,000	187,000	1,557,300
Imported materials to site:							
Restoration backfill	215,000	187,000	--	187,000	--	187,000	--
Stabilization cover	268,000	--	--	--	--	--	1,005,000
Sand, gravel, cobbles, and boulders	165,000	--	72,000	--	712,000	--	631,900
Riprap	57,400	--	113,000	--	77,000	--	77,000

[a]Quantities are based on Tables A-8, A-13, A-19, A-26, and A-28, Appendix A in the DEIS. Excavated volumes listed in these tables may not equal volumes placed because of 12 percent shrinkage factor used in volume calculations.

In Alternative 2, approximately 483,000 cubic yards of silty clay and clay soil would be imported from the Bodo Canyon borrow areas to the Durango site for constructing the stabilization cover and backfilling areas where contaminated soils were excavated. Topsoils at the borrow areas (20,000 cubic yards) would be stripped, stockpiled, and replaced during reclamation. The topsoil would undergo some degradation while stockpiled and would require mulching and fertilization before revegetating. Approximately 50,000 cubic yards of sand and gravel bedding material would be imported from the quarry (see Figure A-10, Appendix A, Conceptual Designs and Engineering Evaluations, Remedial Action Alternatives, in the DEIS) and placed over the clay cover. Another 150,000 cubic yards of quarried gravel, cobbles, and boulders would be imported and placed over the bedding material and channel lining for erosion protection. In addition, 57,400 cubic yards of quarried riprap would be imported for constructing the grouted riprap blanket at the top of the stabilization cover between the diversion ditches and the grouted riprap erosion barrier at the toe of the stabilized pile along Lightner Creek and the Animas River.

In Alternative 3a, 529,000 cubic yards of clayey soil excavated from within the Bodo Canyon disposal site boundary would be reused in constructing the liner and stabilization cover. An additional 522,000 cubic yards of on-site clayey soil would be used to construct the retention embankments. Another 128,000 cubic yards of soil and weathered rock would be excavated at the site and used as supplemental fill material for the construction operations. It is estimated that 32,000 cubic yards of topsoil would be stripped, stockpiled, and replaced over the compacted clay stabilization cover. Approximately 113,000 cubic yards of riprap and erosion-protection materials would be imported from the riprap quarry. As in Alternative 2, clayey soils would be excavated from the Bodo Canyon borrow areas and transported to the Durango site for use in backfilling areas excavated during decontamination operations. Approximately 187,000 cubic yards of these soils would be required for reclamation of the Durango site.

In Alternative 3b, the same quantities of soils would be used as have been described for Alternative 3a with one exception. The quantity of fill used to improve County Road 212 and 211 would be less with Alternative 3b because the required road width would be less than 35 feet. A small amount of fill may be required during the construction of the conveyor with Alternative 3b.

At the Long Hollow site (Alternative 4), a total of 70,000 cubic yards of topsoil would be stripped, stockpiled, and reused during reclamation of the site. Excavation of the drainage channels would provide 256,000 cubic yards of clayey soil for constructing the retention embankment and the reclamation cover. Liner materials would be obtained from the bottom of the disposal site; 407,000 cubic yards of soil and weathered shale would be excavated and stockpiled; 351,000 cubic yards of sand and gravel would be imported from commercial sources for constructing the underdrain (drainage blanket). Another 478,000 cubic yards of clayey soil, from within the disposal site boundary and the downstream borrow area, would also be excavated for placement in the reclamation cover. The stockpiled liner materials excavated from the bottom of the disposal area would be mixed to obtain uniformity, and recompacted over the sand and gravel underdrain on the bottom of the excavation. About 77,000 cubic yards of riprap materials would be imported for erosion protection at strategic locations in the diversion channels. Imported erosion-protection gravel for stabilizing the cover would amount to 241,000 cubic yards of material. Haul road construction would require 120,000 cubic yards of sand and gravel. It is expected that these riprap materials would be purchased from commercial sources or obtained as waste from county or state road-construction activities.

Under Alternative 5, reprocessing and stabilization of tailings at the Long Hollow site, 162,000 cubic yards of topsoil would be removed and stockpiled on the eastern portion of the Long Hollow site. The liner system would consist of a lower liner of compacted clay (260,000 cubic yards), a layer of sandy fill (130,300 cubic yards), an inner synthetic liner, and a protective cover of compacted clay (130,300 cubic yards). All clay and sand materials would be obtained from within the disposal site or the Bodo Canyon borrow area. Additional materials obtained from on-site sources or other borrow areas would be 335,000 cubic yards of rock materials for erosion protection, [77,000] cubic yards of riprap, 1,005,000 cubic yards of silty clay for the radon barrier, and 46,600 cubic yards of aggregate material for in-plant roads. Haul road construction would require 120,000 cubic yards of sand and gravel.

5.5 IMPACTS ON MINERAL RESOURCES

Evaluations of impacts on mineral resources for each of the five alternatives are based on the presence of proven resources at each of the alternative disposal sites. The no-action alternative (Alternative 1) would not affect mineral resources.

There are no coal beds under the Durango site (Alternative 2). Coal beds under the Long Hollow site (Alternatives 4 and 5) are in the Menefee Formation at depths of 1000 feet or more, and mining of these coal beds is unlikely. Only Alternatives 3a and 3b would have any potential impact on coal resources. This impact would be minimal since: (1) the estimated 400,000 tons of coal in the Menefee Formation underlying the Bodo Canyon site are only indicated resources (not proven), and (2) the mining of these thin coal beds, even if they were proven resources, is not economically feasible with present day mining practices in the western United States. Assuming a market value of $20 per ton, $8.0 million worth of potentially recoverable coal would be lost under either option of Alternative 3. Whether the Colorado Wildlife Commission would authorize a mineral lease for coal mining is unknown.

Use of the Bodo Canyon site for stabilization of the Durango tailings would not necessarily preclude future development of these coal resources. Public Law 95-604 requires that the mineral rights be transferred to the Federal Government along with the disposal site. Public Law 95-604 also authorizes the Secretary of the Interior, with the concurrence of the Secretary of Energy and the Nuclear Regulatory Commission to dispose "of any subsurface mineral rights by sale or lease...if the Secretary of the Interior takes such action as the Commission deems necessary pursuant to a license issued by the Commission to assure that the residual radioactive materials will not be disturbed by reason of any activity carried on following such disposition." However, it is unlikely that these coal resources would ever have a value sufficient to warrant development under the conditions that the Nuclear Regulatory Commission may place on development of these resources in order to ensure that the stabilized tailings were not disturbed by the mining operations.

There would be no impact to low impact on potential oil and gas resources under any of the alternatives. The low to moderate potential for oil or gas at Long Hollow is considered to be a high risk situation for developing a producing well. Moving the tailings to Long Hollow would further reduce the likelihood that oil or gas could be produced at the site because of the high cost of angle drilling. Oil and gas exploration wells drilled previously near the alternate disposal sites have been dry.

The volume of alluvial sand and gravel underlying the Durango site is negligible when compared to the large and abundant deposits in the Animas River valley. There are no sand and gravel deposits at either the Bodo Canyon or Long Hollow sites.

Under Alternative 5, reprocessing the uranium mill tailings, an estimated 435 tons of uranium and 2100 tons of vanadium could be recovered. The recovered uranium would be in the form of a slurry with a uranium content of 35 percent by weight while the vanadium would occur as a 15 percent solution. Alternatives 1, 2, 3a, 3b, and 4 would not preclude future recovery of the uranium and vanadium resources contained in the tailings but would increase the costs of recovery.

5.6 IMPACTS ON WATER

5.6.1 Impacts on surface waters

The criteria used to evaluate the relative impacts of the remedial-action alternatives are: (1) project-related effects on streamflows, and (2) project-related effects on in-stream water quality. Impacts on streamflows were evaluated by estimating the increase in storm-runoff quantities resulting from project-related activities and comparing these increases with the flows of the nearest stream under existing conditions. Similarly, the impact of water consumption was assessed by comparing the quantity of consumptive use with the average annual flows of the affected streams. It was assumed that the in-stream water quality would vary inversely with the sediment load derived from the affected areas. Consequently, the impacts on the water quality of streams was assessed by estimating the additional sediment load contributed by project-related activities and comparing it with the ambient sediment loads of affected streams.

Impacts during remedial actions

Alternative 1 (no action) would cause no additional impacts on the surface-water environment other than those which presently exist. It is acknowledged that if the pile slid into the Animas River, there would be a considerable, short-term impact on water quality.

During the remedial-action phase of Alternative 2, stabilization on the Durango site, storm runoff from contaminated areas would be stored in a synthetically lined storage reservoir and used for dust suppression on the working areas and on-site haul roads. The quantity of this runoff, which normally would be discharged into the Animas River, would be small when compared to natural streamflows in the Animas River. Therefore, on-site storage of this tributary water would not have any measurable effect on natural flows of the Animas River. Uncontaminated water required for off-site dust control, tailings compaction, and the truck-wash stations would be taken from the Animas River at an average rate of approximately 13,500 gallons each working day. This would be a small fraction (0.0022 percent) of the average streamflow of 950 cubic feet per second (613,958,400 gallons per day), and only 0.22 percent of the lowest flow (94 cubic feet per second) ever recorded on the Animas River at Durango. Withdrawal of water at this rate would not have any measurable effect on the quantity or quality of the streamflows of the Animas River. Potable water required for the construction workers would average about 3900 gallons each working day and would be purchased from the city of Durango.

Under Alternative 3a (stabilization at the Bodo Canyon site with transportation by truck), on-site runoff from contaminated areas at both the Durango and Bodo Canyon sites would be collected in synthetically lined water storage reservoirs. The small amount of retention at either site would not have any measurable effect on the flow of the Animas River. During construction activities, uncontaminated water requirements at Bodo Canyon would be pumped to the site from a withdrawal point on the Animas River. Uncontaminated water required at the Durango site for Alternative 3a (22,500 gallons each working day) would be almost twice that required for Alternative 2. Demand for potable water at the Durango site would be about 2450 gallons per work day for Alternative 3a and would be purchased from the city of Durango. Potable water would have to be trucked to the Bodo Canyon site.

With Alternative 3b (stabilization at the Bodo Canyon site with transportation primarily by conveyor), surface-water management would be the same as for Alternative 3a. The total quantity of uncontaminated water required each working day for truck washing, dust control, and compaction would also be approximately the same as for Alternative 3a. In Alternative 3b, more water would be used on dust control for the conveyor; however, less water would be needed for truck washing and for dust control on roads when compared with Alternative 3a.

If the tailings and other contaminated materials at the Durango site are relocated to the Long Hollow site (Alternative 4), on-site runoff at both sites would be controlled in a similar way as for Alternative 3a and would not have any effect on the surface-water environment. Uncontaminated water requirements at the Long Hollow site would be 35,000 gallons per working day while the underdrain and liner are constructed during the first 11 months of the 28-month-long project. During the remaining 17 months, the water requirements for Alternative 4 would be the same as those for Alternative 3a and would have the same impacts. Water for the Durango site would be obtained from the Animas River; however, the source of the uncontaminated water at the Long Hollow site is not established at this time. Probable sources for uncontaminated water are the Animas or La Plata Rivers. Any waters pumped from the Animas or La Plata Rivers and not lost through evaporation or infiltration would ultimately be returned to their source stream. In Alternative 4, potable water use at the Durango site would remain the same as Alternative 3a (2450 gallons per work day), but would increase at the Long Hollow site to 3200 gallons each working day for the rest of the project. Potable water would be trucked to the site.

If the tailings and other contaminated materials at the Durango site are relocated to Long Hollow for reprocessing and stabilization (Alternative 5), on-site runoff during the remedial action at both sites would be collected in synthetically lined storage reservoirs. The small amount of retention at the Durango site would have no measurable effect on the Animas River. At the Long Hollow site, the intermittent drainages receive most of their runoff from off the site; the runoff would be routed around the site with diversion ditches. Therefore, only a minor effect on streamflow would be caused by the retention of on-site runoff. Uncontaminated water requirements for this alternative are 10,000 gallons per working day; water for the Durango site would be obtained from the Animas River, while possible sources for the Long Hollow site are the Animas and La Plata Rivers, or one or more deep wells. Potable water use at the Durango site would remain the same as for Alternatives 3a and 4, but would increase to a maximum of 3200 gallons per day at the Long Hollow site. The potable water would be trucked to the site.

Neither Alternatives 2, 3a, 3b, 4, or 5 would have any appreciable effects on the quantity or quality of ephemeral stream waters along the transportation corridor. Some contamination of the Animas River would be possible under Alternatives 3a, 3b, 4, or 5 if a transportation accident occurred in which a truck loaded with contaminated materials overturned, spilling its load into an ephemeral tributary, and then the contaminated materials were carried by storm runoff to the Animas River. Such an accident is possible but highly improbable.

All of the action alternatives include the removal of vegetation and contaminated soils from within the floodplain and wetlands of the Animas River and Lightner Creek (see Appendix J, Floodplain and Wetlands Assessment, in the DEIS). These activities would result in a maximum increase of five and 21 percent in the cross-sectional area of the Animas River and Lightner Creek floodplains, respectively, during a 100-year flood event. A total of 5.1 acres would be impacted. These activities would have no detectable effect on flood conditions (i.e., flow heights and velocities) over the affected length of the channels. The disturbed area would be recontoured and revegetated following removal of the contaminated soils.

Impacts after remedial actions

The no-action alternative (Alternative 1) would have no effect on present quantities or uses of the surface-water systems (Animas River and Lightner Creek) associated with the Durango site. Alternative 1 implies that the existing uranium-tailings piles would be left as they are now. Under existing conditions, there is a potential for erosion of the toes of the piles by flood flows in Lightner Creek and the Animas River which could result in the release of contaminated materials into these streams. There is evidence of surface erosion on the sideslopes of the tailings piles. If erosion continues, it is likely that contaminated materials would be deposited in the Animas River. Also, because of the permeability of the soil on the site, any leachates generated over a period of time would likely reach the Animas River. Thus, under the no-action alternative, there is a possibility that the water quality of the Animas River would be degraded because of the release of contaminated solids or leachates from the tailings piles. The deposition of tailings in the river could provide a continuing source of contamination to bottom-feeding fauna. The effects on the quality of local surface waters resulting from a Probable Maximum Flood (PMF) in either the Animas River or Lightner Creek are unknown; however, the radiological effects would be negligible compared to other effects of the flood, such as damage to property and possible loss of life.

Alternative 2 (on-site stabilization) would involve stabilization of all tailings and other contaminated materials at the Durango site. Runoff from areas upgradient of the stabilized pile would be diverted around the pile by a system of drainage ditches. This diversion would reduce the sediment loading of the Animas River. The stabilized pile would be covered with a five-foot-thick layer of clay soils and capped with a two-foot-thick layer of granular materials that would permit drainage of overland flow from a Probable Maximum Precipitation (PMP) event without erosion (see Figure A-7, Appendix A, Conceptual Designs and Engineering Evaluations, Remedial Action Alternatives, in the DEIS). Runoff from the surface of the stabilization cover would remain uncontaminated and ultimately be discharged to the Animas River. Since the volume of the runoff would be only a small fraction of the normal streamflow in the Animas River, it would have no measurable effect on the volume of flow or quality in the Animas River. The stabilization cover would also minimize the percolation of incident precipitation and snowmelt into the underlying contaminated materials. Any leachate that currently exists within the tailings, or that would be generated in the future, would migrate with time and eventually be discharged to the Animas River, just as would occur for the no-action alternative. The cover and other design features would appreciably reduce the amount of leachate discharged to the Animas River. The grouted riprap erosion barrier would protect the stabilized pile from the erosion forces of a PMF in the Animas River and Lightner Creek. However, this alternative would require repeated maintenance over the project's design life because of the potential for meandering of the Animas River channel, the design's dependence on grouted riprap for erosion protection, and the use of surface-water diversion channels to direct surface-water flow from Smelter Mountain around the north and south ends of the stabilized pile.

Both options of Alternative 3 would involve the transport and stabilization of the tailings and other contaminated materials at the Bodo Canyon site. There are no perennial surface-water systems at the Bodo Canyon site (or the Long Hollow site) or along the respective transportation corridors. A five-foot-thick compacted clay cover would be placed on the tailings with a top layer of rock for erosion protection (see Figure 3.7). This would minimize the infiltration of incident precipitation and snowmelt into the underlying material. In addition, a liner would be provided to control the release of leachates from the stabilized materials. Thus, the potential for contamination of surface waters would be small. Surface runoff from the stabilized tailings would be directed to natural drainage channels by constructing discharge channels cut into bedrock. The channels would be protected from arroyo headward erosion by lining the channels with rock. The volume of this runoff would not cause any measurable impact on the quantity or quality of the Animas River, which is the nearest surface-water body in this area. The drainage channels were designed to withstand the erosive forces of a PMP event. Migration of existing drainage channels and subsequent erosion of the stabilized tailings would be prevented by the placement of riprap along these drainages.

Alternative 4 would involve the transport and stabilization of all tailings and other contaminated materials at the Long Hollow site. As in Alternatives 2, 3a, and 3b, the stabilized materials would be covered with a five-foot-thick layer of clay soil, graded to permit surface drainage without erosion from a PMP event, and revegetated (see Figure 3.11). The cover would minimize potential infiltration of incident precipitation and snowmelt. In addition, a clay liner would be provided to minimize leachate migration from the stabilized materials. Thus, there would be a low potential for the contamination of surface waters from the release of leachates. Surface runoff would be controlled by diverting water flows around the stabilized tailings to the Long Hollow drainage downstream. Thus, no impact on the ephemeral drainage system of Long Hollow would occur.

Alternative 5 would involve the transport, reprocessing, and stabilization of the tailings at the Long Hollow site. The stabilized materials would be covered with a six-foot-thick layer of clayey soil and two feet of erosion-protection materials which would be graded to permit surface drainage without erosion from a

PMP event. The cover, along with high evapotranspiration, would minimize potential infiltration of snowmelt and incident precipitation. In addition, a double synthetic liner system below the stabilized materials would prevent contact with shallow ground water which could later discharge to the surface-water system. Thus, there would be little potential for the formation of leachates because of contact with either percolating precipitation or the shallow ground water. Surface runoff would be controlled by diverting flows around the stabilized embankment to the Long Hollow drainage system downstream. Thus, no impact on streamflow or water quality after remedial action would be anticipated for this alternative.

5.6.2 Impacts on ground water

The criteria used in evaluating the relative impacts of the various disposal alternatives are (1) the effects on the water quality of the base flow component, (2) the associated effect on in-stream water quality, and (3) the incremental change in the base flow to local streams and rivers. Each alternative was evaluated qualitatively with respect to ambient conditions, both during and after the implementation of remedial actions.

Impacts during remedial actions

Under the no-action alternative, leachate generation and the migration of contaminants from the tailings piles and the raffinate-ponds area to the Animas River would continue.

Under Alternative 2, the existing tailings piles would be recontoured and covered with five feet of clay soils which would reduce the potential for infiltration of incident precipitation into the pile and generation of leachates. No impacts to ground-water quality are expected during construction because planned excavation depths are above recorded ground-water levels. If necessary, contaminated soils will be dewatered prior to excavation. The potential for degradation of ground-water quality in the aquifers underlying the Mancos Shale beneath the tailings piles would be small since the Mancos Shale, being of low permeability, impedes the downward migration of ground water. Contaminated soils in the raffinate ponds area would be excavated and relocated to the mill site area for long-term stabilization. During excavation in the raffinate ponds area, the potential for additional ground-water contamination is low. If necessary, contaminated soils will be dewatered prior to excavation with contaminated water pumped to tanker trucks for off-site treatment. Although ground water in this area is presently contaminated, the physical removal of the contaminated soils would result in further short-term deterioration of ground-water quality. The associated degradation of the in-stream water quality would be negligible because of the thousand-fold dilution by the surface-water flow along this reach of the Animas River.

On-site stabilization (Alternative 2) would have no effect on ground-water resources at the Bodo Canyon and Long Hollow sites or along the transportation corridor.

Both options of Alternative 3 would involve relocation of the tailings and other contaminated materials from the Durango site to the Bodo Canyon site. During removal of the contaminated materials from the Durango site, mixing of ground water from the shallow gravel aquifer with the contaminated materials being excavated might occur. In addition, exposure of the tailings during construction might result in an increase in the potential for leachate generation because of incident precipitation and snowmelt. At the Bodo Canyon site, the potential for ground-water contamination by seepage would be minimized through the use of clay liners. During construction activities, ground-water quality might deteriorate as a result of leachate generation. However, the volume of leachate is expected to be small and would be diluted by the natural ground-water flow. Ground-water flow patterns would be disrupted, resulting in a minor reduction in the base flow component. Also, the potential of spills and seepage from the contaminated water storage reservoir would exist which might affect ground-water quality.

If the tailings and other contaminated materials are moved to the Long Hollow site for stabilization (Alternative 4), impacts similar to those described for Alternative 3a would apply. In addition, the Long Hollow site is located within a ground-water discharge area. An underdrain is included in the design to prevent ground water from building up within the tailings and causing an increase in the potential for leachate generation and degradation of both surface- and ground-water quality. The rates of ground-water discharge within the Long Hollow site are believed to be very low because of the low permeability of the Lewis Shale and the overlying alluvium and colluvium. Estimated lateral ground-water velocities are 0.01 to 0.1 foot per day within the fractured shale zone, with flow rates less than 0.005 cfs. The magnitude of the impact on in-stream water quality in the Long Hollow drainage is expected to be insignificant.

If the tailings and other contaminated materials are moved to the Long Hollow site for reprocessing and stabilization (Alternative 5), impacts at the Durango site would be similar to those described in Alternative 3a. The Long Hollow site is in a ground-water discharge area. However, the potential for a build-up of the shallow ground-water table and the associated increased potential for leachate generation would be minimized by the construction of a ground-water interceptor trench and a double synthetic liner system below the stabilized materials. The interceptor trench would be constructed along the west side of the facility where ground-water discharge has been noted. The intercepted ground water would be routed south of the site and discharged to the Long Hollow surface-water drainage system causing no reduction in normal streamflow or water quality and lowering the potential for a build-up of the shallow ground-water table in the site vicinity. Additional protection from contact between the shallow ground water and the stabilized materials would be provided by the double synthetic liner system below the tailings. It is expected that virtually no exchange would occur between the tailings and the shallow ground water.

Alternatives 3a, 3b, 4, and 5 would not have any predictable effects on the quality of ground water along the transportation route. Only if contaminated materials are spilled during an accident and not cleaned up could shallow ground water be potentially affected.

The relative impacts for each alternative during remedial action are summarized in Table 5.9.

Impacts after remedial actions

Under the no-action alternative (Alternative 1), leachate generation within the tailings and its subsequent migration to the water table and to the Animas River would continue as in the past. As a result, the quality of the ground water within the alluvial gravel aquifer underlying the site and in-stream water quality would continue to be degraded. However, the magnitude of the effects on the quality of the Animas River would be negligible because of dilution.

Once on-site stabilization (Alternative 2) was completed, the potential for seepage of contaminated ground water into the underlying Mancos Shale would still exist. However, as mentioned in Section 5.6.1, the cover design would minimize the potential for infiltration into the tailings pile. The rate of exfiltration from the pile is unknown. However, lateral migration of ground water beneath the stabilized pile would not be controlled and any contaminants which exist would continue to move to the Animas River as they did prior to stabilization. In the area of the existing tailings piles at the Durango site, rates of contaminant migration within the Animas River alluvium are estimated, based on observed hydraulic conductivities and water table gradients (BFEC, 1983), to range from less than 10 to more than 2000 feet per year. Similarly, under the prevailing water table gradients in the raffinate ponds area, rates of contaminant migration within the Animas River alluvium are estimated to range from less than 20 to more than 2000 feet per year.

Potential impacts after stabilization at the Bodo Canyon site (Alternatives 3a and 3b) would involve seepage of contaminated waters through the base of the pile to the shallow groundwater system. This potential, however, would be small. The results of computer simulation studies indicate that redistribution of moisture within the stabilized tailings would occur resulting in both leachate generation within the stabilized pile and the slow release of this leachate. The rates of leachate generation due to infiltration of incident precipitation and moisture redistribution witnin the pile would decrease with time from an estimated 0.2 cubic foot per second to the rates of natural

Table 5.9 Summary of relative impacts on ground water

Alternative	Impacts during remedial action			Impacts after remedial action		
	Potential effects on quality of base flow component	Associated potential effects on in-stream water quality	Potential effects on quantity of base flow contribution to streams	Potential effects on quality of base flow component	Associated potential effects on in-stream water quality	Potential effects on quantity of base flow contributions to streams
No action (1)	--	--	--	Moderate	Moderate	None
On-site stabilization (2)	Moderate to high	Moderate	Low	Moderate to high	Moderate	Low
Bodo Canyon (3a & 3b)	Moderate to high	Low	Low	Low	Low	Low
Long Hollow (4)	Moderate to high	Moderate	Low	Moderate	Low to moderate	Low to moderate
Long Hollow (5)	Moderate	Low	Low	Low	Low	Low

ground-water recharge, which are estimated to be less than 0.004 cubic foot per second. Further details of these evaluations are described in Appendix F, Water Resources Information, in the DEIS, and in the Addendum to Appendix F in this FEIS. Ground-water flow patterns that existed in the shallow aquifer system at the Bodo Canyon site prior to construction would be affected because of the change in the pattern of natural ground-water recharge. As discussed previously, the Bodo Canyon site is located within an area of regional ground-water recharge.

The Long Hollow site is located within an area of ground-water discharge. In order to prevent the ground-water table from rising over time into the tailings and causing an increased potential for leachate generation and degradation of both surface- and ground-water quality, an underdrain was incorporated into the design for Alternative 4, stabilization at Long Hollow. Leachate generation due to infiltration of incident precipitation and redistribution of moisture within the tailings is expected to be small and of the same order as the natural rates of ground-water recharge. Based on computer modeling studies, the quantity of leachate released from the base of the pile is estimated to be on the order of 0.5 percent of the rates of ground-water discharge from below to the drainage blanket once steady-state has been reached (Appendix F in the DEIS). The leachate would be diluted by a factor of 230:1 at the point of discharge immediately downstream of the pile, resulting in the following concentrations: uranium 50 microg/l, sulfate 5800 mg/l, iron 8.7 mg/l, and manganese 0.75 mg/l. These waters would flow southward along the ephemeral Long Hollow drainage channel, recharging shallow ground water or ultimately discharging to the La Plata River. During the first several years following tailings disposal, effluent concentrations would be higher due to initial moisture redistribution, resulting in a dilution factor as low as 13:1. Although ground-water flow patterns would be permanently altered, no measurable effect is anticipated concerning ground-water contributions to base flow or water quality.

Under Alternative 5, the ground-water interceptor ditch would intercept ground water moving toward the site from the west and redirect it around the stabilized tailings, thereby minimizing the potential for the ground-water table to rise into the stabilized tailings. The clay cover would inhibit infiltration into the pile and the clay and synthetic liner system would inhibit exfiltration of water in the tailings.

Although Alternatives 4 and 5 include stabilizing the tailings at the same location, the present conceptual designs include different measures for ground-water protection. The measures presently include the construction of an underdrain and clay liner as in Alternative 4, the construction of an interceptor ditch and clay and synthetic liner system as in Alternative 5, and shifting the location of the stabilization area to the southeast away from the ground-water discharge area.

For Alternatives 3a, 3b, 4, and 5, no adverse impacts on ground water at the Durango site would occur after the tailings and other contaminated materials were removed. However, any contaminants within the alluvium beneath the affected area would continue to migrate downward and laterally and, with time, be discharged to the Animas River.

The relative impacts for each alternative following remedial action are summarized in Table 5.9.

5.7 IMPACTS ON ECOSYSTEMS

Terrestrial ecosystems would be affected both directly and indirectly by remedial actions. Direct impacts would occur primarily from surface disturbance that would temporarily eliminate vegetation and habitat. Thus, direct impacts were evaluated by estimating the area of each vegetation type and the amount of annual production, when known, that would be temporarily eliminated. The magnitude of impact was considered greater if the potentially affected communities are particularly valuable as habitat and provide abundant forage for wildlife and livestock. This value was obtained through review of literature and government agency (CDW, USFWS, SCS) information. Similarly, the potential for impacts on special-status species (economically important, threatened, or endangered) and their habitats was considered in judging the severity of impacts. Field inventory data and literature on such species provided the basis for this judgement.

Potential impacts on wildlife were assessed by considering direct effects of mortality and habitat loss plus indirect effects related to influx of people, barriers to movement, noise and disturbance from project activities, and displacement of populations into adjacent areas. The importance of certain areas for particular wildlife species, including season of use, was determined from literature, government agency contacts, and field data. Similar methods were used to assess impacts to threatened or endangered species. Such indirect impacts as migration of big game to adjacent areas were analyzed qualitatively. The potential for remedial-action traffic to increase road kills of big game was identified and evaluated based on data available from the Colorado Division of Wildlife (Zgainer, 1984).

The remedial-action activities could potentially affect aquatic organisms in the Animas River downstream from Durango and in Lightner Creek. The activities which would cause impacts include movement of tailings for off-site disposal, and withdrawal of water from the Animas River. Potential impacts from tailings movement include possible sedimentation and introduction of radionuclides into the Animas River from dust and erosion of the disturbed tailings pile. These potential impacts were qualitatively assessed and considered to be insignificant because of the ability of annual flows and flushing to alleviate or reduce their effects, and the planned use of erosion control measures to curtail infiltration into the Animas River. A quantitative assessment of water withdrawals was made by identifying the average and lowest historical flows on the Animas River, measured at the Durango gauge upstream from the river's confluence with Lightner Creek, and applying the projected water requirements for remedial action to these low flows.

5.7.1 Impacts on vegetation and terrestrial wildlife

Alternative 1 - no action

Selection of the no-action alternative would cause no new impacts on vegetation or terrestrial wildlife.

Alternative 2 - on-site stabilization

Because most of the Durango site has been previously disturbed and generally supports monotypic plant communities, impacts there on vegetation and wildlife would be minor. In addition to impacts that would occur at the Durango site, about 16 acres in Bodo Canyon would be used to provide borrow material for on-site stabilization. Big sagebrush-dominated vegetation and minor amounts of pinyon-juniper woodland would be destroyed, temporarily eliminating about 600 to 1400 pounds (air dry) of annual vegetative production per acre. Revegetation to obtain similar production would probably take a minimum of five years after initial reclamation. Obtaining structural and floristic composition similar to the existing vegetation may require up to 20 years.

Borrow pit development would temporarily preclude use of the area, which is a small portion of the total available habitat, by a certain number of elk, mule deer, small mammals, reptiles, amphibians, and birds. Although elk and mule deer probably do not frequent the area near the road, increased human activity there would be expected to disrupt normal use over a wider zone. Although the highest use of the area by deer and elk occurs in the winter, this is also the period of reduced remedial-action activities because of adverse weather conditions. The action would also reduce the recreational hunting value of the area. In addition, approximately three acres of sagebrush-rabbitbrush and oak brush shrub vegetation would be eliminated by widening of the road for borrow material transport from Bodo Canyon. Although minor in area, this loss would be long term since the road would remain following completion of remedial actions. Additionally, there would be a temporary loss of wildlife forage along the haul road due to vegetation adversely affected by fugitive dust. Physical disturbances along with fugitive dust will adversely affect wildlife up to a distance of 0.5 mile from the borrow areas and 0.25 mile from the haul road during the remedial action.

If County Road 211 is closed to public use, an estimated 20 percent loss of recreation days would result. Based on an estimated use of 11,805 recreation days annually on the Bodo State Wildlife Area (RHA, 1984), a 20 percent loss represents 2370 recreation days.

Alternative 3a - stabilization at Bodo Canyon with truck transport

Disposal of the tailings in Bodo Canyon under Alternative 3a would eliminate about 41 acres of vegetation, including big sagebrush shrub (17 acres), rubber rabbitbrush shrub (five acres), bluegrass meadow (11 acres), oak shrub (five acres), and pinyon-juniper woodland (three acres). The action would cause a loss of 500 (pinyon-juniper) to 2000 (rubber rabbitbrush) pounds per acre of annual vegetation production (air dry) (see Appendix G, Ecological Information, Section G.1.3 in the DEIS, for more detailed discussion of production). It is estimated that 20 years would be required for native species to become reestablished in areas that would be affected adjacent to the disposal site. Because of the change in the physical properties of the site, it is highly unlikely that restored native vegetation will offer the same diversity that was there prior to disturbance. Borrow material would be obtained from the borrow area described for Alternative 2, therefore, impacts to vegetation and wildlife habitat at the borrow area would be similar to those described for Alternative 2. Approximately 4.5 acres of sagebrush-rabbitbrush shrub vegetation would be eliminated by widening of the road for tailings transport by truck to the Bodo Canyon site with Alternative 3a. Although minor in area, this loss would be long term as the road would remain following completion of remedial actions.

Impacts to wildlife include those caused from transportation and disposal of tailings. These impacts include an increase in wildlife-vehicle accidents, loss of habitat from widening roads, loss of habitat from fugitive dust, and loss of habitat utilization due to stress from increase in traffic volumes. Big game animal mortality from accidents with vehicles is expected to increase from three deer at present to 20 deer and two elk annually during the life of the project, according to estimates provided by Zgainer (1984). However, if hauling of tailings is suspended during the time deer and elk are on their winter ranges, losses could be reduced by 80 to 90 percent. Highway mortality following the project is estimated to be four deer and one elk annually (RHA, 1984). Widening of County Roads 211 and 212 will result in a permanent loss of 4.5 acres of wildlife habitat (RHA, 1984). The most direct impact of fugitive dust on wildlife forage will be a reduction in palatability. Physiological stress on forage plants is still another effect. This effect will vary from death of some plants to diminished vigor and retarded growth in others. Loss of effective use of forage is estimated to be total from zero to 200 feet from the roads, 50 percent from 200 to 1200 feet, and insignificant beyond 1200 feet (RHA, 1984). Stress from increase in traffic volumes is expected to adversely impact animals for a distance up to 0.25 mile on both sides of the haul roads. Figure 5.2 illustrates loss of habitat due to disturbance from hauling and disposal of tailings.

Impacts due to disposal activities include loss of habitat and loss of habitat utilization due to increased human activity. Direct loss of wildlife habitat will include 41 acres at the disposal site and 16 acres at the borrow areas. Even with restoration of native vegetation at these locations, the net result will be a loss in the availability of wildlife cover and forage. A temporary loss of habitat effectiveness caused by human disturbance

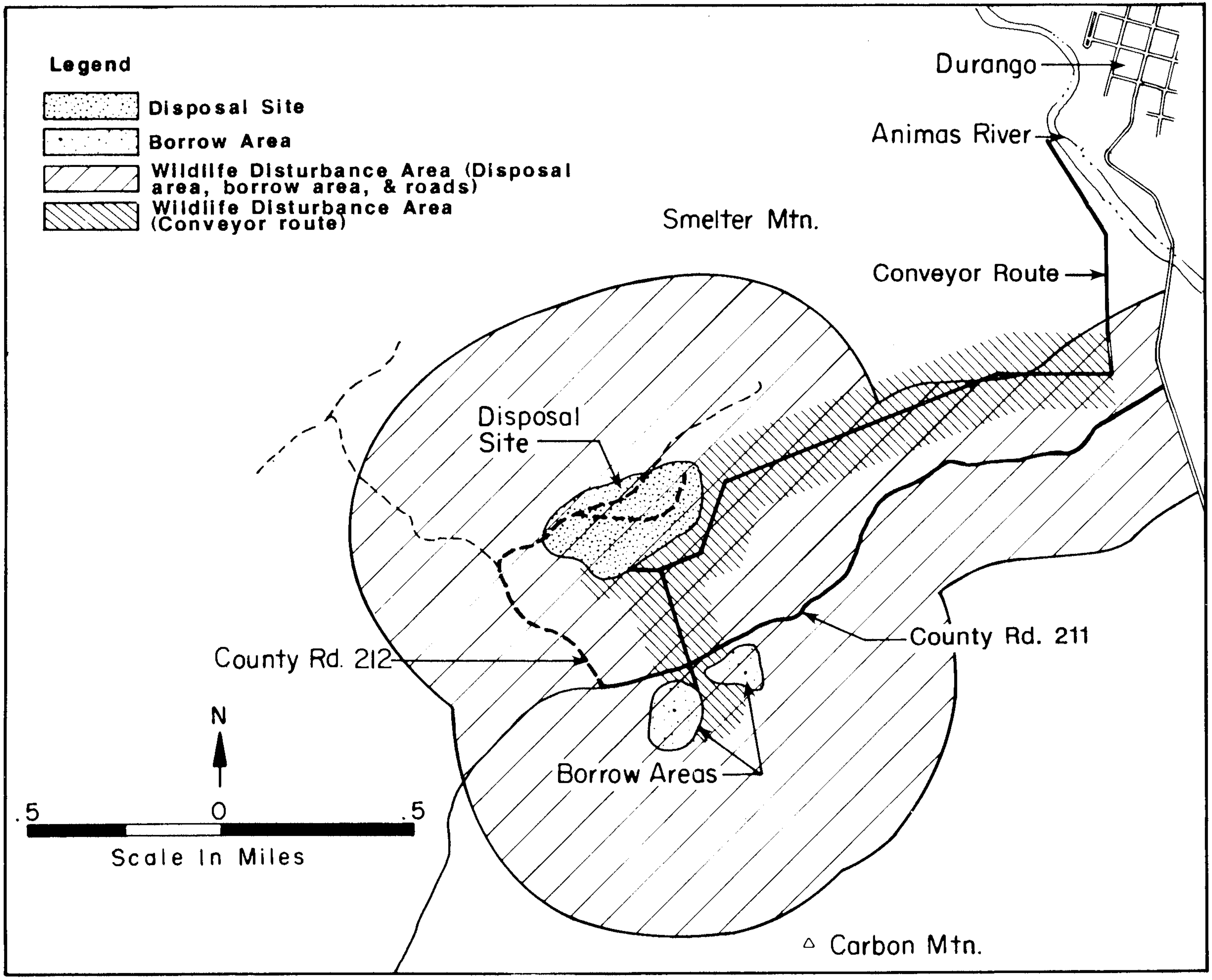

FIGURE 5.2
WILDLIFE HABITAT LOST FROM DISTURBANCE

will extend for a distance up to 0.5 mile around the disposal site and the borrow areas (Figure 5.2). Additional loss of habitat effectiveness will occur for a similar distance around the rock quarry.

The draft wildlife mitigation plan to mitigate the impacts on the Bodo Wildlife Area has been included as Appendix L of this FEIS. The plan includes items such as land replacement, food replacement, and fencing. The final mitigation plan will be developed in consultation with the State of Colorado.

Activities associated with remedial actions at the Bodo Canyon site could also affect the Bodo Wildlife Area's recreational value. Displacement of mule deer and elk herds during remedial-action activities would reduce the value of the area to hunters. If County Roads 211 and 212 are closed to public use, an estimated one-third loss of recreation days would result. Based on an estimated use of 11,850 recreation days annually on the Bodo State Wildlife Area (RHA, 1984), a one-third loss represents 3946 recreation days. Furthermore, such closures would cause an additional expense to the CDW by increasing travel time and cost of its employees that manage the area.

Alternative 3b - stabilization at Bodo Canyon with conveyor transport

Disposal of the tailings in Bodo Canyon under Alternative 3b would result in impacts on vegetation that are similar to those described for Alternative 3a. However, instead of the impacts from widening County Road 211, Alternative 3b would cause six acres of vegetation to be temporarily lost due to conveyor construction. The vegetation along the conveyor route consists of 0.7 acre of sagebrush shrub, 2.5 acres pinyon-juniper, 1.8 acres open pinyon-juniper, 0.8 acre oak shrub, and 0.2 acre oak-mountain shrub vegetation.

Wildlife impacts associated with Alternative 3b would be the same as those described under Alternative 3a with the following exceptions. Truck traffic on County Road 211 would be 132 trips per day for Alternative 3b as compared to 544 trips per day with Alternative 3a. This would result in five deer and 0.5 elk mortalities during remedial action under Alternative 3b whereas Alternative 3a would cause 20 deer and two elk mortalities. Construction and operation of the conveyor system would not cause any direct big game mortalities. Stress to animal populations along the conveyor route would extend to a smaller area on either side of the corridor than for roads used by haul trucks as illustrated in Figure 5.2.

Alternative 4 - stabilization at Long Hollow

Tailings disposal in the Long Hollow site would eliminate about 80 acres of existing vegetation and habitat, primarily heavily grazed pasture (about 60 acres), pinyon-juniper woodland (about three acres), big sagebrush and rubber rabbitbrush shrub vegetation (about 15 acres), and oak shrub vegetation (about three acres). In addition, two stock ponds and associated small areas of marsh vegetation of cattails and bulrushes would be eliminated. These vegetation units potentially have similar compositions and productions to those described quantitatively for Bodo Canyon but, because of livestock use, are quite open with less species diversity. Although the loss of existing vegetation cover and annual production would be adverse, the impact on the revegetated areas would be short term because revegetation would probably achieve production levels comparable to existing values after a minimum of five years following initial reclamation if a seedbed conducive to plant growth is provided.

The wildlife impacts at the Long Hollow site would be similar to those for the Bodo Canyon site (Alternative 3a) except for potential impacts on nesting peregrine falcons. However, the direct impacts on the disposal site would generally be smaller because the site is only of moderate quality for wildlife habitat. The impacts from human disturbance and fugitive dust surrounding the disposal site and adjacent to the haul roads would affect habitats of greater relative value, however, and would include more extensive areas than in Alternative 3a due to the larger disposal site (80 acres) and the longer hauling distance (11 miles). The impacts from Alternative 4 at the borrow areas and the quarry on the Bodo State Wildlife Area would be the same as for Alternative 3a. Excavation would destroy an unknown number of small mammals and reptiles, and also destroy habitats of these and several bird species (red-winged blackbird, Brewer's blackbird, mallard). Reclamation efforts would restore usable habitat in a minimum of five years; however, the composition would differ from the present habitat. Thus, a minor but relatively long-term reduction in habitat diversity is anticipated.

Approximately 10 acres of sagebrush-rabbitbrush shrub, one acre of meadow, and four acres of pinyon-juniper woodland would be eliminated by widening of the transportation corridor on County Road 211. Although small in area, this habitat loss would be long term. Additionally, another 98 acres of habitat would be lost from construction of 2.3 miles of road into the disposal site from County Road 211.

Mortality of wildlife would also occur from road kills during tailings transport to the Long Hollow site and after remedial action as a result of upgrading County Road 211. The route (County Road 211) parallels an ecotone between pinyon-juniper woodland and sagebrush/grass or meadow habitats. Thus, mule deer and elk movements in this area are expected regularly and increase the probability for road kills, especially during November through March when deer and elk become concentrated in the area. The increased number of road kills would persist after remedial action because of higher traffic volumes and speeds that would follow upgrading of County Road 211.

If County Road 211 is closed to public use, an estimated 75 percent reduction in recreational use on the Bodo State Wildlife Area would result. Based on an estimated use of 11,850 recreation days annually on the Bodo Area, the reduction in use would amount to 8888 recreation days per annum. Such a closure would also preclude management of the property by the CDW and would force it to relocate its shop and storage facilities. One family that rents a CDW-owned house would also have to be relocated.

Alternative 5 - reprocessing and stabilization at Long Hollow

Reprocessing and disposal of the tailings at Long Hollow would disturb a total of about 247 acres of existing vegetation and habitat, with approximately 205 acres cleared and graded for reprocessing-related activities. Vegetation eliminated by this alternative would include heavily grazed pasture (about 153 acres), pinyon-juniper woodland (about eight acres), big sagebrush and rubber rabbitbrush shrub vegetation (about 39 acres), and oak shrub vegetation (about eight acres). As with Alternative 4, two stock ponds and associated small areas of marsh vegetation would be eliminated.

The impacts on wildlife would be similar to those described for Alternative 4; however, many of these impacts would be greater due to the larger size of the disposal site (195 acres) and a longer project duration (51 months). The potential for a spill of sulfuric acid and the resultant adverse impact to adjacent habitats and species from the two to three tankers arriving at the site each day is considered very low.

The impacts on recreational use from any road closures would be the same as Alternative 4 except the impact would be of longer duration. The CDW and the family living in a CDW-owned house would be similarly affected.

5.7.2 Impacts on aquatic biota

Potential impacts to aquatic biota in the Animas River (particularly the 10-mile segment below Durango) and Lightner Creek from on-site remedial actions, regardless of the disposal site utilized, would consist primarily of increased siltation and stream-loading of toxic and radiochemical substances. Such impacts are expected to be minor but persistent throughout the estimated period of remedial-action activities, and would terminate after remedial action.

Activities associated with transport of tailings and off-site disposal would disturb existing soils of affected areas. Sedimentation from accelerated wind and water erosion of disturbed soils may reach the Animas River causing increased turbidity, siltation, and stream-loading of toxic and radiochemical substances, particularly during periods of low river flows. Increased turbidity in the Animas River during summer and fall may inhibit overall productivities. Toxic and radiochemical parameters of concern include pH, total uranium, radium-226, selenium, molybdenum, and vanadium (Horak and Olson, 1980). However, erosion and sediment control measures during remedial-action activities would reduce impacts from turbidity and siltation, and these impacts are expected to be small.

The average monthly flow in the Animas River over a 75-year period, measured at the Durango gauge upstream from Lightner Creek, is approximately 50,600 acre-feet (USGS, 1981). The lowest minimum flow on record is 94 cubic feet per second (March 2, 1913), which, if continuous over a period of one month, would be equivalent to a flow of about 4670 acre-feet per month. Therefore, the anticipated rates of withdrawals from the Animas River of 270,000 gallons per month (0.83 acre-foot per month) for Alternative 2, 450,000 gallons per month (1.38 acre-feet per month) for Alternatives 3a, 3b, and 4, and 2,800,000 gallons per month (8.59 acre-feet per month) for Alternative 5, would not affect downstream aquatic habitats.

5.7.3 Impacts on threatened and endangered species

No impacts on candidate or listed threatened or endangered plant species are anticipated.

The northern bald eagle has wintered along the Animas River near Durango for many years. An analysis of remedial action indicates that project-related activities will not alter wintering bald eagle use of the river (DOE, 1985). An historic peregrine falcon eyrie is located about one mile south of the Bodo Canyon disposal site and 28 peregrine falcons have been released near an historic eyrie about three miles north of the Bodo Canyon site. At present, the closest active eyrie is about 24 miles from Bodo Canyon. Remedial action activities will not affect nesting peregrine falcons unless they reoccupy historic eyries near the site before or during construction.

Raptors of high Federal concern that may occur at the sites are the ferruginous and Swainson's hawks (USFWS, 1985). Analysis of the distribution of these species at Bodo Canyon indicates that they occur as occasional wintering birds and remedial action activities will not have an impact on these species.

Potential impacts to the roundtail chub, bonytail, and Colorado squawfish, which rarely occur within approximately 100 miles downstream of the Durango site, resulting from the transfer of tailings piles or on-site stabilization would be minor and limited to possible increased loading of toxic and radiochemical substances. Diversion ditches designed to intercept runoff associated with the on-site activities would reduce the loading of these substances in the Animas River and, thereby, prevent impacts to downstream fish.

Although it appears unlikely that any of the remedial action alternatives would affect any threatened and endangered species, the DOE is consulting with the U.S. Fish and Wildlife Service USFWS to verify that no impacts would occur. Pursuant to this consultation, the DOE received a letter from the USFWS (USFWS, 1985) listing three endangered and three candidate species to be addressed in a report referred to as a Biological Assessment (DOE, 1985). This Biological Assessment indicates that the remedial action will not have an impact on the species listed by the USFWS (1985).

5.8 IMPACTS ON LAND USE

Land-use impacts would derive primarily from the direct change in land use at the site(s) affected by each action alternative and from indirect impacts arising from construction and stabilization-related activity near the site(s). Impact assessments entailed quantifying the acreage affected by the direct change in land use at each affected site, and characterizing the land-use change. Indirect impacts were qualitatively assessed based on descriptions of activity near each site, specifically vehicular traffic on nearby roads.

Impacts on land use would vary among the four action alternatives under consideration and would be both short term and long term.

Alternative 1 - no action

Under the no-action alternative, the Durango site would continue to be restricted. It is likely that the presence of the tailings and other contaminated materials would effectively prevent development since it is unlikely that any private party would be willing to pay for or assume liability for decontamination that would be required prior to site development. Land values at the Durango site if the tailings were removed would probably be less than the $55,000 to $65,000 per-acre values at the industrial park south of the site (see Section I.6.1, Appendix I, Information on Populations, Socioeconomics, and Land Uses, in the DEIS). If the cost for cleanup of the tailings and other contaminated materials is about $21 to $24 million for either stabilization on the site or at another location, it would not pay landowners to perform cleanup in order to use the site when its value would be no more than a maximum of $4.6 million.

Lands in the vicinity of the Durango site would probably not be affected by the no-action alternative. Nearby areas have historically and recently been developed (primarily for light industrial, public utility, recreational, and commercial uses) despite the nearby presence of the tailings. This development seems to indicate that nearby landowners' decisions are not affected by any health-related or other fears of any danger related to the presence of tailings and radioactivity.

The no-action alternative would not affect land use at the Bodo Canyon or Long Hollow sites or in the transportation corridor.

Alternative 2 - on-site stabilization

Land use at the Durango site would change during the short term because of construction and stabilization activities on the site. Long-term land use of the 38-acre stabilization site would not change significantly because it would be under Federal control and would not be available for use except as the location for the contaminated materials, which would also be the case under the no-action alternative. The remainder of the Durango site (about 88 acres), however, would be released for any use consistent with local land-use controls. A small area in Bodo Canyon would be temporarily used as a borrow source for soils necessary for Alternative 2.

Stabilization of the tailings and other contaminated materials at the Durango site would not affect land use at either the Bodo Canyon or Long Hollow sites. However, some short-term impacts on land use would occur during the transport of borrow materials on County Road 211 (Bodo Canyon Road) from the Bodo Canyon borrow areas to the Durango site. Truck traffic on Bodo Canyon Road with attendant noise and visual effects would lessen the enjoyment of users of the Bodo Wildlife Area.

Alternative 3a - stabilization at Bodo Canyon with truck transport

Decontamination of the Durango site and stabilization of the tailings at the Bodo Canyon site under Alternative 3a would affect land use at both sites and along the transportation route on County Roads 211 (Bodo Canyon Road) and 212. Impacts would consist of the following:

- o Short-term (during remedial action) indirect effects on recreational use of the Bodo Canyon area along the transportation route and near the stabilization site.
- o Long-term (during and after remedial action) land-use preemption of the Bodo Canyon site for the stabilization area and ancillary facilities.
- o Long-term (after remedial action) release of the entire 126-acre Durango site for future development.

Preemption of land use at the Bodo Canyon stabilization site would initially affect about 61 acres, consisting of 41 acres for the stabilization site itself and 20 acres for new access roads, truck parking and turnaround, truck-wash station, topsoil stockpile area, and other ancillary facilities needed during construction. Once stabilization activities are completed, the areas not required for long-term operations would be revegetated. The area permanently preempted would consist of a service road and 41-acre stabilization site.

Some adverse impacts on land use are expected during transport of the tailings. Truck traffic on Bodo Canyon Road and access roads to the stabilization site and attendant noise and visual effects would lessen the enjoyment of recreational users of the Bodo Wildlife Area over the short term. Impacts to recreational use (i.e., days lost) of the Bodo Wildlife Area are shown in Table 5.10. Off-site long-term impacts from the

Table 5.10 Impacts on implementation of Alternative 3a on annual recreational days use in the Bodo State Wildlife Area[a,b]

Recreation activity	Estimated present use[c]	Estimated use during remedial action	Loss in recreation days
Big game hunting	2950	1968	982
Small game hunting	600	400	200
Non-consumptive wildlife use	7100	4736	2364
Miscellaneous[d]	1200	800	400
Totals	11,850	7904	3946

[a]Assumes County Roads 211 and 212 will be closed during the remedial action phase of the project.
[b]Recreational user days would also be lost with the other alternatives; however, the impacts for Alternatives 2, 3b, 4, and 5 would be lower than for Alternative 3a.
[c]Estimates of use were provided by Mike Zgainer, Area Wildlife Supervisor, CDW, Durango, after consultation with local CDW employees, and Robert Clark, Senior Wildlife Biologist, Montrose.
[d]Includes jogging, hiking, photography, geological study, and other non-wildlife related activities.

presence of the stabilization facility would arise from the visual presence of the facility. Over the long term, enjoyment of the natural scenery by recreational users within the viewshed of the stabilization site would continue to be lessened by the presence of the access road, access barrier, and altered topography.

Upon completion of decontamination, the Durango site would be available for development. Given (1) population growth projections, (2) the high level of development activity in nearby areas, and (3) the site's designation in the La Plata County Draft Comprehensive Plan as being suitable for urban densities and uses, development is likely to occur. Since the county has not finalized a long-term plan that includes the Durango site and the site is not zoned, the actual type of development cannot be determined at this time. The site is suited for a variety of uses; however, uses which exclude development of ground-water resources should be encouraged.

Alternative 3b - stabilization at Bodo Canyon with conveyor transport

Decontamination of the Durango site and stabilization at the Bodo Canyon site under Alternative 3b would affect land use on a level similar to that described for Alternative 3a. The differences in the impacts would be that Alternative 3b would affect six acres of land due to conveyor construction and County Road 212 would not be widened. The permanently preempted area would be the same under either alternative. Presence of the conveyor in the viewshed on the west side of the Animas Valley and north of County Road 212 may affect the enjoyment of recreational users during the 22 months of its presence.

Alternative 4 - stabilization at Long Hollow

Decontamination of the Durango site and stabilization of the tailings at the Long Hollow site would affect land use at both sites and along the transportation route (County Road 211 and the proposed new haul road). These impacts would consist of the following:

- Short-term (during remedial action) temporary indirect effects on recreational use of the Bodo Canyon area along the transportation route and possibly near the Long Hollow site (see Section 5.21.9).
- Long-term (after remedial action) land-use preemption at the Long Hollow site for stabilization of contaminated materials.
- Long-term (after remedial action) release of the entire 126-acre Durango site for development (with impacts being the same as those described under Alternative 3a).

Preemption of land at the Long Hollow site would initially affect about 179 acres, consisting of the 80-acre stabilization site about 99 acres for access and haul roads, diversion channels, truck parking and turnaround, truck wash station, stockpile and borrow area, and other ancillary facilities needed during remedial action. Once stabilization and reclamation are completed, only the 80-acre stabilization site and a short service road would be unusable for other purposes.

Truck traffic and related noise and activity on County Road 211 may adversely affect recreational use of the Bodo Wildlife Area during transport of the tailings. Sheep ranching near the Long Hollow site may also be adversely affected and possibly be curtailed during the remedial action due to truck traffic and noise.

The presence of the stabilized tailings at the Long Hollow site might reduce the potential for development of nearby areas for residential uses. Although the stabilized tailings would present no health hazard, some residents and potential land purchasers might have fears related to low-level radioactivity that may not be ameliorated by stabilization. This impact, if it occurs at all, is likely to be small.

Alternative 5 - reprocessing and stabilization at Long Hollow

Decontamination of the Durango site and relocation of the tailings at the Long Hollow site for reprocessing and stabilization would affect land use at both sites and along the transportation route (County Road 211 and the proposed new haul road). These impacts would consist of the following:

- o Short-term (during reprocessing and remedial action) land-use preemption at the Long Hollow site for reprocessing of contaminated materials.

- o Long-term (after reprocessing and remedial action) land-use preemption at the Long Hollow site for stabilization of contaminated materials.

- o Short-term (during reprocessing and remedial action) indirect effects on recreational use of the Bodo Canyon area along the transportation route and near the Long Hollow site see Section 5.21.9.

- o Long-term (after remedial action) release of the entire 126-acre Durango site for development (with impacts being the same as those described under Alternative 3a).

Preemption of land at the Long Hollow site would initially affect about 256 acres of which approximately 205 acres would be cleaned and graded for reprocessing activities. Once reprocessing is completed, approximately 195 acres and a short service road would be unusable for other purposes.

Truck traffic and related noise activity on County Road 211 would adversely affect recreational use of the Bodo Wildlife Area during transport of the tailings. Sheep ranching near the Long Hollow site may also be adversely affected and possibly curtailed during the remedial action due to truck traffic, noise, and unavailability of land. These impacts would be less intense but of longer duration than under Alternative 4 because of the protracted amount of time required for tailings excavation, hauling, and reprocessing (51 months).

5.9 IMPACTS ON SOUND LEVELS

Ambient sound levels[a] have not been measured at the Durango site or any of the alternate disposal sites, but have been estimated according to typical values of ambient sound levels that have been measured in similar situations (National Academy of Sciences, 1977). These estimates of sound levels were based on existing land uses and the area's population density.

A noise-prediction model described in Kessler et al. (1978) was used to estimate the noise that would be emitted by the heavy construction equipment and trucks used for each alternative. This model considers the number of pieces of individual units, maximum sound levels emitted by a class of equipment, and the percentage of time a unit is at its noisiest mode of operation. The levels of site noise at off-site locations were estimated by considering the distance from the remedial-action activities to the receptor of interest. The noise-level extrapolation model is conservative (i.e., the noise levels that it predicts are probably higher than would be realized) as no attenuation for air absorption, berms, or foliage are considered in the model.

Alternative 1 - no action

The no-action alternative would not affect the ambient sound levels which prevail at the Durango, Bodo Canyon, or Long Hollow sites, or in the transportation corridors which connect these sites.

Alternative 2 - on-site stabilization

In Alternative 2, the major noise impact would be from the excavation, grading, and recontouring activities in the area of the tailings piles and mill site at the north end of the Durango site. Placement, grading, and compacting the reclamation-cover materials would also contribute to area noise.

The data used for the computation, and the resulting equivalent sound level[b] (L_{eq}) (EPA, 1978) used for extrapolation to nearby noise-sensitive areas for Alternative 2, are listed in Table 5.11. The duration of sound for the L_{eq} used herein is eight hours. The estimated background ambient sound levels and the estimated sound levels during the operations for all alternatives are summarized in Table 5.12. The distance from the general work area at the Durango site to the nearest population and commercial concentrations in the city of Durango is about 1600 feet. Thus, it was calculated that the daytime sound level in the central business district of Durango would be approximately 68 dB during construction activities, an increase of about 13 dB over the present estimated 55 dB. For

[a]All sound levels are A-weighted unless otherwise noted.

[b]Equivalent sound level (L_{eq}) is the A-weighted sound level that is "equivalent" to an actual time-varying sound level, in the sense that it has the same total sound energy for the duration of the sound (EPA, 1978).

Table 5.11 Noise levels of equipment for stabilization at Durango site (Alternative 2)

Location	Equipment	Maximum sound level at 50 feet (dB)	Number of units	Use factor	Estimated equivalent sound level (L_{eq}) at 500 feet (dB)
Durango site	Scrapers	93	3	0.65	78
	Bulldozers	88	2	0.20	
	Compactors	82	2	0.80	
	Front-end loaders	87	2	0.10	
	Motor grader	88	2	0.35	
	Trucks, 25-ton capacity	85	8	0.30	
	Water truck	83	1	0.50	
	Flatbed truck	83	1	0.50	
	Fuel-lube truck	83	1	0.50	
Borrow area in Bodo Canyon	Front-end loader	86	1	0.10	64
	Trucks, 25-ton capacity	85	2	0.30	
Quarry area	Air-trac drill	96	1	0.20	70
	Trucks, 25-ton capacity	85	2	0.30	
	Front-end loader	86	1	0.10	

Ref. Kessler et al., 1978.

Table 5.12 Estimated ambient daytime sound levels[a] for Alternatives 1, 2, 3a, 3b, 4, and 5

Activity	Background ambient sound levels L_{dn} (dB)	Operation ambient sound levels L_{eq} (dB)			Change in daytime L_{eq} (dB)		
		500 ft	1600 ft	5000 ft	500 ft	1600 ft	5000 ft
Alternative 1							
Durango	55		55			0	
Alternative 2							
Durango site	55	78	68	59	23	13	4
Bodo Canyon area	35	64	54	44	29	19	9
Quarry area	35	70	60	50	35	25	15
Alternative 3a							
Durango site	55	69	59	57	14	4	2
Bodo Canyon area	35	80	70	60	45	35	25
Quarry area	35	70	60	50	35	25	15
Alternative 3b							
Durango site	55	76	66	58	21	11	3
Bodo Canyon area	35	76	66	56	41	31	21
Quarry area	35	70	60	50	35	25	15
Alternative 4							
Durango site	55	69	59	57	14	4	2
Long Hollow site	40	82	72	62	42	32	22
Bodo Canyon area	35	64	54	44	29	19	9
Alternative 5							
Durango site	55	74	64	58	19	9	3
Long Hollow site	40	73	63	53	33	23	13
Bodo Canyon area	35	64	54	44	29	19	9

[a]Day-night sound level (L_{dn}) is an EPA description of environmental sound. It is the average of daytime and nighttime A-weighted sound levels with nighttime sound given an average penalty of 10 decibels. For this analysis, it is assumed that the background daytime L_{eq} is approximately equal to the estimated background day-night sound level (L_{dn}).

comparison, 68 dB is the noise level that would be created by normal speech at a distance of one foot. At a distance of 500 feet from the center of activity on the Durango site, the daytime sound level would be 78 dB. During remedial action, the Durango site would be classified as a construction project and subject to the maximum permissible noise levels specified for industrial zones by the city of Durango and would be in compliance with a noise-ordinance of 80 dB during daytime (City of Durango, 1983).

Background ambient sound (day-night sound levels) at the borrow area in Bodo Canyon is representative of rural areas. The current levels are estimated to be 35 dB. During construction activities, daytime ambient sound levels would increase by about 29 and nine dB at distances of 500 and 5000 feet, respectively. Background ambient sound levels are also estimated to be 35 dB in the quarry area west of the raffinate ponds area (see Figure A.10, Appendix A, Conceptual Designs and Engineering Evaluations, Remedial Action Alternatives, in the DEIS). Here, operational sound levels would increase by 35 and 15 dB at distances of 500 and 5000 feet, respectively. However, except for wildlife, there are no noise-sensitive areas nearby and the impact of the increased sound levels is judged to be minor. The effect of noise on wildlife would also be minor and temporary (EPA, 1980). Although some species may relocate their nesting sites, many will adjust to the noise.

Along Bodo Canyon Road (County Road 211), a motor grader's average noise level would be about 63 dB at a distance of 500 feet. With its engine at full load, this noise level would increase to about 68 dB at a distance of 50 feet and then decrease as the grader passes by and moves away. Similarly, truck noise would vary as the trucks pass by. The maximum noise level would be 65 dB at 500 feet for less than 30 seconds, about 280 times per day (five days per week) for a duration of five months.

Alternative 3a - stabilization at Bodo Canyon with transportation by truck

Under Alternative 3a, the increase of the daytime ambient sound level in Durango's business district would be less than that for the on-site stabilization alternative because scrapers, which emit high energy noise for most of the time they are working, would not be operating on the Durango site. At a distance of 500 feet from the center of activity on the Durango site, operational ambient sound levels would be 69 dB, nine dB less than that for Alternative 2. At a distance of 1600 feet, the daytime ambient sound levels in Durango's central business district would only increase about four dB, from 55 to 59 dB.

Because of the close proximity of the Bodo Canyon site to the borrow area in Bodo Canyon, the operational ambient sound levels originating at both locations have been combined to develop a worst-case condition. The estimated equivalent sound level (L_{eq}) 500 feet from the center of the combined activities is 80 dB (Table 5.13), an increase of 45 dB. This sound-level is reduced to 60 dB at a distance of 5000 feet; however, it is still an increase of 25 dB over background ambient sound levels. A single residence (leased or rented from the Colorado Division of Wildlife) is located about 4000 feet to the southwest where the daytime ambient sound

Table 5.13 Noise levels of equipment for stabilization at the Bodo Canyon site, transportation by truck (Alternative 3a)

Location	Equipment	Maximum sound level at 50 feet (dB)	Number of units	Use factor	Estimated equivalent sound level (L_{eq}) at 500 feet (dB)
Durango site	Bulldozers	88	1	0.20	69
	Front-end loader	87	1	0.10	
	Front-end loader	82	1	0.10	
	Motor grader	88	1	0.35	
	Trucks, 25-ton capacity	85	2	0.30	
	Water truck	83	1	0.50	
	Flatbed truck	83	1	0.20	
	Fuel-lube truck	83	1	0.10	
Bodo Canyon	Scrapers	93	7	0.65	80
	Bulldozers	88	3	0.20	
	Compactors	82	3	0.80	
	Front-end loader	87	1	0.10	
	Motor grader	88	1	0.35	
	Trucks, 25-ton capacity	85	2	0.30	
	Fuel-lube truck	83	1	0.10	
Quarry area	Air-trac drill	96	1	0.20	70
	Trucks, 25-ton capacity	85	1	0.30	
	Front-end loader	86	1	0.10	

Ref. Kessler et al., 1978.

level is estimated to increase by 27 dB above background. The ambient sound level increase at the quarry site would be the same as for Alternative 2, and the impacts on wildlife in Bodo Canyon and near the quarry for Alternative 3a would be similar to those for Alternative 2.

Truck traffic on County Roads 211 (Bodo Canyon Road) and 212 (Smelter Mountain Road) would almost double that for Alternative 2 and would increase daytime ambient sound levels within 2000 feet of the transportation corridor an average of about 15 to 20 dB. The maximum noise level would be about 65 to 68 dB for about 30 seconds as the trucks pass by, but this would occur approximately 540 to 560 times per day (five days per week) over a 16-month period. There are no residents living along the transportation route, and the noise impact on wildlife is expected to be minor (EPA, 1980).

Alternative 3b - stabilization at Bodo Canyon with conveyor transport

Under Alternative 3b the increase of the daytime ambient sound level in Durango's business district would be slightly less than that for the on-site stabilization alternative. At a distance of 500 feet from the center of activity on the Durango site, operational ambient sound levels would be 76 dB, two dB less than that for Alternative 2, but seven dB higher than that for Alternative 3a. At a distance of 1600 feet, the daytime ambient sound levels in Durango's central business district would increase about 11 dB, from 55 to 66 dB. The primary reason for the conveyor option having a higher noise impact is due to the use of two diesel-powered Sauerman scrapers.

Because of the close proximity of the Bodo Canyon site to the borrow area in Bodo Canyon, the operational ambient sound levels originating at both locations have been combined to develop a worst-case condition. The estimated equivalent sound level (L_{eq}) 500 feet from the center of the combined activities is 76 dB (Table 5.14), an increase of 41 dB. This sound-level increase is reduced to 56 dB at a distance of 5000 feet, but it is still an increase of 21 dB over background ambient sound levels. A single residence (leased or rented from the Colorado Division of Wildlife) is located about 4000 feet to the southwest where the ambient sound level is estimated to increase by 23 dB above background. The daytime ambient sound level increase at the quarry site would be the same as for Alternatives 2 and 3a and the impacts on wildlife in Bodo Canyon and near the quarry for Alternative 3b would be similar to those for Alternatives 2 and 3a.

Truck traffic on County Roads 211 (Bodo Canyon Road) and 212 (Smelter Mountain Road) would be substantially less than that for Alternatives 2 and 3a. The maximum noise level at a distance of 500 feet would be about 65 to 68 dB for about 30 seconds as the trucks pass by. This would occur approximately 132 times per day average (five days per week; maximum 150 times per day) over a 22-month period. There are no residents living along the transportation route, and the noise impact on wildlife is expected to be minor (EPA, 1980). The conveyor system would be a relatively minor source of noise as is true with most electrically powered equipment. For this analysis, the conveyor system was assumed to cause a noise level of eight dB when measured at 50 feet.

Table 5.14 Noise levels of equipment for stabilization at the Bodo Canyon site, transportation primarily by conveyor (Alternative 3b)

Location	Equipment	Maximum sound level at 50 feet (dB)	Number of units	Use factor	Estimated equivalent sound level (L_{eq}) at 500 feet (dB)
Durango site	Bulldozers	88	2	0.20	76
	Cranes	78	1	0.10	
	Backhoes	77	1	0.10	
	Sauerman scrapers	93	2	0.80	
	Trucks, 25-ton capacity	85	1	0.30	
	Water truck	83	2	0.50	
Bodo Canyon	Scrapers	93	2	0.65	76
	Bulldozers	88	5	0.20	
	Compactors	82	2	0.80	
	Front-end loader	87	1	0.10	
	Motor grader	88	1	0.35	
	Trucks, 25-ton capacity	85	1	0.30	
	Conveyor units	80	3	1.00	
Quarry area	Air-trac drill	96	1	0.20	70
	Trucks, 25-ton capacity	85	1	0.30	
	Front-end loader	86	1	0.10	

Ref. Kessler et al., 1978.

Alternative 4 - stabilization at Long Hollow

Construction activities at the Durango site for Alternative 4 would be the same as those described for Alternative 3a. Hence, the impacts of sound-level increases would be the same. Similarly, the activities at the borrow area in Bodo Canyon under Alternative 4 would be the same as described for Alternative 2 with equal impacts resulting from the increased sound levels. There would be no quarrying operations for Alternative 4.

At the Long Hollow site, construction activities would be the greatest (including the amount of heavy construction equipment) during the first 10 months of the remedial action. Thus, noise levels would be the highest during this period and would be less during the last 18 months of the remedial action. The estimated operational equivalent sound level (L_{eq}) at a distance of 500 feet from the center of construction activities during the first 10 months of the remedial action is 82 dB (Table 5.15), an increase of 42 dB over background ambient sound levels. Even at a distance of 5000 feet, the sound-level increase would be 22 dB. Only one residence exists within this latter distance of the site, but the increased sound levels at this residence are expected to be buffered and reduced because of the intervening 100-foot-high ridge on the west side of the Long Hollow site. The effect of noise on wildlife at Long Hollow would be slight (EPA, 1980).

Under Alternative 4, it is expected that the average number of truck passbyes in the transportation corridor would be in the range of approximately 530 to 550 times per day (five days per week) over a period of about 15 months while tailings are transported from the Durango site to the Long Hollow site during the last 18 months of the remedial action activities. This would be only slightly less than for Alternative 3a; however, the impacts resulting from the increased noise levels are expected to be the same. The transportation corridor from the Durango site to the Long Hollow site is approximately 7.5 miles longer than that for Alternative 3a, so the area affected would be greater. Also, the single residence located near County Road 211 and owned by the Colorado Division of Wildlife would be subjected to increased sound levels resulting from the heavy truck traffic.

Alternative 5 - reprocessing and stabilization at Long Hollow

Reprocessing of the tailings would elevate noise levels at Durango, Long Hollow, the Bodo Canyon borrow area, and along the transportation corridors. Equivalent sound levels (L_{eq}) from equipment operating at the Durango site would be approximately 74 dB at a location 500 feet removed from the center of activity (Table 5.16). Such levels would be approximately 19 dB higher than ambient levels in Durango. At a distance of 1600 feet from the center of activity, daytime ambient sound levels in Durango's central business district would be approximately 64 dB.

Activities at the Long Hollow site would result in daytime ambient equivalent sound levels (L_{eq}) of 73 dB at a distance 500 feet from the center of activity (Table 5.16). These sound levels would represent a 33 dB increase over background ambient sound levels in the area. The nearest residence to the Long Hollow site is located approximately 3500 feet to

Table 5.15 Noise levels of equipment for stabilization at the Long Hollow site (Alternative 4)

Location	Equipment	Maximum sound level at 50 feet (dB)	Number of units	Use factor	Estimated equivalent sound level (L_{eq}) at 500 feet (dB)
Durango site	Bulldozers	88	1	0.20	69
	Front-end loader	87	1	0.10	
	Front-end loader	82	1	0.10	
	Motor grader	88	1	0.35	
	Trucks, 25-ton capacity	85	3	0.30	
	Water truck	83	1	0.50	
	Flatbed truck	83	1	0.20	
	Fuel-lube truck	83	1	0.10	
Long Hollow site	Scrapers	93	10	0.65	82
	Bulldozers	88	4	0.20	
	Compactors	82	3	0.80	
	Motor grader	88	2	0.35	
	Trucks, 25-ton capacity	85	3	0.30	
	Water truck	83	2	0.50	
	Flatbed truck	83	1	0.20	
	Fuel-lube truck	83	1	0.10	
	Backhoe	80	1	0.25	
	Crane (5 ton)	75	2	0.10	
Borrow area in Bodo Canyon	Front-end loaders	87	2	0.10	64
	Trucks, 25-ton capacity	85	2	0.30	

Ref. Kessler et al., 1978.

Table 5.16 Noise levels of equipment for reprocessing and stabilization at the Long Hollow site (Alternative 5)

Location	Equipment	Maximum sound level at 50 feet (dB)	Number of units	Use factor	Estimated equivalent sound level (L_{eq}) at 500 feet (dB)
Durango site	Bulldozers	88	2	0.20	74
	Water truck	83	2	0.50	
	Front-end loader	87	2	0.10	
	Front-end loader	82	2	0.10	
	Fuel truck	83	1	0.10	
	Trucks, 25-ton capacity	85	14	0.30	
	Motor grader	88	1	0.35	
Long Hollow site	Water truck	83	4	0.50	73
	Front-end loader	82	2	0.10	
	Fuel truck	83	1	0.10	
	Trucks, 25-ton capacity	85	14	0.30	
	Motor grader	88	1	0.35	
Borrow area in Bodo Canyon	Front-end loaders	87	1	0.10	64
	Trucks, 25-ton capacity	85	2	0.30	

Ref. Kessler et al., 1978.

the west. Sound attenuation alone over this distance would reduce levels to approximately 56 dB at the residence; however, the ridge located between the site and the residence would reduce sound levels even further.

Sound levels resulting from equipment operating in the Bodo Canyon borrow area would be similar to levels generated under Alternatives 2 and 4. There would be an increase of 29 dB over daytime background ambient sound levels to 64 dB at a location 500 feet removed from the equipment and an increase of nine dB over background to 44 dB at a distance 5000 feet away from the center of activity. Such elevations in noise levels would represent a noticeable increase over normal ambient background levels; however, no noise-sensitive receptors presently exist in the immediate area.

Under Alternative 5, the maximum number of truck passbyes in the transportation corridor would be 144 per day, which would occur during hauling of the tailings. While this is considerably less than the number of passbyes that would occur under Alternatives 3a and 4, the period for truck transport of tailings would be significantly longer (51 months). There would also be an increase in noise levels from trucks hauling the reprocessing mill from Naturita and chemicals and associated materials for the actual reprocessing. However, such trips would be relatively infrequent.

5.10 IMPACTS ON SCENIC, HISTORIC, AND CULTURAL RESOURCES

Impacts on scenic, historic, and cultural resources were assessed by first evaluating the scenic, historic, and cultural resources at the Durango site and the alternative stabilization sites at Bodo Canyon and Long Hollow. Then, the changes brought about by each alternative were evaluated based on the site plans and the type of activity generated by each alternative at and near the sites. The U.S. Bureau of Land Management (BLM) Visual Resource Management System (BLM, 1978a) was used to evaluate impacts on scenic resources. The site plans for Alternatives 3a, 3b, 4, and 5 were superimposed on maps of cultural and historic resources to determine which resources could potentially be affected by access road construction, conveyor construction, construction of dikes, or placement of tailings and cover material. This assessment is described in greater detail in Section I.6.2, Appendix I, Information on Populations, Socioeconomics, and Land Use, in the DEIS. Impacts of the alternatives on changes in scenic values and cultural and historic resources are described below.

Alternative 1 - no action

Alternative 1 would have no impacts on the scenic, historic, or cultural resources.

Alternative 2 - on-site stabilization

On-site stabilization of contaminated materials would alter the appearance of the Durango site. The primary short-term visual change would consist of activity and equipment at the site during remedial action. An access barrier would be erected, the contaminated materials would be rearranged to allow stabilization, dikes and cover would be added, and areas where contaminated materials were excavated at the site would be backfilled and revegetated; these actions would alter the site's appearance for the long term. These visual changes would be visible from U.S. Highway 550 and portions of southern Durango. The relatively low scenic rating assigned to the Durango site (see Section 4.11.2) indicates that no special management attention is required. The remedial action would cause a small short-term visual impact to the proposed Animas River Valley National Natural Landmark.

No sites of archaeological significance are known to exist on the Durango site or along the transportation route. The smelter stack located on the Durango site which is eligible for listing in the National Register of Historic Places (NRHP) would be demolished (Table 5.17). The stack is radioactively contaminated and would pose a safety hazard to workers due to structural instability. Decontaminating the stack would require removal of the liner brick which would increase structural instability. For these reasons, dismantling the stack would be the most reasonable course of action.

Alternative 3a - stabilization at Bodo Canyon with truck transport

Alternative 3a would change scenic values at the Durango site and the Bodo Canyon site. Short-term visual effects would result from removal of the tailings and revegetation of the Durango site. Removal of the tailings and revegetation would essentially return the site to approximately its natural appearance. By allowing other land uses, Alternative 3a would ultimately permit the Durango site's appearance to change from disturbed to developed.

Alternative 3a would also change the appearance of the Bodo Canyon site by converting it from its natural state to a revegetated and stabilized site. During the remedial action, visual impacts would result from site preparation, grading, and erection of a security fence. Increased activity at and near the site during construction would be visible to recreational users of the nearby areas in Bodo Canyon. Once remedial action is complete, the stabilized site, access barrier, and some monitoring facilities would also be visible. However, the viewshed of the alternate site is limited, because of surrounding topography, which provides good visual screening. The Bodo Canyon site's scenic rating indicates that no special management attention is required (see Section 4.11.2).

Under Alternative 3a, the smelter stack at the Durango site would be demolished for the reasons described under Alternative 2 in this section. The stack is eligible for inclusion on the NRHP. Removal of the tailings would have a positive long-term effect on the proposed Animas River Valley National Natural Landmark by improving the view of the site from the city of Durango.

Stabilization of the Bodo Canyon site would result in the loss of some of the cultural resources recorded during the on-site archaeological survey in October, 1981. While most of the prehistoric sites recorded are

Table 5.17 Impacts to cultural and historic resources

Alternative	Site number	Resource description	SHPO determination	Impact
1	--	--	--	No sites affected
2	5LP1479	Brick smelter smoke stack	Eligible	Dismantled
3a and 3b	5LP1479	Brick smelter smoke stack	Eligible	Dismantled
	5LP478	Basketmaker III pit house	Eligible	Destroyed
	5LP481	Basketmaker III burned pit house	Eligible	Destroyed
	5LP483	Basketmaker III jacal structure	Eligible	Destroyed
	5LP1096	Ceramic and lithic scatter	More data needed	Avoided
	5LP1097	Archaic lithic and tool scatter	Eligible	Destroyed
	5LP1100	Basketmaker III pit house	Eligible	Destroyed
	5LP1102	Hearth and lithic scatter	Eligible	Destroyed
	5LP1104	Lithic scatter	Eligible	Destroyed
	5LP1108	Lithic and ceramic scatter	More data needed	Avoided
	5LP1114	Lithic scatter	Eligible	Destroyed
	5LP1115	Basketmaker III structure	Eligible	Avoided
4 & 5	5LP1479	Brick smelter smoke stack	Eligible	Dismantled
	5LP172	Burned structure, lithic and ceramic structure	Not determined	Avoided
	5LP173	Masonry walls, lithic and ceramic scatter	Not determined	Avoided

Table 5.17 Impacts to cultural and historic resources (Concluded)

Alternative	Site number	Resource description	SHPO determination	Impact
4 & 5 (Cont'd)	5LP192	Harper homestead	Not determined	Probably avoided
	5LP461	Campsite, trash dump	Not determined	Destroyed
	5LP462	Fire hearth, lithic scatter	Not determined	Avoided
	5LP481	Habitation, burned pit house	Eligible	Destroyed
	5LP482	Habitation, hearths	Not determined	Destroyed
	5LP494	Unknown	Not determined	Avoided
	5LP496	Lithic scatter	Not determined	Avoided
	5LP504	Lithic and ceramic scatter	Not determined	Avoided
	5LP563	Historic corral	Not determined	Avoided
	5LP579	House, trash scatter	Not determined	Avoided
	5LP581	Ranch buildings	Not determined	Avoided
	5LP608	Masonry structures, ceramic scatter	Not determined	Avoided
	5LP610	Storage pit, lithic and ceramic scatter	Not determined	Destroyed
	5LP1370	Ceramic and lithic scatter	More data needed	Avoided

[a]The Colorado State Historic Preservation Officer (SHPO), in consultation with the DOE, has determined that these cultural resources are either eligible for nomination to the National Register of Historic Places or that more data are needed prior to determining eligibility.

located away from areas that would be used during stabilization, several are located within or near the disposal site or near and in access routes or likely working areas (Nickens and Associates, 1981). Nine of the archaeological sites that are eligible for nomination to the NRHP would be affected by the remedial actions. Other eligible or potentially eligible sites would be avoided by the remedial action activities.

The number of sites recorded during the archaeological investigation is not considered unusual for areas in southwestern Colorado. Prior to disturbing the archaeological sites, the mitigation measures discussed in Section 5.21.6 would be implemented. The impacts are summarized in Table 5.17.

Alternative 3b - stabilization at Bodo Canyon with conveyor transport

Stabilization of the tailings at the Bodo Canyon site with transportation primarily by conveyor would result in impacts to scenic resources similar to those for Alternative 3a. In addition, the conveyor would be visible from some residences in south Durango and Highway 550 and from parts of County Road 211. This change in the viewshed would be obtrusive to some individuals who are familiar with the area. However, visual impacts due to the conveyor would be short term because the conveyor would be dismantled and removed after the remedial action and the corridor would be revegetated.

Alternative 3b would result in almost the same impacts to cultural resources that have been described for Alternative 3a. The smelter stack, which is eligible for nomination to the NRHP, would be demolished for reasons described under Alternative 2 in this section. Some additional archaeological sites may be identified along the 3200-foot length of the conveyor route that will be surveyed during 1985. If additional archaeological sites are identified and they are determined to be eligible for the NRHP, the sites would either be avoided or the archaeological data would be recovered as mitigation prior to construction. Assuming no additional sites are identified, nine archaeological sites would be affected by Alternative 3b. The impacts are summarized in Table 5.17.

Alternative 4 - stabilization at Long Hollow

Alternative 4 would result in impacts on scenic resources at the Durango site equal to those described above for Alternative 3a. Visual impacts would also occur at the Long Hollow site and along the transportation route. Site preparation, grading, erection of an access barrier, and general activity would be visually obvious to travellers on County Road 141 during construction; no visual screening is available to screen site activity from County Road 141 vantage points along the site. During transport of the tailings along County Road 211, trucks would be visible from most of Bodo Canyon and Ridges Basin. This impact would be short term. Once stabilization is complete, the revegetated stabilized tailings piles and ancillary facilities would also be visible to travellers on County Road 141. The site would not be visible from existing residences. The Long Hollow site was assigned a low to medium scenic rating score (see Section 4.11.2) indicating no special management attention is required.

Alternative 4 would result in the demolition of the smelter stack on the Durango site which has been determined to be eligible for nomination to the NRHP by the State Historic Preservation Officer. The reasons for demolition are described under Alternative 2 earlier in this section.

Stabilization of the Durango tailings and other contaminated materials at the Long Hollow site would affect lands near an historic homestead site (CASA, 1983). This site is located near the southwest boundary of the area that would be disturbed during remedial-action activities; however, this site is not eligible for nomination to the NRHP (Sudler, 1984). Other prehistoric sites are also in the vicinity of the Long Hollow site but are unlikely to be disturbed during the construction operations. Road upgrading and construction may result in the disturbance of sites that are eligible for inclusion on the NRHP. If disturbance of the sites becomes necessary, the mitigation measures discussed in Section 5.21.6 would be implemented. The impacts are summarized in Table 5.17.

Alternative 5 - reprocessing and stabilization at Long Hollow

Alternative 5 would affect the scenic qualities of the Durango site, the Long Hollow site, and transportation corridors. Visual impacts and impacts to the proposed Animas River Valley National Natural Landmark at the Durango site under Alternative 5 would be similar to those of Alternatives 3a, 3b, and 4 with short-term visual effects resulting from tailings removal. However, removal of the tailings and revegetation would return the site to approximately its natural state and, ultimately, could change the site's status from disturbed to developed.

Transportation of the tailings would be visually apparent to travelers along County Roads 141 and 211 during remedial action. Activities at the Long Hollow site would be visible to those traveling on County Road 141, as would the gravel-covered tailings pile following reprocessing and stabilization. However, the Long Hollow site would not be visible from any existing residences. The Long Hollow site was assigned a low to medium scenic rating score (Section 4.11.2) using the BLM Visual Resource Inventory and Evaluation System, indicating no special management attention is required.

Alternative 5 would result in the demolition of the smelter stack at the Durango site for reasons described under Alternative 2 earlier in this section. The State Historic Preservation Officer has determined the stack is eligible for inclusion on the NRHP. Stabilization of the tailings at the Long Hollow site would not affect any sites eligible for inclusion on the NRHP. Road upgrading and construction may result in the disturbance of sites that may be eligible for inclusion on the NRHP. If disturbance of sites becomes necessary, the mitigation measures discussed in Section 5.21.6 would be implemented. The impacts are summarized in Table 5.17.

5.11 IMPACTS ON POPULATIONS AND THE WORK FORCE

The impacts of each alternative on populations and the work force were evaluated by projecting the baseline populations, employment, and labor force in La Plata County and Durango for the period 1983 to the year

2000 using a version of the U.S. Bureau of Reclamation Economic Assessment Model (BREAM) (USBR, 1981) reprogrammed to run on a different computer system. This model and the projection methodology are described in greater detail in Appendix I, Information on Populations, Socioeconomics, and Land Use, in the DEIS. Conservative assumptions were used to ensure that the impacts predicted would represent the upper limit of the impacts that would occur.[a] The employment requirements of each remedial-action alternative were input into the computer model, which was used to project impacts on population and the work force[a]. The peak employment requirements were 56, 71, 64, 79, and 64 workers for Alternatives 2, 3a, 3b, 4, and 5, respectively, during remedial action. The average employment requirements were 41, 50, 58, 53, and 34 workers for Alternatives 2, 3a, 3b, 4, and 5, respectively, during remedial action.

Populations and employment trends described in Section 4.12 and Appendix I would be unaffected by the no-action alternative (Alternative 1). Impacts of the remedial action alternatives (Alternatives 2, 3a, 3b, 4, and 5) are described in detail in Section I.6.3, Appendix I in the DEIS, and summarized below.

Remedial-action Alternatives 2, 3a, 3b, 4, and 5 would cause small to moderate, temporary increases to La Plata County's population and employment. Stabilization at the Bodo Canyon site with transportation primarily by conveyor (Alternative 3b) would cause the largest employment and population increases (a total increase of 138 jobs and 309 persons in La Plata County in 1985). Stabilization at the Long Hollow site (Alternative 4) would result in slightly smaller impacts (a total increase of 129 jobs and 292 persons). Stabilization at the Bodo Canyon site using trucks only (Alternative 3a) and reprocessing and stabilization at the Long Hollow site (Alternative 5) would result in employment increases of 119 and 106 jobs, respectively, and population increases of 266 and 219 persons, respectively. Impacts of stabilization at the Durango site (Alternative 2) would be smallest (94 jobs and 210 persons). For all action alternatives, most of the population increases would occur in Durango where the maximum projected increases would be 142, 180, 208, 251, and 195 persons for Alternatives 2, 3a, 3b, 4, and 5, respectively.

The direct increases to La Plata County's employment for each alternative would induce some inmigration by construction workers; of the total project workforce, between 64 (on-site stabilization) and 86 (stabilization at Long Hollow) percent were projected to be inmigrants. As wages paid to the project's workers are respent locally, additional income and employment would be generated in the local economy. The total number of jobs generated in the county (includes remedial-action workers plus induced service-sector workers) from the remedial-action alternatives was projected at 94, 119, 138, 129, and 106 for Alternatives 2, 3a, 3b, 4, and 5, respectively.

[a]Results for Alternative 3b were based primarily on comparative labor requirements, construction schedules, and expenditures relative to Alternative 3a.

These additional employment opportunities would provide a basis for the La Plata County economy to support a larger population, and some additional inmigration would result as workers in service industries move to the area, some with families. The total increases to La Plata County's population, including workers at the stabilization sites, other migrants and families, were projected to total 210, 266, 309, 282, and 219 for Alternatives 2, 3a, 3b, 4, and 5, respectively. These population increases would range from 0.7 to 1.0 percent of the county's projected population for 1985. No long-term changes in population are expected.

Most of the short-term increase in population was projected to occur in Durango because of its proximity to the sites and its attractive amenities. The increase to Durango's population projected for each remedial-action alternative was 142, 180, 208, 251, and 195 persons for Alternatives 2, 3a, 3b, 4, and 5, respectively. The population increases would represent between 1.2 and 2.1 percent of Durango's population.

Impacts on the tourist industry in Durango were estimated for each alternative under two possible scenarios. Due to the nature of the project and the uniqueness of Durango's economy, hypothetical assumptions were constructed to guide the analysis; these are stated in Appendix N, Tourism Evaluation, in this FEIS.

In the minimum impact case, seven jobs would be lost in the Durango tourist industry each year if any of Alternatives 2 through 5 were initiated. Total labor-years of employment (one labor-year equals the employment of one person, full-time, for one year) lost range from seven (Alternative 2) to 31 (Alternative 5).

Under the probable impact case, 69 jobs per year in the Durango tourist industry would be lost if any of Alternatives 2 through 5 were initiated; this is about two percent of the annual tourist industry employment in Durango. Total labor-years of employment lost ranges from 104 under Alternative 2 to 440 (Alternative 5).

The reason for the differences lies in labor-years of employment relative to the differences in time required for completion of each alternative.

Any loss in tourist industry jobs would not necessarily be compensated for by a gain in jobs generated as a result of the remedial action. Workers employed by the tourist industry would not likely shift to employment with the Remedial Action Contractor for the following reasons:

- Any tourist industry jobs lost would occur after the start of the remedial action.
- A high, though unknown, percentage of tourist industry jobs are filled by college students (whose availability to work is coordinated with the school term or class schedules), or those without the appropriate skills to fill construction or heavy machine work jobs required by any of the proposed remedial actions.
- Many tourist industry jobs are part-time by their nature and are desirable for that reason.

5.12 IMPACTS ON HOUSING AND COMMUNITY SERVICES

Impacts on housing and community services for each remedial-action alternative were projected by comparing baseline levels of (1) occupied and vacant housing and (2) supply and demand levels for community services with the increased demands projected for each action alternative.[a] A version of BREAM (USBR, 1981) was used to project the number of new households generated by each remedial-action alternative. Conservative assumptions were used to assure that the impacts predicted would represent the upper limit of the impacts that would occur. These projected impacts on numbers of households include both workers employed at the sites for the action alternatives who migrate to La Plata County, some with dependents, and workers and their families who migrate to La Plata County to take jobs in service industries created by the spending of wages by workers employed by each action alternative. The number of new households was then compared to the stock of vacant housing (both year-round and transient) in Durango and La Plata County to determine impact. The impact on community services was assessed assuming that the proportional increase in demand for community services would be approximately equal to the proportional increase in population caused by each alternative. This increase in demand was then compared to expected excess capacities in public services in Durango and La Plata County. These results are described in greater detail in Appendix I, Information on Populations, Socioeconomics, and Land Use, Section I.6.5 in the DEIS.

The no-action alternative (Alternative 1) would not affect housing or community services in La Plata County or elsewhere. Impacts of the remedial-action alternatives (Alternatives 2, 3a, 3b, 4, and 5) are described in detail in Appendix I, in the DEIS and in the Addendum to Appendix I in the FEIS, and are summarized below.

The short-term increase in La Plata County's population caused by remedial action Alternatives 2, 3a, 3b, 4, and 5 would create additional demand for housing. The number of additional households in La Plata County was projected at 124, 158, 182, 200, and 156 for Alternatives 2, 3a, 3b, 4, and 5, respectively. Most of this impact would occur in Durango, with the increase in the city's number of households projected at 103, 131, 151, 190, and 148 for Alternatives 2, 3a, 3b, 4, and 5, respectively. The impacts of Alternative 5 would be of similar magnitude but longer in duration. The number of additional housing units in La Plata County during site preparation, tailings excavation, hauling and reprocessing, and site closeout is projected to reach a maximum of 151. These increases would be short term for Alternatives 2, 3a, 3b, and 4, lasting only as long as the construction and stabilization phases for each alternative (12 months for Alternative 2, 18 months for Alternative 3a, 22 months for Alternative 3b, and 28 months for Alternative 4). However, for Alternative 5, the increases would persist for a longer period (82 months).

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[a]Results for Alternative 3b were based on comparative labor requirements relative to Alternative 3a.

The number of year-round housing vacancies in La Plata County was 1247 in 1980, 215 of which were located in Durango. In addition, Durango has an ample supply of hotel and motel units during part of the year; such units are often favored by migrating construction workers. Under the assumption that the supply of vacant housing during the construction and stabilization period will approximate the 1980 supply of vacant housing, it is unlikely that any of the remedial-action alternatives would cause housing shortages in Durango or La Plata County.

The impact of the remedial-action alternatives on community services would be similarly minor. Most of the local services (police and fire protection, water and sewer systems, and health care) appear to have sufficient excess capacity to accommodate the low levels of increased demand associated with each remedial-action alternative. Most of the impact would occur in Durango, which has an enlarged sewage plant, has adequate water supplies, is a regional health care center with two hospitals, and which has fire protection capabilities that are above average for a city of its size. The only service that may not have excess capacity in Durango is police protection; the Durango Police Department is considered by some of its members to be short-handed, despite the fact that on a per-capita basis, it is staffed at about the regional average for a city of Durango's size. Given the low level of increased demand for services projected for each action alternative, the short term of the impact, and the existence of excess capacity for most services, the impact on community services for each remedial action alternative is considered minor.

5.13 IMPACTS ON ECONOMIC STRUCTURES

Impacts of each remedial action alternative were evaluated by projecting the effect on personal income and on public finance. Personal income impacts were estimated by using a version of the U.S. Bureau of Reclamation Economic Assessment Model (BREAM) (USBR, 1981), which is described in Appendix I, Information on Populations, Socioeconomics, and Land Use, Section I.6.5, in the DEIS.[a] The direct employment of each action alternative and local wage factors were entered into the model, which then produced projections of changes in personal income in La Plata County based on interrelationships between the county's population, employment, and personal income. Impacts on public finance were estimated by evaluating changes in assessed valuation of land at the applicable site(s) brought about by each action alternative, and applying the relevant property tax rate. State and Federal income taxes generated by direct employment for each alternative were projected based on estimates of wage payments and application of income tax rates. Local and state sales taxes would not be directly affected by any action alternative, since purchases for Federal projects are exempt from local and state sales taxes. This impact methodology is described in greater detail in Appendix I, in the DEIS. Appendix N, Tourism Evaluation, in this FEIS describes the tourism industry in the Durango area and presents the predicted impacts on tourism under two scenarios.

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[a]Results for Alternative 3b were based on comparative labor requirements relative to Alternative 3a.

Impacts on La Plata County's economic structures arising from the remedial-action alternatives would be very small because of the low level of employment and income earned by workers at the project and in related industries. Impacts on land values and public costs and revenues are also expected to be small.

Alternative 1 - no action

The no-action alternative would not affect economic structures in the city of Durango or La Plata County but would preclude economic benefits that could otherwise result from development of the Durango site. The economic benefits that could be derived from development of the Durango site would be equivalent to the value of the land released for development if the tailings and other contaminated materials were concentrated in a smaller area or completely removed from the site. Thus, the value of the Durango site would be increased by about $2.8 to $4.6 million (1983 dollars), assuming a maximum average value of $65,000 per acre for relatively level land and $1000 per acre for the steeply sloped land. An appraisal of the value of the Durango site is being prepared by the U.S. Army Corps of Engineers. No changes to the tourism industry are expected to result from the no action alternative.

Alternative 2 - on-site stabilization

Impacts on economic structures in La Plata County arising from on-site stabilization at the Durango site would be the lowest of the action alternatives. Impacts on the economy would result from wages and fringe benefits paid to workers and the purchase of materials, supplies, and services from local vendors. The largest contribution to the economy would be wages and benefits.

Wages paid to project workers in 1983 dollars are projected to total about $1.15 million through completion of stabilization, and $11,440 per year thereafter for environmental monitoring, based on the wage schedule in Table I-7, Appendix I, Information on Populations, Socioeconomics, and Land Use, in the DEIS. Also, approximately $0.26 million in benefits would be paid during stabilization and $2300 annually following stabilization.

Assuming an income multiplier of 1.85[a], which indicates that for every dollar in wages paid to project workers an additional $0.85 is earned in the service sectors of La Plata County, total personal income in La Plata County would rise by approximately $2.12 million during stabilization at the Durango site. Following stabilization, the annual impact on total personal income for La Plata County would be about $21,200 because of post-stabilization environmental monitoring.

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[a]A multiplier of about 1.85 was derived from preliminary test runs using the BREAM model.

Forecasts of the project's impact on personal income in La Plata County indicate that it is small. The projected increase to La Plata County total personal income is $1,145,000 (1972 dollars[b]), occurring in 1985. This level of impact would represent only about 0.7 percent of total county personal income projected for 1985.

Local purchases of supplies and materials for the project would be minimal. Concrete purchases are estimated at $14,000. An estimated 378,300 gallons of fuel and lubricating oil will also be necessary; at an average cost of $1.20 per gallon, the total value of these purchases would be about $454,000. This volume of purchases would not noticeably affect local personal income.

Local, state, and Federal tax receipts would be slightly changed by implementation of Alternative 2. The primary taxes affected would be state and Federal income taxes. Local property taxes would be slightly reduced by removal of the Durango site from local tax roles. The site is currently assessed at about $200 per acre or $25,200, and at current tax rates ($70 per $1000 assessed value) the owner pays approximately $1764 in annual property taxes to La Plata County. If, by remedial action under Alternative 2, the land value of the Durango site would be increased to $2.8 million and the assessed valuation to $62,750, the county's tax receipts would increase to $2629 annually. If the site is annexed by the city of Durango, the city would be benefitted by $285 annually based on the current city property tax rate of $4.54 per $1000 of assessed valuation.

State income taxes would increase because of wages earned by workers at the project. The average annual full-time equivalent wage earned by construction and stabilization employees would be $28,015. At a state average income tax rate of two percent for this income class, direct state income tax payments would be $22,972, based on total wage payments of $1,148,601 (see Table I-7, Appendix I, Information on Populations, Socioeconomics, and Land Use, in the DEIS). Federal income taxes would be about $172,300 assuming an average rate of 15 percent. Annual state income tax payments from post-stabilization monitoring would total $230, and Federal taxes $1700, based on the same average income tax rates. The respending of wage income would also result in increased state and Federal income taxes; however, this induced income would be realized in a number of forms (individual and corporate income, interest income, and the like) and is, therefore, not readily quantifiable.

Losses to personal income, taxable retail sales, and sales tax receipts would occur if the Durango tourist industry were affected. These losses under two possible scenarios are summarized in Table 5.18. See Appendix N, Tourism Evaluation, in this FEIS, for a description of the methodology and assumptions.

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[b]BREAM uses 1972 dollars as its standard accounting unit for dollar figures.

Table 5.18 Durango tourism industry losses by remedial action alternatives

	Alternative[a]				
Scenario	2	3a	3b	4	5
Minimum impact					
Personal income	144,000	218,000	266,000	339,000	619,000
Taxable retail sales	117,000	176,000	215,000	273,000	497,000
Sales tax receipts	2,000	4,000	5,000	6,000	10,000
Probable estimated impact					
Personal income	2,100,000	3,100,000	3,800,000	4,800,00	8,700,000
Taxable retail sales	1,600,000	2,500,000	3,100,000	3,800,000	7,000,000
Sales tax receipts	33,000	49,000	60,000	77,000	140,000

[a]Expressed in 1984 dollars.

Alternative 3a - stabilization at Bodo Canyon with transportation by truck

Impacts on the economy of La Plata County arising from Alternative 3a would result primarily from wages and benefits paid to the remedial-action workers. This impact, while beneficial, would be small given the present magnitude of total personal income in the county.

Wages paid to project workers in 1983 dollars are projected to total about $2.04 million during stabilization, and $11,440 annually thereafter for environmental monitoring, based on the wage schedule in Table I-9, Appendix I, in the DEIS. In addition, benefits would total about $0.47 million during stabilization at the Bodo Canyon site and $2300 per year following stabilization.

Assuming an income multiplier of 1.85, total personal income for La Plata County would increase by $3.78 million during stabilization and about $21,200 annually thereafter because of environmental monitoring.

Employment and income projections indicate that the impact of Alternative 3a on La Plata County's income patterns would be small because the income provided directly by wage payments would be small compared to overall La Plata County income. The projections show that the maximum increase to La Plata County per-capita income from stabilization in Bodo Canyon would be $3 in 1986 (from $5365 to $5368 in 1972 dollars). The impact on total personal income for the county would be a maximum of $1,449,000 (1972 dollars), occurring during 1985, the only full year of construction and stabilization. This impact represents 0.9 percent of La Plata County's total personal income projected for 1985.

Local purchases of supplies and materials for the project would be small. Concrete purchases are estimated at $28,000. The 1,029,400 gallons of fuel and lubricating oil would cost almost $1,310,900 at $1.20 per gallon. This volume of local purchases would not noticeably increase personal incomes in La Plata County.

Under Alternative 3a, local, state, and Federal tax receipts would be slightly changed. The primary taxes affected would be Federal income taxes. Alternative 3a would also have a small effect on local property taxes. Once the Durango site has been cleared and reclaimed, its 126 acres would be available for development and its assessed valuation would increase. The current assessed valuation is approximately $200 per acre, whereas commercial and industrial properties to the south are assessed at approximately $1000 per acre. Because of its greater proximity to Durango, the Durango site property would probably have a slightly higher valuation. If a valuation of $1250 per acre is appropriate for the site's 70 acres of relatively level land and $1000 per acre for the remaining 56 acres of steeply sloped land, its assessed valuation upon completion of the remedial actions would be $98,700, an increase of $73,500. At the current property tax rate of $70 per $1000 assessed valuation, La Plata County would be benefitted by $5145 annually, or approximately 0.4 percent of the county's 1982 budgeted property tax receipts. If the city of Durango annexed the site following completion of remedial action, the city would be benefitted by $448 annually.

State income taxes would increase because of wage payments to the workers. The average annual full-time equivalent wage for the project would be $27,225; the average state income tax for all families (including single persons) with incomes of $25,000 to $35,000 in 1981 was $602, or about two percent. Therefore, direct state income taxes paid by remedial-action workers would be $40,837 based on total wage payments of $2,041,843 (see Table I-9, Appendix I, Information on Populations, Socioeconomics, and Land Use, in the DEIS). Annual state tax payments from post-stabilization environmental monitoring would be $230. Based on an average Federal income tax rate of about 15 percent, Federal income taxes would be increased by about $306,300 during remedial actions and $1700 annually thereafter. The respending of wage income would also result in increased state and Federal income taxes; however, this induced income would be realized in a number of forms (individual and corporate income, interest income, and the like) and is, therefore, not quantified in this analysis.

Losses to personal income, taxable retail sales, and sales tax receipts would occur if the Durango tourist industry were affected. These losses under two possible scenarios are summarized in Table 5.18. See Appendix N, Tourism Evaluation, in this FEIS for a description of the methodology and assumptions.

<u>Alternative 3b - stabilization at Bodo Canyon with transportation primarily by conveyor</u>

Impacts on the economy of La Plata County arising from Alternative 3b would result primarily from wages and benefits paid to the remedial-action workers. This impact, while beneficial, would be small given the present magnitude of total personal income in the county.

Wages paid to project workers in 1983 dollars are projected to total about $3.48 million during stabilization, and $11,440 annually thereafter for environmental monitoring, based on the wage schedule in Table I.19 in the Addendum to Appendix I, Information on Populations, Socioeconomics, and Land Use, in this FEIS. In addition, benefits would total about $0.75 million during stabilization at the Bodo Canyon site and $2300 per year following stabilization.

Assuming an income multiplier of 1.85, total personal income for La Plata County would increase by $6.44 million (1983 dollars) during stabilization and about $21,200 annually thereafter because of environmental monitoring.

Employment and income projections indicate that the impact of Alternative 3b on La Plata County's income patterns would be small because the income provided directly by wage payments would be small compared to overall La Plata County income. The projections show that the maximum increase to La Plata County per-capita income from stabilization in Bodo Canyon would be $3 in 1986 (from $5365 to $5368 in 1972 dollars). The impact on total personal income for the county would be a maximum of $1,665,000 (1972 dollars), occurring during 1985, the only full year of construction and stabilization. This impact represents 1.1 percent of La Plata County's total personal income projected for 1985. Local purchases of supplies and materials for the project would be small, and the volume of local purchases would not noticeably increase personal incomes in La Plata County.

Under Alternative 3b, local, state, and Federal tax receipts would be slightly changed. The primary taxes affected would be Federal income taxes. Alternative 3b would also have a small effect on local property taxes. Once the Durango site has been cleared and reclaimed, its 126 acres would be available for development and its assessed valuation would increase. The current assessed valuation is approximately $200 per acre, whereas commercial and industrial properties to the south are assessed at approximately $1000 per acre. Because of its greater proximity to Durango, the Durango site property would probably have a slightly higher valuation. If a valuation of $1250 per acre is appropriate for the site's 70 acres of relatively level land and $1000 per acre for the remaining 56 acres of steeply sloped land, its assessed valuation upon completion of the remedial actions would be $98,700, an increase of $73,500. At the current property tax rate of $70 per $1000 assessed valuation, La Plata County would be benefitted by $5145 annually (1983 dollars), or approximately 0.4 percent of the county's 1982 budgeted property tax receipts. If the city of Durango annexed the site following completion of remedial action, the city would be benefitted by $448 annually (1983 dollars).

State income taxes would increase because of wage payments to the workers. The average annual full-time equivalent wage for the project would be $27,225 (1983 dollars); the average state income tax for all families (including single persons) with incomes of $25,000 to $35,000 in 1981 was $602, or about two percent. Using 1981 tax rates, direct state income taxes paid by remedial-action workers would be $69,555 based on total wage payments of $3,477,732 (see Table I-11, Appendix I, Information on Populations, Socioeconomics, and Land Use, in the DEIS). Annual state tax payments from post-stabilization environmental monitoring would be $230. Based on an average Federal income tax rate of about 15 percent, Federal income taxes would be increased by about $521,700 during remedial actions and $1700 annually thereafter. The respending of wage income would also result in increased state and Federal income taxes; however, this induced income would be realized in a number of forms (individual and corporate income, interest income, and the like) and is, therefore, not quantified in this analysis.

Losses to personal income, taxable retail sales, and sales tax receipts would occur if the Durango tourist industry were affected. These losses under two possible scenarios are summarized in Table 5.18. See Appendix N, Tourism Evaluation, in this FEIS for a description of the methodology and assumptions.

Alternative 4 - stabilization at Long Hollow

Impacts on the economy of La Plata County arising from stabilization at the Long Hollow site would be slightly greater than those described for Alternative 3a, resulting primarily from wages and fringe benefits paid to remedial-action workers.

Wages paid, in 1983 dollars, to remedial-action workers are projected to be approximately $3.24 million during stabilization and $11,440 per year after stabilization for environmental monitoring (see Table I-11, Appendix I, Information on Populations, Socioeconomics, and Land Use, in the DEIS). Fringe benefits paid to workers would total approximately $0.77 million during construction activities and about $2300 annually thereafter.

Because of the 1.85 multiplier effect, total personal income for La Plata County would increase by $5.99 million through the completion of stabilization at Long Hollow and would continue at an annual rate of about $21,200 because of post-stabilization monitoring.

Forecasts of the impact of Alternative 4 on total personal income in La Plata County would be small because wages paid would be small compared to overall La Plata County income. The maximum projected increase to per-capita income in La Plata County, as a result of Alternative 4 would be $3 in 1987, rising from $5365 to $5368. The total personal income projections for La Plata County show a maximum increase occurring in 1985 of $1,533,000 attributable to the project (1972 dollars), or about 1.0 percent of La Plata County's total personal income projected for 1985. This is slightly more than the impact projected for Alternative 3a.

Local purchases of supplies and materials for the project would be small. Concrete purchases are estimated at $28,000. The 1,660,300 gallons of fuel and lubricant necessary for the project would cost about $1,992,400 at $1.20 per gallon. This volume of local purchases would not noticeably affect personal income levels in La Plata County.

Local, state, and Federal tax receipts would be slightly changed by implementation of Alternative 4. State and Federal income taxes would be the primary taxes affected. Alternative 4 would also have small effects on local property and sales taxes. Increases in property taxes from availability of the Durango site for development would be equivalent to those described for Alternative 3. The Long Hollow site would be purchased by the Federal Government and would not be subject to property taxes. Assessed value at the Long Hollow site is currently about $40 per acre; the loss of the assessed value would cost La Plata County approximately $192 annually at the current rate of taxation ($64 per $1000 assessed value).

State income taxes would increase because of wages earned by workers at the project. The average annual full-time equivalent wage would be $28,574; the average state income for all families (including single persons) with incomes of $25,000 to $35,000 in 1981 was $602, or about two percent. Therefore, direct state income taxes paid by construction and stabilization workers at the project would be $64,785 based on total wage payments of $3,239,273 (see Table I-11, Appendix I, Information on Populations, Socioeconomics, and Land Use, in the DEIS). Annual state income tax payments from post-stabilization monitoring would be $230. Based on an average Federal income tax rate of about 15 percent, Federal income taxes would be increased by about $485,000 during remedial actions and by about $1700 per year thereafter. The respending of wage income would also result in increased state and Federal income taxes; however, this induced income would be realized in a number of forms (individual and corporate income, interest income, and the like) and is, therefore, not quantified in this analysis.

Losses to personal income, taxable retail sales, and sales tax receipts would occur if the Durango tourist industry were affected. These losses under two possible scenarios are summarized in Table 5.18. See Appendix N, Tourism Evaluation, in this FEIS for a description of the methodology and assumptions.

Alternative 5 - reprocessing and stabilization at Long Hollow

Impacts on the economy of La Plata County arising from reprocessing and stabilization at the Long Hollow site would be similar to those described for Alternative 4; however, they would result primarily from wages and fringe benefits paid to remedial-action workers involved in tailings transport and reprocessing.

Wages paid in 1982 dollars to remedial-action workers are projected to be approximately $7.57 million during all three phases of Alternative 5 and $11,440 per year after stabilization for environmental monitoring. These amounts are based on the wage scale in Table I-13, Appendix I, Information on Populations, Socioeconomics, and Land Use, in the DEIS. Fringe benefits paid to workers would total slightly more than $1.76 million during the three phases and about $2300 annually thereafter.

Assuming a 1.85 multiplier effect, the total personal income for La Plata County would increase by $14.0 million through the completion of site closeout at Long Hollow and would continue at an annual rate of about $21,200 because of post-stabilization environmental monitoring.

Forecasts of the impact of Alternative 5 on total personal income in La Plata County would be small because the wages would be small compared to overall La Plata County income. The maximum projected increase to per-capita income in La Plata County, as a result of Alternative 5, would be $4 in 1987, 1988, and 1990. The total personal income projections for La Plata County show a maximum increase occurring in 1989 of $1,327,000 attributable to the project (1972 dollars), or less than 1.0 percent of La Plata County's total personal income projected for 1989. This is slightly less than the impacts projected for Alternatives 3a, 3b, and 4.

Local purchases of supplies and materials for the project would be small. Concrete purchases are estimated at $138,000. The 2,201,700 gallons of fuel and lubricant necessary for the project would cost approximately $2,642,000 at $1.20 per gallon. Given the 82-month project duration, this volume of local purchases would not noticeably affect personal income levels in La Plata County.

Local, state, and Federal tax receipts would be slightly changed by implementation of Alternative 5. State and Federal income taxes would be the primary taxes affected. Alternative 5 would also have small effects on local property and sales taxes. Increases in property taxes from availability of the Durango site for development would be equivalent to those described for Alternative 3a. The Long Hollow site would be purchased by the Federal Government and would not be subject to property taxes. Assessed value at the Long Hollow site is currently about $40 per acre; the loss of the assessed value would cost La Plata County approximately $500 annually at the current rate of taxation ($64 per $1000 assessed value).

State income taxes would increase because of wages earned by workers at the project. The average annual full-time equivalent wage would be $27,694; the average state income tax for all families (including single persons) with incomes of $25,000 to $35,000 in 1981 was $602, or about two percent. Therefore, direct state income taxes paid by construction and stabilization workers at the project would be $151,393 based on total wage payments of $7,569,663 (Table I-13, Appendix I, Information on Populations, Socioeconomics, and Land Use, in the DEIS). Annual state income tax payments from post-stabilization monitoring would be $230. Based on an average Federal income tax rate of about 15 percent, Federal income taxes would be increased by almost $1.14 million during remedial actions and by about $1700 per year thereafter. The respending of wage income would also result in increased state and Federal income taxes; however, this induced income would be realized in a number of forms (individual and corporate income, interest income, and the like) and is, therefore, not quantified in this analysis.

Losses to personal income, taxable retail sales, and sales tax receipts would occur if the Durango tourist industry were affected. These losses under two possible scenarios are summarized in Table 5.18. See Appendix N, Tourism Evaluation, in this FEIS for a description of the methodology and assumptions.

5.14 IMPACTS ON TRANSPORTATION NETWORKS

Impacts of the five remedial-action alternatives on transportation networks would consist of increases in truck and automobile traffic on local roads. To estimate these impacts, the traffic generated by activity by each site was first estimated. This traffic generally would consist of (1) truck trips necessary to prepare the sites and transport tailings, (2) miscellaneous trips such as visitation by contractors', associates, and employee trips during lunch, and (3) trips generated by employees commuting to work. Then, the primary roads upon which these trips would be made were identified. The volume of average daily trips (ADTs) and assumed peak hour trips generated by each alternative were compared to daily traffic volume data for the roads affected to determine impact. Peak hour volume on all roadway segments was assumed to be 10 percent of the ADT for that segment. Traffic accidents caused by the three remedial-action alternatives were then estimated by applying accidents-per-vehicle-mile-travelled averages to projections of increased vehicle-miles travelled (VMT) associated with each remedial-action alternative.

Alternative 1 - no action

The no-action alternative would not affect traffic volumes or accident frequency.

Alternative 2 - on-site stabilization

Stabilization at the Durango site would increase trips on local roads, primarily on U.S. Highway 550 and County Road 211. The 56 workers at the site would add 56 peak-hour trips and 112 average daily trips to local roads. Miscellaneous trips for deliveries and by visitors and workers were assumed to add another daily 100 round-trips to the site (200 ADTs). Trucks and heavy equipment would be stored at the site, requiring once-only road trips to the site over the construction and stabilization period. Thus, a conservative estimate of total ADTs generated by Alternative 2 is 312. This estimate, as well as those presented for other alternatives, is conservative because site-related ADTs would occur only during the work week and are five-day averages. ADT data for affected roads are calculated on a seven-day average basis.

Except during the first month of construction, access to the Durango site would be from the south via the signalized intersection of U.S. Highway 550 and County Road 211 to the newly constructed haul road which would run between the raffinate ponds and Smelter Mountain. Construction worker parking would be provided in the raffinate ponds area. During the initial construction period, access to the site would be via U.S. Highway 160 and across the Lightner Creek bridge. Traffic during this period would be no more than 30 trips per day.

Almost all of the 312 site-related ADTs would occur, in part, on U.S. Highway 550. In 1982, traffic volume on U.S. Highway 550 ranged from 12,500 to 14,600 ADTs at counter locations near the Durango site. Thus, the maximum increase would be 2.5 percent. The average daily peak-hour traffic on U.S. Highway 550 is assumed to be approximately 1350 vehicles. The estimated peak-hour increase attributable to the remedial action is approximately 4.1 percent of that value. This is considered an insignificant addition to the peak-hour traffic.

Transportation of borrow and quarried materials from the Bodo Canyon site would increase the ADTs on County Road 211 by approximately 280 trips per day. There are no ADT data for this roadway but its current usage is light.

During the remedial action, only County Road 211 would be subject to a significant increase in axle loading. Such an increase would be expected to degrade the quality of the roadway by producing ruts and chuckholes. Since the remedial-action plans include roadway upgrading through the addition of surface gravel, safety berms, and drainage ditches, no such degradation would be expected. The DOE would implement a roadway maintenance program to maintain the quality of County Road 211 during remedial action.

Average trip distances for employees commuting would be relatively short, since most employees are expected to live in Durango. Assuming an average distance to work of about 10 miles, daily commuting would generate 3120 vehicle-miles travelled (VMT). Miscellaneous trips would originate primarily from Durango, but some may be long-distance trips from other primary cities in the region. Assuming an average trip length of about 20 miles, miscellaneous trips would generate 400 VMT daily for a total daily average of 7120 VMT generated by Alternative 2. Based on national average accident data (National Safety Council, 1982), during the period of the remedial action, about 21.6 accidents would occur during trips related to the project resulting in an estimated 0.06 death.

Alternative 3a - stabilization at Bodo Canyon with transportation by truck

Stabilization at the Bodo Canyon site under Alternative 3a would increase local traffic volumes primarily on County Road 211 (Bodo Canyon Road), County Road 212 (Smelter Mountain Road), and U.S. Highway 550. Bodo Canyon Road, Smelter Mountain Road, the proposed haul road from the Durango site to County Road 211, and the access road to the Bodo Canyon site would be widened to a 35-foot width and upgraded to accommodate 25-ton-capacity trucks. Approximately 544 ADTs would be required to transport the tailings between the sites. Miscellaneous trips are expected to cause about 200 ADTs. The 71 employees would add a maximum of 71 peak-hour trips and 142 ADTs, assuming one worker per car. The total ADTs generated by Alternative 3a would be 886.

Assuming that all trips occur on U.S. Highway 550, the maximum increase to ADTs on U.S. Highway 550 would be 7.1 percent. Using the same assumption, the maximum increase to peak-hour trips on U.S. Highway 550 would be 5.3 percent. Since truck trips for tailings transport would not occur on U.S. Highway 550, but only on Bodo Canyon Road, a more reasonable, yet still conservative estimated increase in ADTs would be 2.7 percent.

Traffic-volume data do not exist for County Road 211 and County Road 212 but field reconnaissance indicated traffic is very light. It is possible that all of the 886 ADTs generated by Alternative 3a could occur on County Road 211. However, once the road is widened, it would be suitable to accommodate this level of traffic (about two trips per minute assuming eight-hour days and a peak-hour volume of approximately 70 vehicles).

During the remedial action, only County Road 211 would be subject to a significant increase in axle loading. Such an increase would be expected to degrade the quality of the roadway by producing ruts and chuckholes. Since the remedial action plans include roadway upgrading through the addition of surface gravel, safety berms, and drainage ditches, no such degradation would be expected. The DOE would implement a roadway maintenance program to maintain the quality of County Road 211 during remedial action.

The road distance between the Durango and Bodo Canyon sites is about 3.5 miles. Therefore, daily truck trips would generate about 1900 VMT. Workers would generate 1420 VMT daily, assuming a 10-mile average trip distance, and miscellaneous trips may add about 4000 VMT daily if a 20-mile average applies. Therefore, about 7320 VMT would be generated daily by Alternative 3a. Based on national average accident data (National Safety Council, 1982), about 22.5 accidents would occur during trips related to the project resulting in an estimated 0.06 death.

Alternative 3b - stabilization at Bodo Canyon, transportation primarily by conveyor

Even though most of the contaminated materials would be transported by conveyor, 14 daily truck trips would still be required for transport of some contaminated materials (e.g., smelter slag and demolition rubble).

Additional traffic would be created on local roads and highways as workers commute to and from their job sites and as miscellaneous trips are taken. Worker commuting would result in a peak of 128 daily trips that would generate 1280 vehicle-miles traveled (VMT) daily (assuming a 10-mile travel distance). Miscellaneous trips (200 daily) would result in 4000 VMT per day, assuming a 20-mile travel distance.

If it were assumed that all project-related trips (342 daily trips) were to occur on U.S. Highway 550, the maximum increase in ADTs on U.S. Highway 550 would be 2.7 percent; the maximum increase to peak-hour trips on U.S. Highway 550 would be 4.7 percent. Since truck trips for tailings and borrow materials transport would not occur on U.S. Highway 550, but only on County Road 211, a more reasonable, yet still conservative estimated increase in ADTs on U.S. Highway 550 would be 2.6 percent.

Traffic volume data do not exist for County Road 211, but field reconnaissance indicated that traffic is very light. Even if all 342 daily project-related trips were to occur on County Road 211, this road, after the proposed upgrading, should be able to easily handle the additional project-related traffic.

A total of 5329 VMT per day would be generated by Alternative 3b on local roads; 2,500,320 VMT would be generated over the entire construction period. Based on nationwide average accident data, approximately 15.4 accidents and 0.04 death would be expected due to project-related traffic over the entire construction period.

Alternative 4 - stabilization at Long Hollow

Stabilization at the Long Hollow site would increase traffic volumes on County Roads 211 and 141, and on U.S. Highways 550 and 160. Traffic volume on U.S. Highway 160 near the 160/550 junction totals 8650 ADTs. Traffic generated by Alternative 4 at the peak of activities would consist of approximately 540 ADTs by approximately 75 workers at either site. If all of the 350 trips for commuting and miscellaneous purposes occur on U.S. Highways 550 or 160, the maximum increase in ADTs on these roads would be 2.8 and 4.0 percent, respectively. No traffic counts have been made for County Road 141 near the Long Hollow site. The nearest location for which traffic counts exist is about eight miles north of the Long Hollow site near the junction of Wildcat Canyon Road (County Road 141) with U.S. Highway 160. A count of 901 ADTs was recorded at that location in 1981. It was observed during field reconnaissance that the current ADTs near the Long Hollow site are light. County Road 141 would experience limited use for worker commuting early in the project during construction of the haul road. As noted earlier, no traffic data were available for County Road 211. However, since this road will be widened and upgraded to accommodate truck traffic, and since it is lightly traveled, no significant impact on its capacity to accommodate vehicle traffic is expected.

During the remedial action, only County Road 211 would be subject to a significant increase in axle loading. Such an increase would be expected to degrade the quality of the roadway by producing ruts and chuckholes. Since the remedial-action plans include roadway upgrading through the addition of surface gravel, safety berms, and drainage ditches, no such degradation would be expected. The DOE would implement a roadway maintenance program to maintain the quality of County Road 211 during remedial action. Rather than use County Road 141 as a transportation route for hauling tailings, a new haul road approximately two miles in length would be constructed between County Road 211 and the Long Hollow site.

The road distance between the Durango and Long Hollow sites is approximately 11 miles. Therefore, transport of the tailings would generate about 5940 VMT. Assuming an average commuting distance of 20 miles, employees would generate about 3000 VMT. Miscellaneous trips would generate 6000 VMT at 30 miles per trip. Gravel haul trips would generate 6900 VMT at 30 miles per round trip over 103 working days (about five months). Thus, about 14,940 VMT per day would be generated during the last 17 of the 28 months required for the project, and about an average of 11,050 daily VMT would be generated during the first 11 months. Application of average accident-per-vehicle-mile-traveled data to this travel distance results in an estimate of 95.1 accidents generated because of Alternative 4 resulting in an estimated 0.27 fatalities.

Alternative 5 - reprocessing and stabilization at Long Hollow

Traffic impacts for reprocessing and stabilization at Long Hollow in many ways (e.g., roadways affected) would be similar to Alternative 4 (stabilization at Long Hollow). The primary differences would be the extended tailings transport period, the relocation of the plant facilities to be used in reprocessing operations from Naturita to Long Hollow (145 miles), the transport of materials used in the reprocessing operation (e.g., sulfuric acid, soda ash, sodium chlorate, activated carbon), and the transport of the recovered uranium and vanadium. The reprocessing plant facilities would be transported via Colorado Highway 141 to Dove Creek, then U.S. Highway 666 to Cortez, then U.S. Highway 160 to County Road 141 to the site. Most of the chemicals would be transported by truck from Grand Junction via U.S. Highways 50 and 550 (155 miles); the sulfuric acid would be expected to come from Gallup, New Mexico, via U.S. Highways 666 and 550 (150 miles). For purposes of analysis, uranium and vanadium recovered through reprocessing are assumed to be transported to Blanding, Utah, via U.S. Highway 160, a distance of 130 miles.

Existing traffic conditions on County Roads 211 and 141 and U.S. Highways 550 and 160 were described above for Alternative 4. Traffic volumes generated by reprocessing-related operations would be very low (two to three trips per day from Gallup for sulfuric acid deliveries during reprocessing operations, roughly one truck trip per day to deliver chemicals from Grand Junction, and a total of six to seven shipments per month of uranium and vanadium). Thus, impacts on U.S. Highways 666, 550, and 160 between Gallup, Grand Junction, Blanding, and the Durango area would be minor.

The highest traffic volumes associated with this alternative would be during reprocessing operations (Months 11 through 62). During this period, there would be approximately 128 ADTs associated with workers commuting (64 workers), 144 ADTs for tailings transport (72 two-way truck trips), and 200 ADTs for miscellaneous purposes. The 144 ADTs for tailings transport would occur on County Road 211. If the 328 trips for commuting and miscellaneous purposes occur on U.S. Highways 550 or 160, the maximum increase in ADTs on these roadways would be 2.6 and 3.8 percent, respectively. Peak-hour increases to these roadways would be 4.7 and 7.4 percent, respectively. Although no traffic data are available for County Road 211, and since this roadway is lightly travelled and will be widened and upgraded to accommodate truck traffic, traffic flow-related impacts are expected to be minor. As described for Alternative 4, County Road 211 would be subject to increased axle loading because of project heavy-truck traffic. This would be expected to degrade roadway quality by producing ruts and chuckholes. The planned upgrading of County Road 211 and implementation of roadway maintenance programs, would mitigate these impacts.

Transport of contaminated materials to the Long Hollow site (tailings suitable for reprocessing and other contaminated soils unsuitable for reprocessing) would generate about 1,935,000 VMT. Employee commuting would generate an additional 1,478,000 VMT over the entire duration of this alternative. Other project activities (e.g., deliverables of sulfuric acid, other chemicals, other materials, and shipment of product) would generate an additional 1,347,000 VMT. Thus, Alternative 5 would generate approximately 4,760,000 total VMT. Applying average accident-per-vehicle-mile travelled data to this total mileage indicates that Alternative 5 would produce an estimated 55.7 injury accidents and 0.16 fatalities.

5.15 USE OF ENERGY AND OTHER RESOURCES

Each of the remedial-action alternatives would require the use of fuel and lubricants, electricity, water, manpower, and construction materials such as soil and concrete. In addition, Alternative 5 (reprocessing and stabilization) would require the use of assorted chemicals and products in the actual reprocessing activities, including sizeable quantities of sulfuric acid and kerosene. The use of water, manpower, and soils would not be a commitment of nonrenewable resources; however, the uses of engine fuel and lubricants, chemicals, electricity, concrete, and nonsalvageable steel would be. The amounts of these materials that would be used in Alternatives 2, 3a, 3b, 4, and 5 are shown in Table 5.19. Also shown are the amounts of kerosene and sulfuric acid used in Alternative 5. More detail is provided in Appendix A, Conceptual Designs and Engineering Evaluation, Remedial Action Alternatives, and in the Addendum to Appendix A in this FEIS. The amount of nonsalvageable steel used (for concrete reinforcement) in these alternatives would be negligible.

Engine fuel and lubricants would be required for the earthmoving equipment and construction-related machinery used in the four remedial-action alternatives. Electricity would be needed to power the office-trailer facilities and the water pumps for the truck-wash stations at all three sites, and to power the reprocessing facilities required under Alternative 5. Fuel and electricity requirements are tabulated in Table 5.19. Engine fuel and electricity are in ample supply in the La Plata County area. Electricity at the Durango, Bodo Canyon, and Long Hollow sites could be provided by existing power lines. Total electricity demand required under Alternative 5, although considerably larger than that required under Alternatives 2, 3a, 3b, and 4, would be spread over a much longer timeframe.

Table 5.19 Energy and other resource requirements

Alternative	Engine fuel: #2 diesel (gallons)	Engine fuel: #1 diesel (gallons)	Lubricants (gallons)	Sulfuric acid (tons)	Electricity (kilowatt-hours)	Concrete (cubic yard)	Cement (tons)
2	369,000	--	9,300	--	33,600	225	8,352
3a	1,069,000	--	23,400	--	79,200	450	159
3b	936,000	--	16,000	--	4,044,000	450	159
4	1,618,000	--	42,300	--	88,000	450	159
5[a]	2,730,000	245,000	62,700	95,300	2,567,000	1,120	159

[a] In addition, for Alternative 5 (reprocessing and stabilization), the following materials will be consumed: NaCl, 3000 tons; soda ash, 2800 tons; sodium chlorate, 1550 tons; activated carbon, 550 tons; NH_3, 600 tons; NaOH, 750 tons; scrap iron, 300 tons; alamine 336, 60 tons; decyl-alcohol, 25 tons; tributyle phosphate, 15 tons; hydrogen peroxide, 35 tons.

Minor amounts of concrete would be needed to construct the pads for truck-wash stations at all three sites. However, Alternative 5 would require additional amounts of concrete to construct the foundation pads for the reprocessing equipment and tanks. Under Alternative 2, 176,000 sacks (8272 tons) of cement would be required to construct the grouted riprap-erosion barriers.

5.16 NONRADIOLOGICAL IMPACTS OF ACCIDENTS

In the remedial-action alternatives, the major hazards would be those typically associated with earthmoving construction projects, i.e., hazards from falls, transportation, and equipment-related hazards. The expected numbers of work-related accidents have been calculated for each action alternative, based on incidence rates for 1981. The results of the calculations are summarized in Table 5.20.

5.17 RELATIONSHIP TO LAND-USE PLANS, POLICIES, AND CONTROLS

Alternative 1 - no action

The no-action alternative would not affect or be affected by land-use plans, policies, or controls of any public agency. No land-use changes would occur. No zoning or adopted comprehensive plan designations apply to the Durango site. Although the site is designated in the La Plata County draft comprehensive plan as within the "growth ring" area (suitable for urban uses and population densities), this plan has not been formally adopted by the La Plata County Commissioners. The no-action alternative, however, would preclude more productive use being made of the Durango site.

Alternative 2 - on-site stabilization

Stabilization at the Durango site would not affect land-use plans, policies, or controls of any public agency for the same reasons cited for Alternative 1. Because of its status as a Federal project, Alternative 2 would not be subject to plans, policies, or controls of either the city of Durango or La Plata County. Ownership of the Durango site would be acquired by the State of Colorado for ultimate transfer to the Federal Government. Following the completion of the remedial actions, the ownership of the approximately 38-acre stabilized site would be transferred to the Federal Government and would be restricted from other land uses. The remainder of the Durango site (88 acres) would be available for development and would likely be annexed eventually by the city of Durango.

Alternative 3a - stabilization at Bodo Canyon with truck transport

Stabilization at the Bodo Canyon site under Alternative 3a would not directly affect land-use plans, policies, or controls related to the Durango site, but may have indirect effects on plans, policies, or controls. Plans, policies, and controls related to the Bodo Canyon site would be directly affected.

Table 5.20 Expected number of work-related accidents[a]

Type	Alternative 2	Alternative 3a	Alternative 3b	Alternative 4	Alternative 5
Accidental deaths among:					
Construction workers[b]	0.011[c]	0.018	0.017	0.021	0.060[d]
Truck drivers	0.003	0.007	0.001	0.019	0.029
Total accidental deaths	0.014	0.025	0.018	0.040	0.098
Disabling injuries[e] among:					
Construction workers[b]	0.86	1.45	1.36	1.68	5.61[d]
Truck drivers	1.13	2.78	0.29	7.45	8.96
Total disabling injuries	1.99	4.23	1.65	9.13	14.57

[a]Calculated using manpower schedules in Appendix A in the DEIS (Tables A-6, A-11, A-20, A-21, and A-22), and incidence rates given in "Accident Facts," 1982 Edition, National Safety Council (ISBN-0-87912-011-8).

[b]Construction workers do not include administrators, managers, aides, monitoring personnel, or secretaries.

[c]The expected number of deaths can be related to the individual worker's chances of death in an accident if the size of the workforce is known. For example, "0.011 expected accidental deaths" among a work force of about 56 workers (Alternative 2) means that each worker's chance of a fatal accident would be, on the average, 0.011/56 = 0.0002, or 0.02 percent during the life of the project.

[d]Includes workers involved in reprocessing operations.

[e]A "disabling injury" is an injury involving death or lost work days.

Because no zoning or adopted comprehensive plan designations are in effect at the Durango site, Alternative 3a would not directly influence, or be influenced by, existing land-use plans, policies, or controls. However, development of the entire Durango site would be possible once the tailings and other contaminated materials are removed. The form that development would take, should the site be developed, cannot be accurately predicted because the site appears suited to a variety of uses. Development would have to be approved by La Plata County's Board of County Commissioners. The site is within the city of Durango's service area (that area designated for service in the future by Durango's water and sewer systems). In order to obtain approval by La Plata County for development, the sponsor of development at the Durango site would be required by the county to abide by Durango's development regulations, as required by a memorandum of agreement that exists between the city of Durango and La Plata County. It is likely that the site would ultimately be annexed by the city of Durango.

Alternative 3a would also affect plans, policies, and controls that apply to the Bodo Canyon site. The site is currently managed by the Colorado Department of Natural Resources, Division of Wildlife, via a deed from the Nature Conservancy (Section 4.9 contains additional discussion of this deed). Use of the site is restricted to wildlife conservation and open-space recreation based on the restrictions in the deed held by the Division of Wildlife. In order to permit use of the site for stabilization of the tailings, a land-exchange agreement or similar arrangement (e.g., replacement in-kind) would be executed between the Colorado Department of Natural Resources and the DOE. In order to be acceptable, any proposed land exchange would have to meet the approval of The Nature Conservancy, the Colorado Division of Wildlife, and the Colorado Wildlife Commission. A plan to mitigate the impacts on wildlife within the Bodo Canyon Wildlife Area would be implemented. The approximately 41-acre stabilized site would be permanently owned by the Federal Government and would be restricted from any other land use.

Alternative 3b - stabilization at Bodo Canyon with transportation primarily by conveyor

Alternative 3b would have the same land use considerations as those described for Alternative 3a.

Alternative 4 - stabilization at Long Hollow

Stabilization at the Long Hollow site would have the same relationship to the La Plata County and the city of Durango's land-use plans, policies, and controls as described for Alternative 3[a], because of the indirect effect of opening the Durango site for development.

La Plata County has no zoning or comprehensive plan designations in effect at the Long Hollow site; however, for any private development that may occur at the Long Hollow site, the county's subdivision and planned unit development regulations would apply. Because of its status as a Federal project, Alternative 4 would not be subject to local land-use plans, policies, or controls related to the Long Hollow site. The approximately 80-acre stabilized site would be permanently owned by the Federal Government and would be restricted from any other land use.

Alternative 5 - reprocessing and stabilization at Long Hollow

Reprocessing and stabilization at the Long Hollow site would have the same indirect effect (opening the Durango site for development) on the La Plata County and the city of Durango's land-use plans, policies, and controls as described for Alternative 3a.

The reprocessing alternative assumes that transport and reprocessing of the tailings would be undertaken by a private party and not under the auspices of a Federal project. Therefore, site preparation and reprocessing phase activities would be subject to local land-use plans, policies, or controls related to the Long Hollow site. While no zoning regulations or particular land uses have been designated by La Plata County, the general, although unofficial, policy is that land-use development be compatible with nearby land uses (Hoch, 1983). Primary land-use developments in the future in the Long Hollow vicinity will probably be low-density residential unless the Animas-La Plata Project is implemented. If this project is implemented, lands near the reservoir would become prime for recreation-related development.

Following reprocessing, ownership of the tailings would be transferred to the DOE and, as a Federal project, would not be subject to the above-mentioned controls. The approximately 195-acre stabilized site would be permanently owned by the Federal Government and would be restricted from any other land use.

Bodo Canyon borrow site

Use of the Bodo Canyon borrow site would not affect any long-term land-use plans, policies, or controls. However, because the borrow site is located in the Bodo Wildlife Area, approval of the Colorado Division of Wildlife would be required prior to excavation of borrow materials. Use of the site would be short term and the site would be returned to its present use following reclamation of the site.

5.18 UNAVOIDABLE ADVERSE IMPACTS

The major adverse impact of Alternative 1 (no-action) would be the continued presence of above-background levels of radiation at and near the Durango site, and the continued exposure of the public near the site to enhanced concentrations of radon-222 and its daughter products. The tailings would continue to be subject to wind and water erosion as well as unauthorized removal by man. Use of the Durango site would continue to be restricted because of the potential health and environmental hazards associated with the unstabilized radioactively contaminated materials. Under the no-action alternative (Alternative 1), expected excess lung cancer deaths among the exposed population who live within 80 kilometers of the Bodo Canyon site over a 10-year period would be 0.044 persons.

The following subsections identify unavoidable adverse impacts for the action alternatives.

5.18.1 From the release of radiation

For the remedial-action Alternatives 2, 3a, 3b, 4, and 5, the expected excess lung cancer deaths over a 100-year period (remediation time plus normalization time) would be 0.019, 0.021, 0.021, 0.020, and 0.053 persons, respectively.

Excess lung cancer deaths to remedial-action workers due to radiation would be unavoidable for any of the action alternatives but would be greatest for Alternative 5 because of its duration. For Alternatives 2, 3a, 3b, 4, and 5, the excess lung cancer deaths for remedial-action workers would be 0.0067, 0.017, 0.022, 0.020, and 0.056 persons during the time of remediation, respectively.

Under Alternatives 3a, 3b, 4, and 5, transportation of radioactive materials would unavoidably expose truck drivers and onlookers to slightly higher than background doses. The maximum dose likely to be received by drivers would be 10.8 mrem per day, which is equivalent to 2.6 rem per year. There is about a three in 10,000 chance that a truck driver would acquire a fatal cancer as a result of this exposure.

5.18.2 On air quality

Remedial actions under Alternatives 2, 3a, 3b, 4, or 5 would cause temporary adverse impacts on air quality because of earthmoving activities and operations of equipment. Exhaust emissions under any of these alternatives would have little impact on air quality away from the sites and transportation corridors.

The greatest effects on air quality would be from fugitive dust related to the earthmoving activities. Predicted fugitive dust impacts decrease rapidly with distance from their source and would be temporary. Using an estimating tool that would be expected to over-predict impacts, the maximum predicted concentrations of dust for Alternative 2 would be about equal to the primary annual standard and slightly above the primary 24-hour standard. Under Alternative 3a, the maximum effects at the Durango site would be almost equal to the Federal primary annual standard and slightly above the 24-hour standard, respectively, and the maximum effects at the Bodo Canyon site would be somewhat below the Federal annual standard, but substantially above the annual 24-hour Federal standard. Under Alternative 3b, the maximum effects at the Durango site would be well below the Federal primary annual and 24-hour standards. The maximum effects at the Bodo Canyon site would be slightly below the annual standard and well above the 24-hour standard. Under Alternative 4, the maximum concentrations of dust at the Durango site would be slightly above the 24-hour standard but slightly below the annual standard. The maximum effects at the Long Hollow site would be above the 24-hour standard and below the annual standard. Under Alternative 5, the maximum concentrations of dust at both the Durango and Long Hollow sites would be well below the Federal primary annual and 24-hour standards.

5.18.3 On topography

Impacts on topography from any of the action alternatives would be long term.

Alternative 2 would cause topographic changes at the Durango site and also in Bodo Canyon. The two steeply sloped and flat-topped tailings piles would be reshaped against Smelter Mountain into one smoothly contoured pile covering an area of about 38 acres. The reshaped pile would have slopes of 3 horizontal to 1 vertical. At the borrow areas in Bodo Canyon, the present gentle slopes would be flattened and the deep erosion gullies would be removed. Slopes around the borrow areas would be recontoured to blend with the surrounding terrain.

Alternatives 3a and 3b would affect topography at the Durango site, the Bodo Canyon site, and the borrow areas in Bodo Canyon. Removal of the tailings and other contaminated materials would return the Durango site to its approximate original topography, a relatively flat bench along the west bank of the Animas River. Stabilization of the contaminated materials at the Bodo Canyon site would change the topography of approximately 38 acres from a shallow drainage basin to a low mound with a gently undulating surface. The earthen embankments would have slopes of 3 horizontal to 1 vertical and cover an additional three acres. Topographic changes at the Bodo Canyon borrow areas would not be as severe as with Alternative 2, but existing slopes within the borrow areas would be flattened and the erosion gullies eliminated.

Alternative 4 would affect topography at the Durango site, the Long Hollow site, and the Bodo Canyon borrow areas. Topographic changes at the Durango site and Bodo Canyon borrow areas would be the same as described above for Alternative 3. At Long Hollow, topography would change on the 80-acre area from a gently sloped, U-shaped valley bottom to a low, gently undulating surface that would be about four feet higher in elevation along its center line than at its edges. The earthen embankment at the south end of the stabilization area would have a slope of 5 horizontal to 1 vertical. Maximum crest height of the embankment would be about 35 feet above the Long Hollow drainage channel.

Alternative 5 would have the same effects on topography as described for Alternative 4 except that the stabilized tailings pile would cover 195 acres and would be only a maximum of 18 feet above the existing ground surface.

5.18.4 On ecosystems

Because the Durango disposal site is severely disturbed, only minor unavoidable adverse impacts are projected for on-site vegetation and wildlife species under any of the action alternatives. It is expected that on-site activities could slightly increase siltation and stream loading, which would be most deleterious to fish-food organisms during low-flow periods in the fall and winter, especially in the 10-mile segment of the Animas River downstream from the site.

Excavation of borrow materials for any of the action alternatives would eliminate about 16 acres of vegetation and habitat at the Bodo Canyon borrow area for at least five years, and reestablishing of habitat similar to that presently in the area may require up to 20 years. This operation would also displace some wildlife and cause mortality of some relatively small, less mobile animals.

Stabilization of the tailings at the Bodo Canyon site with either transport mode would prevent utilization of about 61 acres of existing vegetation and habitat by large mammals for an indefinite period of time. In addition, plant production ranging from 500 to 2000 pounds per acre per year would be lost for about five years until a vegetative cover is established on the reclaimed site. Direct loss of habitat would affect numerous animal species including mule deer and elk. Human encroachment would render additional, undisturbed habitat less attractive for traditional deer or elk use. Population displacement into adjoining areas might also cause stress to both resident and migrant animals. Habitat loss and disruption of existing use patterns would be most critical if severe winters also occur during this time period. Increased traffic during remedial actions would contribute to a greater number of wildlife road kills along County Road 211, more so with Alternative 3a than with 3b. The potential exists for peregrine falcons to be disturbed during project activities only if falcons reoccupy nest sites that are not currently active. Project activities would also decrease the value of the Bodo Wildlife Area for recreational value. However, a wildlife mitigation plan would be implemented to mitigate these impacts.

Stabilization of the tailings at the Long Hollow site would eliminate approximately 150 acres of the heavily grazed pasture and 20 acres of additional vegetation and wildlife habitat for an indefinite period of time. Plant production of less than 500 pounds per acre per year would be lost for a minimum of five years or until vegetative cover is established on the reclaimed site. Two stock ponds and adjacent marshes containing cattails and bulrushes would be eliminated. Increased human encroachment would render adjacent habitat less favorable to deer and elk, while direct loss of habitat would affect small mammals, reptiles, and birds presently utilizing the site. Population displacement into adjoining areas could also cause stress to both resident and migrant animals utilizing the Long Hollow site. Sagebrush-rabbitbrush shrub, meadow, and pinyon-juniper woodland would be eliminated by widening County Road 211. Also, the increased traffic may contribute to an increase in the wildlife roadkill frequency on County Road 211.

Tailings reprocessing and disposal at Long Hollow under Alternative 5 would eliminate 195 acres of existing vegetation and habitat. Most of this area is heavily grazed sheep pasture. The

195 acres would not be revegetated and the area would be permanently lost from use by mule deer and elk as winter range and fawning-calving areas. Excavation activities would also destroy small, relatively immobile animals, and an increase in road kills would be expected because of the increase in traffic during tailings transport.

5.18.5 On land use

Regardless of the action alternative selected, the stabilized site (Durango, Bodo Canyon, or Long Hollow) would be permanently owned by the Federal Government and would be restricted relative to any other land use. Under Alternative 2, approximately 38 acres of the Durango site would be restricted; the remainder of the site would be available for development and would likely be annexed eventually by the city of Durango. Under Alternatives 3a, 3b, 4, or 5, the entire Durango site would become available for development and annexation.

Under Alternatives 3a or 3b, the 41-acre Bodo Canyon site would be a restricted area and unavailable for any other use.

Under Alternative 4, the 80-acre Long Hollow site would be a restricted area and unavailable for any other use.

Under Alternative 5, the 195-acre Long Hollow site would be a restricted area and unavailable for any other use.

5.18.6 On sound levels

Unavoidable impacts on noise levels will result from operation of heavy construction equipment and trucks during remedial action.

Under Alternative 2, the day-night sound level in the central business district of Durango would increase about 13 dB. During remedial action, the daytime sound level would be about 78 dB, which is above the EPA's short-term goal of 65 dB. However, the Durango site would be classified as an industrial source by the city of Durango and would be in compliance with a noise ordinance of 80 dB during the daytime. Sound-level increases in Bodo Canyon along the transportation corridor and at the borrow area would be significant but the impact of the increased sound levels on either people or wildlife is expected to be minor.

Under Alternative 3a, the increase of the ambient sound level in Durango's business district would be less than that for the on-site stabilization alternative as described above. Because of simultaneous activity at the Bodo Canyon borrow area and at the Bodo Canyon site, the sound-level increase at a distance of 500 feet is estimated to be 45 dB. Increases in sound levels along the transportation corridor would be over a longer period of time than in Alternative 2, occurring throughout the period during which tailings are being transported to the Bodo Canyon site. However, it is expected that the effects of truck-traffic noise on people and wildlife would be minor and that many would acclimate to the noise.

Under Alternative 3b, the increase of daytime ambient sound levels in Durango's business district would be slightly less than that for Alternative 2. At a distance of 500 feet, the estimated sound levels would be 76 dB, two dB less than for on-site stabilization.

Impacts of sound-level increases at the Durango site and Bodo Canyon borrow area under Alternative 4 would be the same as described for Alternative 3a. At the Long Hollow site, increases in sound levels would be about 42 dB over background levels at a distance of 500 feet. Impacts to people and wildlife would be expected to be moderate since the increased sound levels would only occur during the daytime. The maximum increase in noise along the transportation corridor to Long Hollow would occur over a period of about 15 months and would impact a linear area about 7.5 miles longer than the transportation corridor to Bodo Canyon.

Increases in sound levels at the Durango and Long Hollow sites under Alternative 5 would be 19 and 33 dB, respectively, at distances of 500 feet from the sites. At the Bodo Canyon borrow site, the increase would be 29 dB at a distance of 500 feet from the site. These levels would occur over an 82-month period at Durango and Long Hollow and periodically over an 82-month period at Bodo Canyon.

5.18.7 On transportation networks

Any of the action alternatives would cause increases in truck and automobile traffic on local roads. However, the impacts on road and highway networks are expected to be minor. No impacts upon other transportation networks (air or rail) are expected.

The action alternatives may also be expected to cause increases in the number of traffic accidents on local roads. Based on national average accident data, about 21.6 accidents would occur during trips related to the remedial action under Alternative 2; these would result in an estimated 0.06 death. For Alternative 3a, it is estimated that there would be about 22.5 accidents, resulting in an estimated 0.06 death. Alternative 3b would result in approximately 15.4 accidents and an estimated 0.04 death. It is expected that there would be 92.2 accidents as a result of Alternative 4 and that these would result in an estimated 0.26 death. The number of traffic accidents and associated fatalities that would result from Alternative 5 are 55.7 and 0.16, respectively.

5.18.8 On cultural and historic resources

Unavoidable impacts on cultural resources would result from any of the remedial action alternatives. The brick smelter stack at the Durango site, which is eligible for nomination to the National Register of Historic Places (NRHP), would be demolished with all of the remedial action alternatives.

Alternatives 3a and 3b would cause a loss of nine archaeological sites, also eligible for nomination to the NRHP, at the Bodo Canyon disposal site. Five archaeological sites would be lost along the transportation corridor to Long Hollow under Alternatives 4 and 5.

5.19 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Alternative 1 does not require the use of any resources on the part of DOE. Alternatives 2, 3a, 3b, and 4 would require the use of engine fuel, electricity, cement, backfill and cover materials, manpower, water, and land. Alternative 5 would require these same resources, plus 12 chemical and other compounds used during reprocessing activities.

The amounts of resources that would be used are identified in Section 5.15. The only resources which would be irretrievably lost are engine fuel, electricity, cement, possibly coal at Bodo Canyon, and the materials used for reprocessing.

The use of water would not be a permanent commitment of the resource, since it would be released into the environment following treatment. Even the use of backfill and cover materials, and the land in general, would not necessarily be permanently committed.

The uranium and vanadium resources within the tailings would be recovered under Alternative 5. These resources would be available for future recovery under Alternatives 1, 2, 3a, 3b,, and 4 by either in-situ techniques or by opening the tailings embankment and reprocessing the tailings in a manner similar to Alternative 5.

Commitment of land for long-term stabilization of the tailings, and the potential ground-water impacts described in Section 5.6, would represent irreversible and irretreivable commitments of resources.

5.20 RELATIONSHIPS BETWEEN THE SHORT-TERM USE OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Under the no-action alternative (Alternative 1), there would be no short-term remedial action use of the environment. The long-term productivity of the Durango site would continue to be restricted because of the unstabilized tailings remaining on the site.

If the tailings and other contaminated materials were stabilized on the Durango site (Alternative 2), other uses in the vicinity and portions of Bodo Canyon would be inconvenienced by construction activities for about one year. There would be noise and dust from these activities, some increases in traffic congestion, and construction workers would be subject to above-background levels of radiation. Productivity of the borrow site in Bodo Canyon would be reduced until a vegetative cover was established and self-perpetuating; this is estimated to require at least five years. The long-term productivity of Bodo Canyon would not be affected. Restricted use of the Durango site would continue over the long term because of the presence of the stabilized tailings. Isolation of radiological and chemical contaminants in the stabilized tailings would be immediately beneficial to the environment and populace of the Durango site and in its general vicinity. This beneficial impact would continue over the long term and could increase the productive use of properties adjacent to the Durango site.

Stabilization of the tailings and other contaminated materials at the Bodo Canyon site (Alternative 3a) is estimated to require 18 months. During this period, the inconveniences of construction activities would be similar to those described above but would occur at both the Durango site and the Bodo Canyon site. Other uses of Bodo Canyon, by both people and wildlife, would be temporarily disrupted. Removal of the tailings piles would make the Durango site available for other productive uses. The 41-acre Bodo Canyon site would be permanently restricted and unavailable for other uses.

Implementation of Alternative 3b would require an estimated 22 months. During this period, the inconveniences of construction activities would be much like those described for Alternatives 2 and 3a. The construction of the conveyor would cause little disruption aside from temporary loss of wildlife habitat and vegetation.

Stabilization of the tailings and other contaminated materials at the Long Hollow site (Alternative 4) is estimated to require 28 months. Effects on productivity of the Durango site would be the same as for the Bodo Canyon alternative. Use of the Long Hollow area for livestock and wildlife range would be temporarily disrupted. The 80-acre Long Hollow disposal site would be permanently restricted and unavailable for other uses.

Reprocessing and stabilizing the tailings and other contaminated materials at the Long Hollow site (Alternative 5) would require approximately 82 months to complete. This alternative would have the same short-term impacts as Alternatives 3a and 4 such as displacement of wildlife, increases in traffic congestion, and increase in radiation exposure to workers. However, the short-term impacts of Alternative 5 would be less intense, but of longer duration, than those of Alternatives 3[a] and 4. The 195-acre site for the final stabilization of the tailings and contaminated material under Alternative 5 would be permanently restricted and unavailable for other uses.

5.21 MITIGATION MEASURES DURING THE REMEDIAL ACTION

Many of the mitigation measures to be taken during the remedial-action alternatives have already been described in previous sections of this document. The planned measures would be adopted as part of the normal procedures during construction activities. As a part of the operating procedures throughout the remedial actions, the DOE would establish and maintain a surveillance program consisting of routine field sampling and laboratory analysis. Results from the monitoring program would be compared with UMTRA Project guidelines. If any significant deviations were recorded, immediate action would be taken to eliminate or ameliorate the problem.

5.21.1 Mitigation of impacts from the release of radiation

Actions for mitigating exposure of remedial-action workers to radioactively contaminated particulates would include dampening exposed contaminated material or covering it with tarps or plastic sheeting to prevent dust blow off, by stopping the handling of contaminated materials during periods of high wind, providing protective equipment such as dust masks, and by using trucks fitted with removable covers and water seals on the tailgates or a covered conveyor system when contaminated materials are moved off the site. Public exposure to radiation during the construction phases would be limited by restricting access to the construction areas.

Inadvertent off-site transportation of contaminated materials would be controlled by use of truck-wash stations to clean trucks and construction vehicles before they leave the site. Surface-water runoff from contaminated areas and contaminated wash water would be impounded on the construction site.

Should the conveyor system malfunction and spill tailings or contaminated material along the conveyor route, the spill would be cleaned up much like a spill from a truck. The material would be removed with shovels or a small front-end loader and hauled to the disposal site. The conveyor would be equipped with automatic shut-off devices that sense belt tension or motion and other operating conditions. Devices such as these would turn off the conveyor in case of damage to the belt or other problems.

5.21.2 Mitigation of impacts on air quality

Construction areas and temporary on-site haul roads would be sprayed with water as needed to control fugitive dust emissions. Permanent haul roads and County Roads 211 and 212 would be covered with gravel and a dust palliative would be applied as needed to control dusting; additional water spraying would be used during all material-handling activities; all contaminated materials hauled in trucks would be covered with tarps, and excavation and loading operations would be halted during periods of adverse weather conditions. Water spray or negative pressure dust collection would be used at conveyor transfer points. The exact air-quality impact mitigation measures would be determined during the final design phase of the project with the review and approval of the Colorado Department of Health.

Tail-pipe exhausts from internal-combustion engines in construction vehicles would be minimized by keeping the engines well maintained and tuned to reduce emissions.

5.21.3 Mitigation of impacts on water quality

Actions of mitigating the impacts of construction activities on surface and ground water during the remedial actions include using synthetically lined, water storage reservoirs at all sites to hold radioactively contaminated water from the truck-wash stations. Seepage and runoff from contaminated areas would be collected in temporary catchment ditches or sumps and pumped to the storage reservoirs. Diversion ditches would be constructed upgradient from the working areas to minimize the amounts of runoff reaching the contaminated areas. Temporary dikes could also be constructed to isolate contaminated runoff waters that form during heavy storms. Sediments that collect on the bottom of the contaminated water storage reservoirs would be buried in the tailings during the final stages of the remedial-action process.

For Alternative 5, additional protection against the leakage of contaminated water would be provided by a double liner system of clay and synthetic liners. A leak-detection system would be installed to verify the absence of leakage during reprocessing activities.

5.21.4 Mitigation of impacts on sound levels

The impacts of noise would be reduced by using functional and properly maintained mufflers on all construction equipment and vehicles, and by scheduling hauling trips and noisy activities at all sites to take place within daylight hours according to state and local ordinances and the recommendations of the Colorado Division of Wildlife. Hearing-protection devices would be worn by workers either operating or working close to excessively noisy machinery.

5.21.5 Mitigation of impacts on transportation networks

To minimize additional traffic on U.S. Highways 160 and 550, a new haul road would be constructed on the Durango site from the tailings piles to County Road 211 for truck traffic. Further, employers would encourage construction workers to car-pool when travelling to and from work.

Under Alternatives 4 and 5, a new haul road would be constructed roughly parallel to a two-mile segment of County Road 141.

The transport and reprocessing of the tailings under Alternative 5 would be subject to the State of Colorado licensing requirements as set forth in Part III - Licensing and Radioactive Materials, RH 3.7 through RH 3.10.

5.21.6 Mitigation of impacts on cultural and historic resources

Impacts on cultural and historic resources would be mitigated in three ways. Archaeological and historical sites that are eligible for listing on the National Register of Historic Places would be avoided by remedial action if practical. Sites that cannot reasonably be avoided would be subject to recovery of archaeological or historical data as appropriate. For archaeological sites, this would be total excavation of the prehistoric resources, as well as photography, recording, and cataloging of artifacts. For historic structures, this would be archival quality photographs, measured line drawings, and historical research. A Programmatic Memorandum of Agreement (PMOA) has been agreed to by the DOE, the Colorado State Historic Preservation Officer (SHPO), and the Advisory Council on Historic Preservation (ACHP). The procedure outlined in the PMOA requires the concurrence of the SHPO and in some cases the ACHP when the DOE decides upon the appropriate mitigation measures. A mitigation plan has been written and has been approved by the SHPO (Fuller, 1985) for impacts to archaeological resources at Bodo Canyon. A mitigation plan is in preparation for impacts to the smelter stack at the Durango site.

5.21.7 Mitigation of impacts on wildlife

A wildlife mitigation plan will be an integral part of the project regardless of which of the action alternatives is implemented. Such a plan has been developed in draft for Alternative 3a. In the event another alternative is decided upon, a revised mitigation plan containing the same essential elements would be developed and implemented.

The mitigation plan contains measures to avoid, minimize, and compensate for adverse impacts of the project on wildlife and wildlife habitat, the recreational use of these resources, and other interests of the CDW.

The plan is divided into measures to mitigate short- and long-term impacts. Among short-term impact mitigation measures are those which would do the following: (1) educate workers as to how to avoid vehicle collisions with deer and elk; (2) impose speed restrictions on hauling trucks to minimize vehicle-wildlife collisions; (3) restrict timing of remedial action activities both daily and seasonally to minimize conflicts with wildlife; (4) provide for installation of highway signs to warn truck drivers of the location of deer and elk crossing areas; (5) require all employees to report collisions with big game animals; (6) require financial reimbursement for road-killed animals; (7) provide transportation of workers by vans and/or buses; (8) reduce fugitive dust; (9) restrict the timing of road construction activities; (10) provide for exhaust system maintenance on hauling trucks to reduce noise; (11) provide for a ban on employees carrying firearms; (12) provide for short-term habitat replacement; (13) provide for replacement lands to compensate for recreation days lost; and (14) provide compensation to the CDW for additional management costs.

Mitigation measures for long-term impacts include those to compensate for loss of habitat due to road construction activities and drastic disturbances at disposal sites and borrow areas, and restore natural vegetation on borrow areas and adjacent to disposal sites.

Specific details of the mitigation plan to be implemented will be worked out in consultation with the CDW and The Nature Conservancy.

In terms of mitigation costs, wildlife mitigation measures will be most costly for Alternative 3a followed by Alternatives 3b, 5, 4, and 2.

5.21.8 Environmental, health, and safety

The UMTRA Project Health and Safety Plan (DOE, 1983b) specifies the basic Federal health and safety standards and special state, local, and DOE requirements applicable to the remedial action at Durango. This section provides an overview of the plan and summarizes its key features. Responsibilities in carrying out this plan are delineated. Where not otherwise specified, the Remedial Action Contractor (RAC) will have the principal responsibility for implementing this plan. Guidance on program requirements and radiation control and monitoring is also included.

UMTRA Project health and safety policy

The DOE and its contractors will take all reasonable precautions in the performance of the remedial action work to protect the health and ensure the safety of employees and the public. The DOE will comply with all applicable Federal, state, and local health and safety regulations and requirements including, but not limited to, those established pursuant to the Occupational Safety and Health Act (OSHA).

Responsibilities

The responsibilities of the DOE, state, and local governments, and the RAC are described below:

a. The DOE/UMTRA Project Office, and appropriate division of the Albuquerque Operations Office

   - Conducts periodic surveys, with assistance from the Technical Assistance Contractor (TAC), of contractor programs and site activities and prepares Health and Safety Survey Reports.

   - Acts on employee inquiries and complaints in accordance with procedures outlined in the UMTRA Project Health and Safety Plan (DOE, 1983b).

- o Ensures compliance with the health and safety standards by reviews of UMTRA Project contractor performance, and reviews of violations of the prescribed plan and the timing and manner of correction.

b. State of Colorado and local governments

- o Participate in the planning for the remedial action by identifying and interpreting applicable local or state regulations.
- o Advise the DOE/UMTRA Project Office of changes to regulations which apply to this project.
- o Identify and assist in obtaining necessary reviews and approvals to comply with environmental regulations.

c. The Remedial Action Contractor

- o Develops implementation procedures for the requirements set forth in this plan.
- o Executes programs and policies in a manner that shall ensure compliance with the requirements set forth in this plan.
- o Assures that the required information specified in subsequent sections of this plan is recorded and reported.
- o Submits requests for variance from the standards of this plan to the DOE Contracting Officer or Contracting Officer's Representative.
- o Includes the requirement for compliance with the plan in all applicable subcontracts.

Key features of the health and safety plan

The following elements are included in the UMTRA Project Health and Safety Plan (DOE, 1983b):

a. General

- o The RAC will maintain qualified radiation health staffing as necessary to ensure protection of the workers and the environment. These personnel will develop and implement procedures for all activities involving potential safety or radiological health risks.

b. Community protection

- o An environmental monitoring program will be conducted to ensure that effects on the environment and exposure to the general population are negligible. Continuous air particulate samples, radon-222 samples, groundwater samples, and surface-water samples will be collected and analyzed for radiological parameters. Monitors will be located in areas mutually acceptable to the State of Colorado and the DOE. Monitoring locations will include the site boundary and upwind locations.

- Passive environmental radon monitors (Track-Etch cups) will be used. A real-time, continuous radon monitor will also be located in the area to provide instantaneous read-out of average radon concentrations.

- Operating response plans will be prepared by the RAC relative to severe weather events, construction accidents, or medical emergencies. Operational procedures will be established to include action levels which will be applied to construction activities to control any elevated radon emissions detected by monitoring programs. Typical responses to elevated radon levels will include additional wetting of exposed contaminated material, coverage with plastic tarp, reduction of the uncovered area, or suspension of operations. Administrative controls will be utilized to limit off-site radon levels to three pCi/l average during a 52-week period and six pCi/l average during a 26-week period.

c. Worker protection

- Training sessions which are commensurate with the degree of radiation hazard present at the site will be conducted for all employees prior to the start of work. These sessions will include discussion of site conditions, potential radiological hazards, effects of radiation, and emergency procedures. Records will be maintained which document successful completion by employees of all training.

- A system of employee health records will be maintained which documents individual radiation exposures and the results of personnel dosimetry and bioassays.

- Restricted areas will be designated and conspicuously marked. Access control points will be established for restricted areas, and all personnel and equipment will be monitored. Access control records, including a log of personnel and equipment entering and leaving the restricted area and a log of dosimeters issued, will be maintained.

- Protective clothing will be distributed to employees at the access control point when conditions warrant. Change and cleanup facilities will be maintained.

- o Thermoluminescent dosimeters (TLDs) or film badges will be supplied to permanent employees in restricted areas. Dosimeters will be changed quarterly or more frequently if necessary. Urinalysis will be used to monitor employee internal exposures, and additional dosimetry may be required if positive results are noted.

- o Air particulates samples will be collected in work areas and at site boundaries. Samples will be analyzed for gross alpha levels and will be stored for later isotopic analyses, if necessary. Additional samples will be collected in work areas where ventilation is limited, and analyzed for radon-daughter concentrations.

- o A respiratory program, with procedures for training employees and checking for adequate fit of respirators, will be developed by the RAC. Respirators will be used in work areas where monthly average air particulate concentrations are expected to exceed 25 percent of the regulatory limit for a given radionuclide.

- o Industrial hazards will be controlled in accordance with OSHA regulations.

5.21.9 Mitigative measures not included in the remedial-action designs

The following are mitigative measures which were not included in the remedial-action designs. Generally, inclusion of these measures would decrease the impacts on one environmental component such as transportation, but would increase the impacts on other environmental components, such as wildlife.

County Road 211 may be dedicated for use as a haul road and all other traffic excluded or restricted under Alternatives 2, 3a, 4, or 5. This measure would reduce the potential for traffic accidents but would also result in the restriction of access to the Bodo Canyon Wildlife Area. Since County Road 211 is the primary access to the Bodo Canyon Wildlife Area, recreational use of the area would be disrupted. The State of Colorado has expressed an objection to this potential mitigative measure.

The use of large boulders instead of grouted riprap to provide protection against erosion from the Probable Maximum Flood (PMF) under Alternative 2 has been suggested. Preliminary calculations have shown that such boulders would have to be in excess of 10 feet in diameter to withstand the erosive forces of a PMF. Although this measure would eliminate the long-term maintenance required for the grouted riprap, the transportation of the large boulders to the site would be very disruptive to local transportation routes. The boulders would weigh in excess of 100,000 pounds and could only be transported by very large off-road vehicles which would disrupt traffic flow and severely damage roadbeds. The excavation, transportation, and placement of these boulders would also be very costly.

The placement of a clay slurry wall to inhibit ground-water movement under the Durango site has been considered for Alternative 2. A slurry wall is a curtain (perhaps three feet thick) which extends into bedrock and traps the contaminated water beneath the pile. This measure would reduce the amount of contaminated ground water from migrating away from the site; however, the depth to bedrock at the Durango site makes this measure impractical. In addition, the placement of the cover system over the tailings (as proposed) would reduce infiltration of water into the tailings and thereby reduce the amount of contaminated water that would seep from the tailings into the ground water. Therefore, additional ground-water mitigative measures for Alternative 2 were not considered to be necessary.

The placement of a clay liner under the tailings pile to reduce the flow of contaminated water into the ground water under Alternative 2 was considered. This measure would greatly increase costs, dust emissions, worker accidents, and worker health impacts since all of the tailings would have to be moved twice. As discussed above, the placement of the cover over the tailings would reduce the amount of contaminated water which would seep from the tailings.

The placement of a gravel cover over the stabilized piles instead of spreading topsoil and revegetating the pile has been suggested for all alternatives. The designs for all action alternatives presently include a gravel cover. A gravel cover would provide greater protection against erosion from runoff resulting from severe precipitation events. However, spreading topsoil and revegetating the sites would provide habitat for wildlife and reduce the scenic impacts from remedial action. Protection against erosion has been deemed more important than revegetating the piles.

Although Alternatives 4 and 5 include stabilizing the tailings at the same location, they include different measures for ground-water protection. Additional ground-water data collection and analysis are ongoing and will be used to select the most appropriate measure(s) to protect the ground water. The measures presently include the construction of an underdrain and clay liner as in Alternative 4, the construction of an interceptor ditch and clay and synthetic liner system as in Alternative 5, and shifting the location of the stabilization area to the southeast away from the ground-water discharge area.

5.22 SURVEILLANCE AND MAINTENANCE

Title I of the UMTRCA defines the authority and roles of the Department of Energy (DOE), the Nuclear Regulatory Commission ("Commission"), and the intent of licensing regarding inactive tailings sites in the various states. In part, Section 104(f)(2) of the UMTRCA reads:

". . .upon completion of the remedial action program...(the site) shall be maintained pursuant to a license issued by the Commission in such manner as will protect the public health, safety, and the environment. The Commission may, pursuant to such license or rule or order, require. . .monitoring, maintenance, and emergency measures necessary to protect public health and safety and other actions as the Commission deems necessary to comply with the standards (EPA) of Section 275 . . ."

Accordingly, the remedial action must demonstrate compliance with the EPA standards (40 CFR Part 192) and thus, the prime objective of licensing is to ensure continued compliance with the EPA standards via a post-remedial action surveillance and maintenance program.

The DOE would conduct the surveillance and maintenance pursuant to the requirements of the Commission's license until March 7, 1990, under Section 104(f)(2) of UMTRCA. At that time, the DOE or another agency to be designated by the President would maintain the site as required by the Commission.

All of the action alternatives have been designed to remain effective for up to 1000 years, to the extent reasonably achievable, and, in any case, for at least 200 years. Alternatives 3a, 3b, 4, and 5 would meet this design standard with very limited maintenance. However, Alternative 2, stabilization at the Durango site, would require a much greater level of maintenance over the project's design life because of the potential for meandering of the Animas River channel, the design's dependence on grouted riprap for erosion protection, and the use of surface-water diversion channels to direct surface-water flow from Smelter Mountain around the north and south ends of the stabilized pile.

A detailed custodial surveillance and maintenance program would be defined jointly by the DOE and the NRC during the NRC license application and approval process. The program may include some or all of the measures discussed below.

Site inspections

Site inspections constitute a visual verification that the disposal site continues to function as designed and assures continued compliance with the design standards. Inspections may consist of two phases: Phase I, which is a systematic walk-over, is designed to qualitatively evaluate the condition of the disposal site; Phase II constitutes investigations to quantitatively assess changes in the disposal site that could lead to functional failure of the design in the absence of custodial maintenance. The Phase I inspection may be conducted on a specific schedule, such as annually, by a team of qualified professionals. The inspection team would review as-built drawings, engineering details, aerial photographs, and supporting documentation. A site walk-over would then be performed to evaluate any changes at the site with regard to factors such as erosion, flood effects, slope cover stability, settlement, displacement, plant or animal intrusion, and access control.

Based on the evaluation and recommendations of the inspection team, Phase II studies might be conducted to quantitatively determine the magnitude and rate of effect of changes in the above factors. From these studies, the need for a corrective action (i.e., custodial maintenance) would be ascertained.

Aerial photography

Aerial photography might be used to supplement site inspections. The objectives might be to identify changes in site conditions (e.g., patterns of developing erosion that might affect the function of the design), provide visual documentation of year-to-year variation in site conditions, and to identify activities (e.g., road conditions, storm drainage construction) adjacent to the site that might affect its function.

Aerial photography might be conducted on the same schedule as site inspection. Photographs would be taken at both low (i.e., high resolution) and higher (i.e., for adjacent activities) altitudes, and at oblique and vertical angles. The types of film, ground control, camera specifications, amount of aerial overlap, interpretative keys, and other requirements, would be established prior to completion of remedial action.

Ground-water monitoring

Certain existing wells may be preserved during construction for use as monitoring wells after completion of the remedial action. In addition to those wells, a series of both shallow and deep wells might be installed for the purpose of monitoring ground-water quality. Locations for these wells would be selected in order to monitor the performance of the tailings embankment. Details of the ground-water monitoring would be developed during the NRC licensing process.

Reporting

Summary surveillance and monitoring reports that evaluate the results of these activities and recommend needed custodial maintenance (i.e., corrective actions) and future surveillance and monitoring would be prepared. Reports and supporting documentation would be placed on file with the DOE, NRC, the State of Colorado, and La Plata County.

Custodial maintenance

The need for custodial maintenance (i.e., corrective actions) can only be determined following site inspection and monitoring, and by NRC evaluation of the reports of these activities. However, it is anticipated that custodial maintenance may consist primarily of the following:

- o Limited soil/rock replacement because of unanticipated erosion, human or animal intrusion, or cover disturbance. These activities would be expected to be required infrequently.

- o Control of deep-rooted plants by infrequent application of herbicides or physical removal as required.

- o Mechanical repairs to access barriers, gates and locks, and warning signs, when necessary.

Contingency plans

In case of severe natural events (e.g., extreme rainfall, or seismic events) or unusual human intrusion, procedures would be developed to initiate inspection and to institute custodial maintenance of the disposal site.

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6.0 PUBLIC AND AGENCY COMMENTS

6.1 INTRODUCTION

This chapter discusses the comments made by private citizens, organizations, and government reviewers (Federal, state, and local) on the DEIS for remedial actions at the former Vanadium Corporation of America site in Durango, Colorado.

Comments on the DEIS were obtained from the public, citizen's groups, and government agencies during two public hearings and a 101-day[a] written-comment period. Two public hearings were held in Durango, Colorado, on December 18, 1984. A total of 28 persons presented oral statements on the DEIS. Written comments were received from 534 individuals or organizations during the written-comment period. Table 6.1, at the conclusion of this section, lists the persons, groups or agencies that presented oral statements at the public hearings, or that submitted written comments.

To put all the comments in an easily accessible form, each oral statement (recorded by a certified stenographer) and letter was analyzed in detail to identify specific issues. A preliminary outline of this chapter was then prepared based on these issues. Notebooks were prepared in which all comments on a specific topic (e.g., ground water at the Long Hollow site) were consolidated. This system allowed the preparers of the FEIS to consider all comments received on a topic while revising the sections of the FEIS dealing with that topic.

As a result, comments have been grouped into 18 major topics that cover all the substantive comments received. Each of these topics deals with one or more issues which are listed in this section as part of the discussions of the 18 topics. Where the responses required changes in the text of the DEIS, they appear in the main text of this FEIS. For example, the State of Colorado disagreed with the extent of the wildlife mitigation measures presented in the DEIS. In responding to this comment, the DOE has met with the state to compare details of its more definitive mitigation plan with the ideas of the state and has presented a mitigation plan in Appendix L, Wildlife MItigation Plan. Finally, a nineteenth section was added to include those comments that were not directly applicable to the DEIS, but which should be acknowledged, and in some instances, responded to.

Sections 6.2 and 6.3 discuss the legal basis of the proposed remedial action and the choice of alternatives. Sections 6.4 through 6.9 discuss the processing site and alternate sites, various matters related to the

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[a]The EPA notice of availability of the DEIS was published in the Federal Register on November 16, 1984 (Vol. 49). This notice allowed a 56-day comment period, through January 11, 1985. The comment period was extended through February 25, 1985, by a Federal Register notice published February 7, 1985 (Vol. 50, p. 5295). A total of 101 days was officially allowed for public comment. However, written comments were received by the DOE until April 5, 1985; all were considered in this final environmental impact statement (FEIS).

engineering designs of the alternatives, and the direct and indirect costs of the alternatives, including the requests for a more thorough economic analysis of the project.

Sections 6.10 through 6.18 discuss comments on the noneconomic impacts of the alternatives: the radiological and nonradiological impacts of the remedial actions, wildlife, transportation, land use, mineral resources, air quality, historic and cultural resources, socioeconomics, and vicinity properties. Section 6.19 discusses those comments which are editorial in nature. Finally, Section 6.20 discusses the comments that dealt with topics considered to be outside the scope of the EIS.

Section 6.21 contains an alphabetical listing of individuals who gave oral testimony at the public hearing and the names of individuals, organizations, and others who submitted written comments.

Section 6.22 of this FEIS reproduces in full the written comments received on the DEIS. Transcripts of the public hearings are available for inspection at each of the public reading rooms and libraries listed at the beginning of Section 6.22. Numbers in the margins of written comments indicate the location in Section 6.0 where the issue is discussed.

6.2 COMPLIANCE WITH NEPA AND EPA STANDARDS

The compliance of the DEIS with the National Environmental Policy Act (NEPA) and with the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA was commented on in four written statements. The comments and responses are summarized below.

1. Comment

Several commenters implied or stated that the DEIS did not comply with NEPA due to a lack of sufficient data or incomplete analysis. (493, 515, 551) Two commenters (508 and 509) referred to the lack of core sample data from the tailings pile. Others cited inadequate ground-water analysis. (422, 423)

Response

The intent of writing an EIS is to provide a document to be used in the decisionmaking process and which estimates the impacts of the alternatives under consideration. The CEQ regulations specifically direct that lengthy technical discussions are not appropriate for an EIS. The CEQ regulations also specify that when data or analyses are incomplete, that impact analyses must be conservative (i.e., over estimated) and must provide a realistic upper limit of the specific effect. The DOE believes that this has been the case. However, in recognition of the complexity of the issues involved, the DOE has collected additional data in several disciplines, including ground-water hydrology. These data are presented in the addendum to Appendix F, Water Resources Information, in this FEIS, in revisions to the text of the EIS, as well as in Sections 6.4 through 6.7. DOE has been unable to obtain pile data as yet. Regardless, conservative safety factors have been applied in the various designs and no difficulties are anticipated during remedial action.

2. Comment

One written statement requested that a supplement to the DEIS be prepared and released to the public prior to issuance of the FEIS. This conclusion was based on the commenter's opinion that the DEIS should have included the use of an asphalt emulsion barrier as part of one or more of the alternatives, and that other details of the alternatives and proposed remedial action should be disclosed. (491)

Response

In selecting the alternatives for the DEIS, DOE was aware of the asphalt emulsion radon barrier concept from experience with the UMTRA Project Technology Development Program (DOE, 1985b). Other radon control techniques were also considered including chemical and thermal conditioning (DOE, 1985b). The DOE did not propose to use an asphalt emulsion barrier in any of the Durango alternatives because of the uncertainty of the longevity and durability of asphalt materials. The DOE believes that the commenter has not provided information that is new or was not previously known that would have a bearing on the decision and, thus, may warrant a supplement to the EIS.

3. Comment

The appendices provide incomplete, inaccurate, and often contradictory technical data which prevents a clear assessment of environmental impacts. The following areas are deficient for all alternatives:

- o Technical data for surface-water and ground-water hydrology.
- o Site-specific geology, including lithology and structures.
- o Evaluation of the impact of contamination on surface-water and ground water at the present or in the future.
- o Source and cost estimates for reclamation topsoil. (554)
- o Other commenters stated similar concerns. (490, 491)

Response

The DOE disagrees with the claim that the DEIS is deficient in these areas. Although some information presented in the DEIS may not have been fully consistent or as complete as the reviewer would like, the DOE has endeavored to address these concerns by revising the DEIS with the issuance of this FEIS.

Specific questions on surface water are addressed in Sections 6.4.1, 6.5.1, 6.6.2 and 6.8. Ground-water issues are discussed in Sections 6.4.2, 6.5.2, 6.6.2, 6.7.2, and 6.8.2. The question of topsoil availability and cost for the Long Hollow site is discussed in Section 6.7.3. Soil requirements for alternatives 2 and 3 are explained in Sections 4.5.1 and 5.4.2 of this FEIS.

4. Comment

With respect to the use of state radiation standards (which are more stringent than DOE standards by a factor of 10), what would implementation of the state standards mean in terms of (1) increased financial costs, (2) the amount of additional cover, and (3) costs and benefits for Alternatives 2 and 3. (519, 549)

Response

In responding to this comment the DOE has assumed that the commenter is referring to the Colorado Department of Health, "Rules and Regulations Pertaining to Radiation Control." The State of Colorado standard for radon flux is two pCi/m^2s under criterion 6, p. 137G (CDH, 1984). However, the state standard applies only to stabilization of uranium mill tailings under active license with the Colorado Department of Health.

The Federal standards to which sites are decontaminated under the UMTRA Project are those promulgated by the EPA (40 CFR Part 192) for the cleanup of land and buildings (subpart B). The standards for land cleanup require the concentration of radium-226 averaged over an area of 100 square meters to not exceed the background levels by more than:

- o Five pCi/g, averaged over the first 15 cm of soil below the surface.
- o 15 pCi/g, averaged over 15-cm thick layers of soil more than 15 cm below the surface.

Background radium concentrations measured in the Durango area ranged from 1.0 to 3.0 pCi/g, averaging 1.6 pCi/g. Considering that surface radium-226 concentrations at a decontaminated site may be 5 pCi/g above background, in this case Federal standards allow surface radium-226 concentrations two to five times above background in the Durango area.

In addition, the radon flux from a stabilized UMTRA Project pile must meet the design standard of 20 pCi/m^2s. Using the conservative soils radium activity to radon flux conversion factor of 1 pCi per square meter per second of radon for each pCi/g of radium in the soil, background fluxes in the Durango area are predicted to be about 1.6 pCi/m^2s. Thus, the UMTRA Project radon flux standard is about a factor of 12 higher than background levels.

The State of Colorado administers maximum permissible concentrations in water and air for occupational as well as environmental (general public) exposure. The primary radionuclide released from stabilized tailings is radon, which must not exceed 3×10^{-9} microCi/ml as an annual average in an unrestricted area. This is equivalent to 3 pCi/l outside of the site boundary. The corresponding UMTRA Project standard is related to the flux limit and limits the site boundary annual average radon concentration to less than 0.5 pCi/l above background. With background levels in Durango averaging about 0.5 pCi/l, this limits the total radon concentration to 1.0 pCi/l, a factor three times more stringent than Colorado state regulations.

The cost differential between implementing the state and EPA standards would depend greatly on the thickness of the cover that would be required by the state to be placed on the tailings and contaminated material. Regulations of the Colorado Department of Health for stabilization of uranium mill tailings under active license require three meters of cover. Because state regulations would not apply at Durango, it is not appropriate to speculate on the cost differential if another set of standards were to be imposed on the remedial action.

5. Comment

Two commenters asked whether the number of deaths and disability injuries resulting from Alternative 4 or 5 would exceed the benefits of the remedial action. (461, 473) The FEIS should contain a cost-benefit analysis. (461)

Response

A cost benefit analysis was not completed as part of this FEIS but could be completed by an interested reader. The basis of selecting the remedial action is compliance with the EPA standards, cost, and public acceptance.

6. Comment

The many uncertainties with regard to the health risks throughout the EIS suggest that DOE's alternatives may not comply with EPA's 1000-year standard. (515)

Response

The EPA standards are based on the cleanup of contamination in soils and habitable structures and stabilizing the tailings against erosion and human misuse. The commenter gives the mistaken impression that the EPA standards require a specific reduction in health effects which is not true. Health effects related to the remedial action alternatives have been predicted using the best available techniques. The DOE believes that for all action alternatives the designs comply with the EPA longevity standard and that the health effects reductions over the no action alternative are acceptable.

6.3 ALTERNATIVES

A number of commenters questioned the process used by DOE to select alternatives which were addressed in the DEIS. Some commenters were interested in alternatives that had been considered but were later rejected from further consideration, while other commenters suggested additional alternatives for consideration. Summaries of the comments and responses are given below.

1. Comment

Other alternative remedial actions should be considered in addition to the five that were examined in the DEIS. (445, 459, 463, 515, 487, 481, 483, 512, 550) One commenter recommended the alternative of moving the tailings to the Durita facility near Naturita. (473) The DEIS failed to identify alternatives that were considered for stabilization in place but discarded. Appendix C, Alternatives That Were Considered But Rejected, only includes sites that were considered and ultimately rejected. (515)

Response

For the UMTRA Project, DOE's proposed action (different from preferred alternative) is to conduct a remedial action, either stabilizing at the current designated site or relocating and stabilizing the tailings at another site. As expressed in Appendix C, nine sites were examined as possible alternatives to stabilizing on site. In this EIS, alternatives considered included various sites, reprocessing, and modes of transporting tailings to other sites. Prior to the development of Alternative 2, several design issues were examined that affected the final configuration of Alternative 2 including the fault through the raffinate ponds area, the identification of the ponds for location of a pump-house for the Animas-La Plata Project, the very limited area on and immediately off the site (beyond the raffinate ponds and up Lightner Creek), and the nearby location of Smelter Mountain. Given these design concerns, the concept described in the EIS for Alternative 2 was considered to be the best available as it offered minimum movement of tailings, occupied the least area, provided for the greatest setback from the Animas River, and allowed for a satisfactory safety factor with the given slopes.

Regarding the relocation of the Durango tailings to the Durita facility, this issue was fully examined in Section 3.2.7 of the DEIS.

2. Comment

The EIS should provide a clearer and more comprehensive statement of how selection of the preferred alternative was accomplished. (534) Two commenters felt that the basis for planning and selection (of the preferred alternative) should depend on factors such as cost, health effects, traffic accidents and deaths, and public opinion, and not on what were used in the DEIS (soils, wildlife, vegetation, and the like). (454, 521)

Response

The DOE, in consultation with the State of Colorado, selected Alternative 5 as the preferred alternative on the basis that the recovery of the mineral values may be economically viable, that the Long Hollow site is relatively remote, health effects would be low, wildlife would be minimally impacted, and that ground-water and transportation impacts could be mitigated in an acceptable manner.

Since publication of the DEIS, it has become apparent that recovery of the mineral resources is not economically viable and that demonstration of compliance with ground-water standards at the Long Hollow site would be difficult given recently collected data (see Sections 6.7 and 6.8). Also, because stabilization in place would only meet the 200-year longevity standard, and would require more long-term maintenance, it became apparent that relocation to Bodo Canyon, all factors considered, was the best of the five alternatives examined in the EIS. Thus, Alternative 3, relocation to the Bodo Canyon site is DOE's preferred alternative.

3. Comment

What were the reasons for rejecting the other six alternate disposal sites besides Long Hollow and Bodo Canyon? (424, 425)

Response

As stated in Appendix C, all nine sites were ranked based upon geotechnical considerations (Table C-1). Once ranked, a multidisciplinary site selection committee, appointed by the state, further evaluated each site considering factors such as reclamation potential, transportation, land use, political issues, and the need for potential future maintenance. The following describes the reasons why each of the six sites was rejected (CGS, 1981).

The Junction site is geotechnically an excellent site. However, it is adjacent to an area that presently is being studied by the U.S. Bureau of Land Management as a possible wilderness area. The site also is irrigated agricultural land and is directly adjacent to recorded archaeological sites.

The Maggies Rock site also is an excellent site from a geotechnical standpoint; however, much of this site is owned by the Ute Mountain Tribe, and also is irrigated agricultural land.

The Mancos Valley site has a higher erosion potential and has a producing oil well on it; Mesa Verde National Park and other significant archaeological resources are only 0.5 mile from the site.

The Thompson Park site is highly visible from U.S. Highway 160. Visual impacts would occur while the project is in progress. This site also is irrigated agricultural land.

The State site is noticeably less desirable than other sites from a geotechnical standpoint. The State site is underlain by the Animas Formation, a "possibly suitable formation" that is locally an important source of ground water in the region.

Geotechnically, Mud Creek was similar to the Mancos Valley and Thompson Park sites. Long-term erosion potential was considered moderate and part of the site was potentially unstable.

4. Comment

Statements in the DEIS imply that the owner of the Long Hollow site may be opposed to the use of the site, forcing the government to condemn his land. Was the issue of landowner acceptability a factor in the site selection criteria? (477)

Response

The issue of land ownership (i.e., private, Federal, state, local) was considered in the evaluation of the nine candidate alternate disposal sites (Section C.1.1). However, the issue of land ownership acceptability was not considered.

In the event that the Long Hollow site were to be selected, the state would have at least two appraisals made of the value of the property. On the basis of these appraisals, the state, not the Federal Government, would negotiate a sale price with the owner of the Long Hollow site.

5. Comment

The EIS should clarify why the Rabbit Mountain alternative was eliminated considering that Rabbit Mountain and Bodo Canyon have similar subsurface geology. (490)

Response

Although the geology of the Rabbit Mountain and Bodo Canyon areas may indeed be similar, the Rabbit Mountain area was rejected for inclusion in the EIS by the state of Colorado because it is "...noticeably less desirable than other sites from a geotechnical standpoint...," it is underlain by "...a possibly suitable formation that is locally an important source of ground water...," and "...has a high erosion potential..." (CGS, 1981). These conclusions were reached based upon a detailed review of all available literature and a site reconnaissance.

6. Comment

The FEIS should address the alternative of disposing of the tailings in the abandoned underground mines in Smelter Mountain. (414, 519, 559)

Response

Disposal within Smelter Mountain would be exceedingly expensive. Based on a continuous opening six feet high, an underground mine area of 175 acres would be required to accommodate the tailings and contaminated materials. It is unlikely that the mine in Smelter Mountain was this large, and it is also probable that most of the mine has caved in; thus, re-excavation of the mine workings would be necessary.

7. Comment

The concept of transporting the tailings by an aerial tram or through the Smelter Mountain mine tunnel should be given consideration in the FEIS. (519, 515, 483, 550) A slurry pipeline (using water) or carbon dioxide pipeline should be considered as a means of transporting the tailings to an alternate disposal site. (326, 419, 424, 425, 439, 440, 458) Conveyor transport should also be considered. (506)

Response

The slurry pipeline concept is discussed in Section 3.2.7. The carbon dioxide pipeline has not been considered because the system has not yet been proven technically feasible. A rough cost estimate for transporting the tailings by aerial tram directly over Smelter Mountain to Bodo Canyon is $5 million which is comparable to the cost for the truck system. This cost includes covers for the gondolas and a hopper for loading and unloading. It does not include contingency costs for loading and unloading, transportation to and from the pile, land-acquisition, engineering, construction management, and ongoing maintenance. This method of moving the tailings is not as commonly used as trucks or conveyors for material transport and there may be many unknown costs. For example, a maintenance road under the tram may need to be constructed to clean up any materials that are accidentally spilled on the tram route. Because a road cannot be constructed to go directly over Smelter Mountain, a more feasible place for the tram would be starting near the raffinate ponds area and then going up the north drainage divide to the Bodo Canyon site. However this route would greatly increase the cost of the tram due to the turns required.

Maintenance is another potential problem with a tram system. If the tram breaks down it would virtually stop construction until repaired. Also, if spillage were to occur, the contaminated material would be carried in the air for a great distance since the gondolas would be high in the air. Migitation measures would have to be studied and developed in order to minimize the probability and effect of such a spill. A system to control fugitive dust would also be required where the gondolas are loaded and unloaded.

The only foreseeable benefit of the tram system would be a reduction in truck traffic. However, a tram system would not completely eliminate truck traffic. An estimated 187,000 cy of soils would have to be transported to the Durango site and approximately 44,000 cy of riprap would have to be transported from the quarry site to the Bodo Canyon site. Also, any large contaminated materials found in the pile at Durango that would not fit in the gondola would have to be trucked to the Bodo Canyon site.

Further, a tram system may not reduce the amount of fugitive dust that would be generated during construction and might possibly increase it. The difference in costs between the trucking system alternative and the tram system that passes directly over Smelter Mountain with no maintenance road is slight. Considering the disadvantages of a tram transportation system, the DOE has selected the truck system and conveyor systems for detailed analysis in Alternative 3.

In reevaluating alternative transportation modes, tailings transport by conveyor has been found to be a viable alternative to truck transport. A relatively new type of conveyor referred to as a "pipe conveyor" appears to be particularly suitable for the Durango remedial action. Accordingly, the DOE has revised the FEIS to include a truck and conveyor option for Alternative 3, stabilization at Bodo Canyon.

8. Comment

In two (2) separate DOE contractor memos, it was stated that the DOE was not going to select a "preferred alternative." Why then did DOE select a preferred alternative in the DEIS without working with the county and local constituents first? (515)

Response

As with all large multidisciplinary projects, the Durango EIS was subject to much discussion both within DOE and with DOE contractor organizations, and with the State of Colorado. The memoranda referred to by the commenter were not intended to be the official position of DOE.

The DOE disagrees that county and local individuals and groups were not consulted throughout the process. DOE gave notice of its intent to prepare an EIS and invited public participation in a notice published in the Federal Register (46 FR 30383 - 30385), June 8, 1981. The notice announced three public scoping meetings which were held on June 30 and July 1, 1981. Announcement of the meetings also was widely publicized in the local media. The preferred alternative in the DEIS was selected based on comments received in the scoping meetings, technical factors, and in consultation with the state (see Section 6.3, response to comment 2). Also, see Section 4.12.8, Public Concerns About the Remedial Action Project.

9. Comment

The EIS should consider the alternative of stabilizing in place without moving any of the tailings. (545, 368, 369, 415, 515)

Response

This concept was considered; however, it was found to be unsuitable for achieving the long-term stability required by the EPA standards. Slopes of the piles would remain too steep (1 to 1.7 or 1.8) for the required level of safety.

10. Comment

Different levels of data were presented for each alternative in the DEIS, making evaluation and decisionmaking more difficult. Every reasonable effort should be made to provide detailed and comparable data so that the comparison of alternatives is meaningful. (554)

Response

The commenter is correct in the underlying assumption that alternatives in an EIS must be treated equally and that the bases of this treatment are the quality and magnitude of supporting data. The DOE believes that every reasonable attempt has been made to obtain site-specific data and provide quantitative analyses. In those case for which information is lacking, data from other tailings piles or regional data have been used. Further, analytical approaches used are conservative in that impacts are overestimated. Thus, for the legislated purpose of an EIS (i.e., provide input to the decisionmaking process), information and analyses in this FEIS are more than sufficient to compare alternatives.

6.4 GENERAL DESIGN CONSIDERATIONS

Comments which involved designs for more than one of the alternatives were collectively grouped within the General Design Considerations category. Written and oral statements were directed at broad issues including tailings covers, erosion protection, geologic and seismic stability, hydrologic conditions, and post remedial action maintenance. The comments are summarized below with the DOE's response.

6.4.1 General engineering design

1. Comment

Several comments were directed at the type of covers which were described in the DEIS.

o Comment a

The Colorado Department of Health recommended that a two-foot layer of gravel would be needed as the final pile cover layer for erosion protection with all of the action alternatives. (493) The Nuclear Regulatory Commission also expressed doubt that a revegetated cover would meet the longevity requirement of the EPA standards. (490) Another commenter suggested that the vegetative cover on the existing pile provides adequate erosion protection. (429)

o Response a

The DOE agrees with the Colorado Department of Health and has modified sections 1.3, 3.2.5, 3.2.6, and 5.6.1 accordingly. The cover will consist of a two-foot-thick rock layer (1.0 inch $\leq D_{50} \leq$ 2.0 inches, 3.0 inches $\leq D_{100}$) on the top- and sideslopes. Vegetation is not believed to be as reliable as rock for providing long-term erosion protection. A drought could cause the vegetation to die out and leave the tailings cover susceptible to severe erosion.

o Comment b

One commenter recommended that the cover design should incorporate a capillary break to retard upward movement of water and salts. (491, 478)

o Response b

It has not been deemed necessary to require a capillary break in cover systems design. The total cover would consist of two feet of rock underlain by five feet of compacted fine grained soil. This system would prevent deep drying of the soils and creation of high soil suctions.

o Comment c

The Colorado Department of Health and the New Mexico Environmental Improvement Division asked what measures would be taken to inhibit intrusion by burrowing animals or plant root penetration. (493, 485, 478)

o Response c

The two-foot-thick rock erosion protection barrier and the five feet of compacted cover would discourage burrowing animal intrusion and plant establishment (DOE, 1985b). Additionally, any intrusion by burrowing animals observed during periodic surveillance inspections would be evaluated and corrected as part of maintenance as necessary. Any deep rooting plants would be removed if densities were high enough to cause potential problems.

o Comment d

It would be better to have a concave surface for the top of the pile under Alternatives 3, 4, and 5 in order to keep the clay cap moist. (493)

o Response d

The DOE disagrees. A concave surface would create excessive infiltration through the clay cap, possibly causing tailings leachate to develop and seep from the embankment. By having a rock layer over the clay, the radon barrier would maintain a higher long-term moisture content without causing excessive infiltration into the stabilized pile.

o Comment e

DOE should have addressed the use of an asphalt emulsion radon barrier. Conclusions of DOE's UMTRA Project Technology Development Program state that asphalt-emulsion barriers are more effective than soil radon barriers. (491)

o Response e

Asphalt emulsions have not been proven to last for hundreds of years. Deterioration and cracking of this type of cover would not be as selfhealing as would a natural soil cover. Research conducted by UMTRA Project Technology and Development Program (Hartley et al., 1981) found that asphalt emulsion and soil barriers both effectively limit radon emanation; however, the long-term reliability of asphalt barriers cannot be assured.

o Comment f

Several commenters requested that the method used to calculate the radon cover thickness should be explained in greater detail. (490, 491, 493, 454) Other commenters urged that the DOE use a very conservative procedure in calculating the radon cover thickness because of the wide variation in factors that control the release of radon. (478, 491)

o Response f

The cover thickness required for all alternatives was calculated using the single layer model, RAECO (DOE, 1982) (see Sections A.4.2.2, A.5.2.4, and A.7.2.4 of Volume II of the DEIS). The source terms for contaminated material used were for the estimated radium content of the tailings. The diffusion coefficients of both tailings and cover material were estimated as well. All estimates were based on typical values of these properties measured at other sites. The EIS does not attempt to present the detailed engineering of the covers, but rather performs an analysis of the health effects impacts assuming that the EPA standard of 20 pCi/m^2s is met after installation of whatever amount of cover material is required based on the detailed engineering design of the alternative selected.

2. Comment

Several comments related to erosion control measures and projected flood conditions.

o Comment a

Several comments questioned the adequacy of erosion control measures in diversion channels at Bodo Canyon and Long Hollow. (473, 485, 490 491, 554) The diversion channels as proposed in the DEIS may not be able to resist erosion during a PMP. Riprap should be required for both the channel sideslopes and bottoms. (491, 554) In addition, calculations and assumptions used in sizing the riprap protection and costs should be provided. (554, 515)

o Response a

In reevaluating the calculated channel velocities, the DOE has decided that riprap would be placed in the channel bottoms and on the sideslopes. In the final design, riprap would be sized by analytical methods using appropriate calculated velocities during a PMP event which would vary depending upon the particular channel. Sections 3.2.4, 3.2.5, and others have been modified to reflect this change. An estimated cost for lining the channel sideslopes and bottoms with riprap in each alternative has been incorporated into the revised cost in Table 1.2.

o Comment b

Another comment stated that the potential for aggradation or filling in of the diversion channels around Long Hollow should be considered. (485)

o Response b

The diversion channels would be designed with sufficient size and slope to prevent long-term aggradation due to storm events from affecting the integrity of the channel capacities.

o Comment c

The drainage area at Bodo Canyon is half that of Long Hollow and would require less protection for the Probable Maximum Flood (PMF). (534)

o Response c

That the drainage area at Bodo Canyon is less than that of Long Hollow does not necessarily mean that less protection is required. The magnitude of design conditions resulting from a PMF event varies widely based upon slope, degree of saturation, times of concentration, and concentration of drainage, in addition to the size of the drainage basin. Each drainage area was analyzed for PMP conditions, and the appropriate erosion protection measures have been incorporated into the conceptual design.

o Comment d

Median soil moisture conditions were used for the calculation of PMF flows (see page F-3, Appendix F, Water Resources Information). Current NRC guidance states that soils over the watershed area should be assumed to be saturated, or that conditions which would reduce surface runoff should be fully justified and documented. The analysis should therefore be performed assuming saturated conditions or justification provided for the degree of saturation assumed in calculating runoff values. (554)

o Response d

There are several parameters used in a flood analysis that can cause the results to vary widely based upon the judgement of the user. At the time the PMF analysis was performed for the Animas River, it was felt that median soil moisture conditions were conservative enough to assess the potential flood hazard. The flood hazard was determined to be major and constituted one of the primary factors in the decision to select Alternative 3 as the preferred alternative in the FEIS. At this point it is considered unnecessary to perform additional flood analysis using more conservative parameter values which would result in a somewhat larger projected flood.

o Comment e

The estimates presented in Appendix F, Water Resources Information, for the Bodo Canyon and Long Hollow Probable Maximum Flood (PMF) do not describe the locations of the estimates. (554)

o Response e

Upstream from the tailings at the Durango site, the Animas River has a drainage area of approximately 770 square miles (492,800 acres), including that of Lightner Creek. These are well defined channels and would have significantly larger flows during a PMF event than at the Bodo Canyon or Long Hollow sites. To clarify the effects a PMF would have on these channels' water surface, elevations were presented at various locations along both Lightner Creek and the Animas River. However, at the Bodo Canyon and Long Hollow sites, the watersheds are comprised of relatively small drainage areas. There are no well-defined channels that would justify the need for water surface elevations along the different drainage areas. Therefore, these elevations were not presented.

o Comment f

The EIS should address the durability of rock that may be utilized from the Bodo Canyon borrow site. (493)

o Response f

Rock durability will be addressed in the Remedial Action Plan in terms of design criteria for the Remedial Action Contractor (RAC). The conceptual design at this point assumes that the proposed source of rock will meet durability criteria and the sizing of the rock is based partially upon this. The final testing and evaluation of rock durability is the responsibility of the RAC.

Should any of the rock being evaluated for use as erosion protection not meet the recommended standards for acceptable rock durability, a new rock source would be identified and evaluated.

If an alternative rock source of better durability cannot be found, the size of the rock would be increased to take into account the degradation of the rock with time. The increase in size is subjective but it is proposed that the rock size be increased by the percentage that the rock fails a criteria.

o Comment g

Several commenters stated that gully erosion at Bodo Canyon warrants modification to the design incorporating long-term erosion protection. (490, 492, 493, 515)

o Response g

Gully erosion conditions at Bodo Canyon have been reevaluated (see Section 4.5.5) and the design has been revised to include placement of a layer of riprap in the upper reach of the gully draining east from the site. (See Section 3.2.4 in this FEIS.)

3. Comment

Several commenters requested that the EIS contain much greater detail on the engineering designs than was presented in the DEIS. (491, 515)

Response

The intent of writing an EIS is to provide a document to be used as part of the decisionmaking process and to estimate the impacts of the alternatives under consideration. The DOE believes that sufficient engineering details are provided to conservatively assess the impacts. The RAP provides additional detail of the conceptual design (DOE, 1985d).

4. Comment

What methods are proposed for controlling windblown tailings at the pile during excavation or stabilization activities? What will prevent disturbed tailings from blowing around during the night or in periods of high winds, adverse weather conditions, on weekends, or during worker strikes? (515, 517, 429, 454, 483)

Response

An Air Pollutant Emission Notice and fugitive dust control plan will be submitted to the Colorado Department of Health prior to their issuance of an air emission permit. The permit will specify necessary dust control measures. Actions that will be considered for controlling windblown tailings at the pile include dampening exposed contaminated material or covering it with tarps or plastic sheeting to prevent blowing dust. There will also be a chemical dust palliative applied to minimize dust where necessary. As described in Sections 3.3.2 and 5.21.2, the specific emission controls would be developed during the final design stage.

5. <u>Comment</u>

Project impacts on present utilities at Durango, Bodo Canyon, and Long Hollow need to be addressed for all alternatives. (493)

<u>Response</u>

There will be minimal impact on present utilities. Water will be obtained from the Animas River, sewage will be relocated to the treatment plant, and the power requirements can be supplied by existing sources. Sections 5.6.1, 5.12, and 5.15 describe these impacts and resource requirements.

6. <u>Comment</u>

Will contaminated material underneath the pile be removed down to a point where radiation levels drop to EPA standards? How deep will this be? Is removal even possible? Could this add significantly to the cost? (483, 515)

<u>Response</u>

During excavation of the pile, all material exceeding the EPA soil concentration standards will be removed. The limits of excavation will be determined by field and laboratory measurements. Conservative estimates of the contaminant interface have been made based upon limited site characterization data. The exact interface will be determined by excavation control measurements used to determine when the limits of contamination have been reached. Excavation costs are directly dependent upon the extent of subpile contamination.

7. <u>Comment</u>

Commenters stated that materials such as yellowcake, machinery, and the like, may be present in the tailings. During the remedial action, how would they be handled? (446, 177, 505) Another commenter stated that the pile should be moved because there is a lot of high grade ore in the center of the pile. (541) Yet another commenter said that DOE's lack of information on what is in the middle of the pile is a good reason to stabilize the tailings in place without moving them. (505)

<u>Response</u>

High grade ore was the source and yellowcake the product, both valuable resources of the milling process, thus their presence in the tailings is not anticipated. However, radiation measurements taken during the remedial action will identify the presence of any such materials. If yellowcake or high grade ore are found in the tailings they will be blended so that uniform radiological properties of the tailings are obtained. At this time is is not anticipated that any yellowcake will be found during the remedial action. Section 3.2.3 has been revised for clarification. Machinery found in the tailings will be appropriately dismantled, reduced in size, and buried in the stabilized pile.

8. Comment

Have road profiles and cross-sections been prepared to determine the feasibility of putting in access roads to the tailings piles along the sides of Smelter Mountain at 30-foot intervals? Will these roads be able to be constructed at the required 35-foot width? What alternative means of excavation/disposal are available if construction of the access roads proves unfeasible? (483, 515) The NRC requested information on the source and quantity borrow materials that would be used for road construction.

Response

Construction drawings for road profiles and cross-sections have not been completed and are not required for this EIS. However, the construction of the road is feasible. It should be noted that the on-site access roads do not have to be 35 feet wide. For example, the road along the face of Smelter Mountain may only have to be wide enough to support one-way truck traffic, approximately 15 feet wide. The most cost effective road design will be incorporated into the final design. Another means of moving the tailings is by conveyor. The tailings could be conveyed from the tailings piles to the raffinate ponds for truck loadout or transported by conveyor from the existing piles to Bodo Canyon. Conveyor transport is discussed in more detail in Section 3.2.4 of this FEIS. The source of borrow materials is a borrow site south of the Bodo Canyon disposal site.

9. Comment

The utility of a two stage truck wash station is questionable. None was needed for the Naturita (Durita) project. (493)

Response

In order to prevent contaminated material from leaving the site, a truck wash and decontamination pad is needed. The Naturita tailings project was operated under a radioactive materials license issued by the State of Colorado and was conducted according to different radiation control standards than are currently in effect for remedial action at inactive uranium tailings sites.

10. Comment

The use of activated carbon for adsorption of radionuclides during the remedial action should be considered by DOE. (417, 418)

Response

Activated charcoal is used as a technique to measure radon flux from the tailings pile on a small scale, and for treatment of waste water in limited situations. It would be impractical to use activated charcoal as a means to filter or cleanse the air or water during remedial action construction activities.

6.4.2 General Hydrologic considerations

Seven written comments raised general issues in the areas of hydrology and water quality.

1. Comment

The NRC noted that Section F.2.2.3 infers that many of the groundwater parameters were elevated above background. What is "background" for the aquifers in question? Were state and Federal standards exceeded? (490, 554)

Response

For the shallow aquifer beneath the tailings piles, none of the monitoring wells are located so as to yield true background samples of water quality. Well No. 22 is the furthest upgradient; however, its proximity to the small tailings pile prevents its consideration as "background." Therefore, concentrations reported as "elevated" (BFEC, 1983) and reiterated in the DEIS are elevated relative to Federal and state standards (Tables F.9 and F.10, Appendix F, Water Resources Information), not to background.

Well 7 is considered the background well in the raffinate ponds area for water entering the shallow system of the eastern portion of this site from South Creek (also referred to as "north drainage"). This well yielded ground-water samples (from November, 1982, to August, 1983) with average concentrations of 4400 umhos/cm conductance, 10 ppb uranium, and 2600 ppm sulfate (see Tables F.21 through F.24). True background water quality for the Menefee Formation (sandstone and coal layers) has not been established for this site. New analytical data for wells DUR-03-602 and 603 completed in Menefee coal seams at Bodo Canyon can be used to estimate background levels of key constituents for down-dip Menefee strata beneath the ponds. The key "background" parameters (averages) for the Menefee Formation wells are: 2250 ppm sulfate; 5.0 ppm iron; 0.6 ppm manganese; <0.01 ppm chromium; <0.005 ppm selenium; 9.3 ppm strontium; <0.01 ppm vanadium; <3 ppb total uranium; 7.3 pH; and 3800 umhos/cm conductance. Thus, as reported in Section 6.2 of the DEIS, elevated levels of chromium and selenium in the aquifers underlying the raffinate ponds area are above both local background levels, and state and Federal standards. Levels of uranium and vanadium are above background concentrations; however, there are no state or Federal drinking water standards for these elements.

2. Comment

It is not appropriate to consider radium-226 in the tailings piles to be in an insoluble form without experimental data. (493)

Response

GECR (1982) presents data from core samples taken from the small tailings pile which indicate that radium may be moving downward within the piles with the leaching of sulfate salts. Radium may form soluble complexes with sulfate and chloride within the tailings solution; however, ample experimental and field data show that radium is strongly adsorbed by most soil types (IAEA, 1984). Also, radium sulfate is likely to be precipitated at the base of the pile as it encounters well buffered neutralizing soils. Analytical results reported by Bendix for wells at the Durango mill site show levels of Ra-226 consistently below 2.0 pCi/l (BFEC, 1983). Therefore, radium may be in a soluble form within the tailings, but it is not mobile outside the acidic, oxidizing environment of the piles.

3. Comment

Site-specific, short-term water balances should be performed for all sites assessed in the EIS in order to obtain accurate estimates of infiltration through the stabilized tailings pile. It is not adequate to state that because annual evapotranspiration exceeds precipitation, that the potential for infiltration is small (as done in Section A.5.2.4 of the DEIS). (490, 554)

Response

It is true that snowmelt and heavy precipitation events may periodically cause infiltration to exceed evapotranspiration losses on a local, site-specific scale. However, the engineering design for both stabilization in place and relocation features a compacted clay cover with low hydraulic conductivity values (K) (on the order of 10^{-7} cm/sec) which will drastically limit infiltration rates into the materials. Assuming a vertical permeability of this order, a unit hydraulic gradient through the clay cover, and saturated flow conditions, then a highly conservative infiltration rate (Darcian velocity) through the cover would be 1.24 inches per year. Average annual precipitation recorded in Durango (1951-1973) is approximately 18.7 inches per year (NOAA, 1975). This vertical seepage rate thus represents 6.6 percent of average annual precipitation. The U.S. Geological Survey (USGS, 1983) estimates that only two percent of average annual precipitation infiltrates to the saturated zone within principal recharge areas of the Durango area (this would amount to only 0.4 inch per year). Infiltration rates will be much less through a cover designed to limit infiltration. A conservative estimate of infiltration into stabilized tailings materials, would be a value of 1.87 inches per year (10 percent of annual precipitation).

4. Comment

The tailings may be far more saturated than is presently believed and more complex bottom liners may be required to mitigate impacts on ground water for Alternatives 3 and 4. (493)

Response

Tailings relocated to either Bodo Canyon or Long Hollow would require transport, mixing, and moisture conditioning prior to placement. Therefore the moisture content of the tailings would be controlled and more complex liners would not be required.

5. Comment

How will water within the existing tailings piles be drained? (493)

Response

It has been assumed that the pile is unsaturated at the surface and partially saturated in deeper layers. Draining the piles is not expected to be necessary as some moisture content is desirable for dust emission control and compaction. However, if necessary, during the remedial action a method of dewatering would be determined and implemented.

6. Comment

How will runoff water from dust control efforts be handled? (429) Will contaminated water be evaporated or treated and discharged? The document is inconsistent on this issue. (454)

Response

Dust control efforts will optimize the amount of water applied to control dust emissions and avoid runoff of excess water. All contaminated water collected from dust control and storm runoff at the sites will be channeled to an on-site water retention reservoir which will be lined with an impermeable synthetic liner to minimize seepage losses. The reservoir will be sized to contain runoff from a 10-year 24-hour precipitation event. Once the remedial action process is complete, the contaminated water storage reservoirs will be retained until all the water has evaporated. Sections 3.2 and 3.3.2 have been revised.

7. Comment

What additional mitigation measures can be included to avoid or decrease siltation of the Animas River to decrease impacts to the fishery downstream from the pile? (549, 519)

Response

During preparation of the final design, sediment control measures will be considered that would reduce sediment discharge to the Animas River. Some of the measures are coffer dams, sediment traps, and mulching of newly graded areas. These measures would be in addition to directing runoff from contaminated areas to contaminated water storage reservoirs.

8. Comment

The discussion of the hydrologic regime at Bodo Canyon and Long Hollow should be revised to include recently collected ground-water data. (493)

Response

The addendum to Appendix F, Water Resources Information, in this FEIS contains this information (see Tables F.42 to F.45, and Figures F.28 and F.29). These tables summarize data collected during recently completed JEG drilling programs at Bodo Canyon and Long Hollow. These data generally confirm hydrologic assessments made in the DEIS. Where new hydrologic interpretations are warranted, they are discussed in responses to several NRC comments in Sections 6.6 and 6.7.

9. Comment

Section 5.1 of the DEIS states that surface-water samples taken from the Animas River showed concentrations of radium above the EPA drinking water standards. After remedial action, will the Animas River continue to have the same excess radium readings? (489)

Response

This issue is thoroughly discussed in Section 5.6.1 of this EIS.

6.4.3 General geologic considerations

Seven written statements, including those from the Colorado Department of Health, the NRC, and Citizens Concerned About Moving the Pile (CCAMP) questioned aspects of geomorphic stability, the seismic evaluation, and the geotechnical characteristics of the tailings piles.

1. Comment

An inadequate data base for the evaluation of seismic hazards was presented in the DEIS. Many seismic events which took place within 300 miles of Durango were not listed. (490, 412) Figure E-8 does not accurately present the seismic events that have occurred in the Durango area. (490)

Response

Seismic activity near Durango has been reevaluated using both deterministic and probabilistic approaches. Section 4.5.4 has been revised to incorporate summaries from the more recent evaluation which has been reproduced as Appendix M, Seismic Evaluation.

Figure E-8, Appendix E, Soils, Geologic, and Seismic Information, depicts earthquakes that have occurred within a 200-mile radius of Durango, not a 300-mile radius as the commenter implies. As stated in the EIS, Table E-6 represents only the larger earthquakes that have occurred within a 200-mile radius. The NOAA file of all monitored seismic activity, from which Figure E-8 was derived has also been reproduced in Appendix M, Seismic Evaluation.

2. Comment

The northwest-trending faults between the Uncompahgre Uplift and Paradox Basin are stated to have Neogene displacement and are located 75 miles from Durango. Section E.2.1.3 provides no discussion of the fault parameters, the basis for stating that the faults are 75 miles from Durango, the basis for the Neogene displacement, or maps showing the faults' locations in relation to the site. (554)

Response

Appendix M, Seismic Evaluation, has been added to this FEIS; seismicity at the Durango sites and the issues raised by the commenter are addressed in detail.

3. Comment

What is the basis for the statement in Section E.2.1.3 that the closest approach of the Rio Grande Rift is 100 miles? From Figure E-7, it appears that normal faults related to the west side of the Rio Grande uplift come as close as 50 miles to Durango. (554)

Response

Appendix M has been prepared and addresses seismicity at the Durango sites in detail. The Rio Grande Rift and possibly some normal faulting associated with the Rio Grande Rift were found to approach within 51 miles of Durango.

4. Comment

What is the age of last movement on normal faults in the Durango area? Where are these faults located in relation to the site? (554)

Response

The normal faults associated with the Durango Anticline and the Perrins Peak Syncline are considered inactive (i.e., not having experienced movement in the past 10,000 years). As stated, these faults are located in the immediate vicinity of Durango, being approximately 0.25 and 0.5 mile distant from the processing site. The locations of these faults are shown in Figure E-5, Appendix E, Soils, Geologic, and Seismic Information, of the DEIS.

5. Comment

In Section E.2.1.3, what is the age of last movement on the Ridges Basin Fault? What is meant by "no measurable displacement" of the Cliff House Sandstone? The basis for saying the fault dies out before reaching the site is weak and the DEIS should provide additional supporting data. (554)

Response

A field study was conducted to determine if active faulting exists in the Durango area (JEG, 1985b). No movement of any faults, including the Ridges Basin Fault, has occurred in the past 10,000 years (Holocene).

6. Comment

Where in relation to the three sites are the faults described in Section E.2.1.3 as north of the electrical substation? What is the basis for the statement that "The faults appear to be tight, and the possibility of ground-water movement along these faults is believed to be slight." (554)

Response

Figure E-5 in Appendix E, Soils, Geologic, and Seismic Information, of the DEIS shows the locations of these faults and the locations of the tailings and Bodo Canyon site. Fault zones in sedimentary rocks often consist of finely ground rock and clay (gouge) which acts as a low-permeability barrier to ground-water flow.

7. Comment

Regional seismicity and projected maximum ground acceleration were the subject of five NRC comments.

o Comment a

Section E.2.3.2 estimates the maximum acceleration for events on potential earthquake sources (i.e., Uncompahgre boundary fault), using Schnabel and Seed (1973) curves. What makes Schnabel and Seed's maximum acceleration versus distance curves superior over other available curves? (554)

o Response a

There are many attenuation curves available for use in the literature. These are developed upon various data bases. While a large variation in acceleration can be derived from the various curves and formulas in the near field, only minor differences exist for the distances considered at Durango.

o Comment b

No fault parameter data are provided to support the distances used to determine the maximum acceleration in Section E.2.3.2. (554)

o Response b

A detailed discussion of fault parameter data used to support the derived acceleration during seismic activity has been presented in Appendix M, Seismic Evaluation, of this FEIS.

o Comment c

Docekal, 1970, discusses a seismic trend along a line from Wichita to Amarillo to the West Mountains. What impact does this seismic trend have on the analysis of seismic potential for the three sites? (554)

o Response c

Docekal, 1970, "Earthquakes of the Stable Interior, with Emphasis on the Midcontinent," discusses isoseismal trends of Magnitude VII and VIII earthquakes for the Central Stable Area of the United States. A review of this document indicates that the seismic trend corresponding to the Wichita-Amarillo-West Mountains Uplift has no affect on the derived ground acceleration at the sites.

o Comment d

Section E.2.3.3 should be revised to include a discussion of site-specific seismic activity, e.g., maximum ground motion used in site design and related impacts. (554)

o Response d

The maximum ground motion used in site design and related impacts is discussed in paragraph 3 of Section E.2.3.3. This discussion has been revised and expanded in Appendix M of this FEIS.

8. Comment

Several commenters stated that the DEIS did not present sufficient borehole or other data on the radioactive constituents and the geomorphic stability of the pile. DOE should obtain this information from Hecla Mining Company or collect new information for evaluation prior to the FEIS. (177, 446, 491, 513, 515, 508, 509, 513)

Response

The geomorphic stability of the tailings pile and the alternate sites has been addressed by the DOE (JEG, 1985c,d,e), using very conservative assumptions and knowledge from other existing tailings piles. The reports are summarized in Section 4.5.4, of the FEIS.

Additional data on the radioactive constituents, principally the radium content of the pile and the extent of subpile contamination, will be obtained by the DOE prior to completing the final design of the remedial action. This information will be used to develop the source term, radon barrier cover, and detailed stability analyses. Although the DOE recognizes that these data would be useful to refine the designs, this information is not necessary to estimate impacts because of the conservatism (i.e., over estimation of impacts) built into the impacts analyses presented in this EIS.

9. Comment

The Colorado Department of Health and three other commenters said the potential instability of the existing tailings piles should be addressed along with its potential to fail and slide into the river during remedial action for all of the alternatives addressed. (493, 508, 509, 513) Other commenters stated that the instability of the piles is justification to move the piles. (407, 560)

Response

Due to lack of legal access to the Durango tailings pile, detailed analyses of stability based on pile data cannot be performed. Examination of the pile indicates that existing stability under static conditions is in excess of a 1.0 safety factor. There appears to be a bulge on the slope of the large pile that may have indicated near instability under active milling conditions or may have been a construction feature. It is likely that the existing pile would be unstable under seismic loading conditions.

Since the existing pile is presently stable, removal of tailings during the remedial action process will lower the height of the tailings pile and increase pile stability. Temporary effects of construction equipment near the edge of the pile are not considered significant, as they will only approach loadings experienced by the embankment during construction of the tailings dike during milling operations.

10. Comment

The embankments associated with Alternatives 2 and 3 have been analyzed for stability using the STABL 2 computer program. However, the embankments for Alternatives 4 and 5 were analyzed by the infinite slope method; a simplified, quick method that is usually applied to long slopes of cohesionless materials. The use of this method is considered an inadequate assessment of stability. Consistency should be maintained by using the more appropriate methods as were applied to Alternatives 2 and 3. (490)

Response

The values presented for the slope stability analysis results, Long Hollow site (Alternatives 4 and 5), Table A-16, were also based on results of the STABL 2 computer program rather than the infinite slope method indicated in the text of Appendix A, Conceptual Designs and Engineering Evaluations, Remedial Action Alternatives.

The infinite slope analysis which is applicable to long-term stability of cohesive slopes (Bowles, 1977) was used to verify that increasing the embankment height by several feet did not invalidate the original analysis.

11. Comment

Another NRC comment stated that Section E.2.1, Appendix E, Soils, Geologic, and Seismic Information, has utilized regional geologic studies in order to draw conclusions on the site-specific geology, yet provides no supporting data for these conclusions. (554)

Response

Section E.2.1 was intended only to give an overview of regional and site-specific geology based on a review of the pertinent literature. Where given, references to site-specific lithology are discussed only in general terms based on available geologic logs. More detailed descriptions of site-specific geology and hydrostratigraphy are given in Sections F.2.2 through F.2.4, Appendix F, Water Resources Information. Site-specific conclusions regarding the ground-water systems within specific geologic strata are based on individual borehole logs derived from site-specific drilling programs. These logs are available for review in the UMTRA Project Office, Albuquerque, New Mexico. They include logs for the Durango mill site (BFEC, 1983), for Bodo Canyon (DOE, 1985c; Dames & Moore, 1983), and for Long Hollow (FMFA, 1978; DOE, 1985c).

6.4.4 Surveillance and maintenance

Several comments related to the plans for surveillance and maintenance following the remedial action. The summarized comments and the DOE's response follow.

1. Comment

The DOE should conduct a post remedial action monitoring program including an annual inspection for the first five years and an inspection once every five years for the following 45 years. Monitoring should also include measurements of radon flux at the pile surface and measurement of ambient radon at the site boundary. (491)

Response

The DOE agrees that surveillance and custodial maintenance will be necessary, regardless of the remedial action. Details of the plans for these activities are available in the draft, unpublished Project Surveillance and Maintenance Plan (DOE, 1985a), the draft, unpublished Project Licensing Plan (DOE, 1984a) and the Remedial Action Plan (DOE, 1985d). These documents will be or have been subject to review and approval by the NRC and will be available to the public at the reading rooms and libraries listed at the beginning of Section 6.22.

The long-term site surveillance and maintenance plan will be designed to assure that the final site remains undisturbed and continues to function as designed. Although the frequency of periodic inspections will not be finalized until late in the remedial action as part of the NRC license, the DOE believes that most UMTRA Project sites will be inspected annually for ten years. After the inspection in year 9, the need and frequency of site inspections will be reevaluated. Radon monitoring will be conducted prior to the remedial action, during the remedial action, and following the remedial action as part of the certification effort. However, the EPA standards do not require radon flux measurements to demonstrate compliance with UMTRCA.

2. Comment

Who has responsibilities for maintaining the site once stabilization has occurred? (513, 483) Other written comments asked how routine maintenance will be done, what emergency procedures would be implemented, if necessary, and what preventive maintenance would be instituted. (515, 483)

Response

Section 1.7 of the FEIS explains that DOE has the responsibility for surveillance and maintenance of the stabilized disposal site until March 7, 1990. After that time the DOE or another agency to be designated by the President will maintain the site pursuant to a license issued by the NRC. Section 5.22 describes the level of maintenance that is anticipated. Additional information is available in the draft unpublished Project Surveillance and Maintenance Plan (DOE, 1985a) and the draft unpublished Project Licensing Plan (DOE, 1984a).

3. Comment

One commenter advised that having state or local governments perform cursory visual inspections of the stabilized tailings would allow more prompt recognition of damage by natural events than would be afforded by the proposed surveillance plan. (493)

Response

The draft unpublished UMTRA Project Surveillance and Maintenance Plan (DOE, 1985a) acknowledges that information from local government officials can provide valuable, timely information on damage to the tailings disposal facility from natural or man-caused events. Furthermore, the DOE encourages local individuals to notify the DOE when sudden natural phenomena threaten the integrity of a stabilized site. This would supplement periodic surveillance by specialists that would be carried out by the DOE after completion of the remedial action.

4. Comment

What steps will DOE take to assure that the tailings are not removed for reprocessing after final stabilization? (483)

Response

A company interested in reprocessing uranium mill tailings is not likely to remove tailings from what would be a Federal Government disposal site without the authorization of the DOE. Before tailings can be legally reprocessed, a radioactive materials license must be obtained from the Colorado Department of Health (CDH). Approval of both the DOE and CDH would be necessary.

5. Comment

The reasons for the remedial actions should be stated more clearly and should be given more emphasis, particularly the aspect of assuring that the tailings are not removed after final stabilization. (486)

Response

The purpose and need for the remedial actions are discussed in Section 2.0.

Regarding post-remedial action surveillance, the DOE or another agency designated will conduct periodic surveillance of the disposal site to verify that no intentional intrusion or removal of the tailings has occurred. Considering that the tailings and contaminated materials would be covered with several feet of soil and rock, the unauthorized removal of tailings would be very unlikely.

6. Comment

One commenter stated that geomorphic stability of the stabilized tailings would be difficult to monitor if the tailings were covered with soil and rock. (412)

Response

The DOE believes that geomorphic stability of the pile would be enhanced by placing a soil and rock cover on the tailings and contaminated material. Not being able to directly view the tailings is much less significant than constructing stable slopes and protecting the tailings from water erosion.

7. Comment

The Colorado Department of Health stated that UMTRCA foresaw the need for occasional maintenance due to unforeseen natural disasters, but did not allow for designs dependent on substantial ongoing maintenance. (493)

Response

The DOE foresees two broad levels of maintenance following remedial action: custodial maintenance and contingency repair.

The DOE Project Surveillance and Maintenance Plan (DOE, 1985a) gives the following examples of site conditions that may require custodial maintenance:

- Damage to site boundary fence, signs, or monuments.
- Damage or obstruction to primary site access road.
- Growth of deep-rooted shrubs on the site cover.
- Development of animal burrows on the site cover.

Contingency repair may be required under the following circumstances:

- Development of rills or gullies on the cover.
- Surface rupture of the cover.

- Mass wasting or liquefaction of cover slopes.
- Encroachment of streams or arroyos onto the site.
- Flood damage.

"Substantial ongoing maintenance" is considered by the DOE to be actions such as yearly cleanout of screens for buried culverts or repaving asphalt covers every five years. Replacement of deteriorated grout in grouted riprap is not "substantial ongoing maintenance" because it would be needed every 50 to 100 years instead of yearly or every five years.

6.4.5 Schedule

1. Comment

The EIS is vague about the procedures that will be used to temporarily halt tailings handling or vicinity property cleanup during periods of high wind. (454, 515)

Response

The specific procedures that will be followed during periods of high winds or other unusual weather conditions will be included in the Environmental, Health, and Safety Plan to be prepared by the Remedial Action Contractor. An explanation of the overall concept is contained in Sections 3.2.2 and 5.21.1. Also, see Section 6.18 for discussion of this issue and vicinity properties.

2. Comment

Are time estimates (i.e., 12 months for Alternative 2, 18 months for Alternative 3) based upon consecutive months of work (e.g., April to April) and do they take into account anticipated "down time" due to adverse weather conditions? Or have anticipated stoppages in work due to bad weather not been included in the time estimates? Will one tourist season (May through September) or two be affected by the remedial action? (483, 513, 515)

Response

The time estimates for completion of the remedial action are "Calendar Months." This takes into account adverse weather conditions that may arise during construction and considers stoppage for winter months when compaction of soil and transportation of contaminated material is difficult. For example, if remedial action with Alternative 3b were to start in March 1, 1986, the remedial action would be completed on December 31, 1987. Table 1.3 of this FEIS has been revised for clarification.

3. Comment

The DOE should minimize the length of time required to complete whichever remedial action is selected. (428)

Response

Schedules for each alternative have been developed within certain constraints (e.g., winter weather shutdown and no operations at night). During the final design phase, methods of speeding up the remedial action will be fully evaluated and implemented where possible.

4. Comment

A commenter inquired about whether the DOE would "spread remedial actions out over a longer period of time" to mitigate socioeconomic impacts. (515)

Response

Although it is true in some cases that lengthening the construction time for some remedial actions would cause smaller peaks in short-term employment, the DOE does not plan to extend the remedial action schedule beyond what is described in this FEIS.

6.5 DURANGO SITE: ENGINEERING, HYDROLOGIC, AND GEOLOGIC CONSIDERATIONS

The design for stabilization in place, Alternative 2, and the hydrologic and geologic site conditions were the subject of many comments. These comments are summarized below along with the DOE's responses.

6.5.1 Engineering design

1. Comment

Many commenters requested that DOE develop other designs for stabilizing the tailings at the Durango site. (1 through 350; 392 through 406, 408, 415, 424, 425, 426, 428, 456, 463, 479, 486, 515, 519, 555) Other commenters said that stabilization of the tailings should be more oriented to landscaping and beautification of the tailings. (415, 483, 513, 615)

Response

At the Durango site, locations for placing the tailings are limited for several reasons. For example, near the raffinate ponds area there is a fault line that must be avoided. In addition, the area available within the designated site is insufficient in size. Also, a water intake structure and pump station have been planned for the raffinate ponds area by the Bureau of Reclamation as part of the Animas-La Plata Project. Considering the remaining lands within the designated site, the stabilization in place alternative has been optimally located to provide mild slopes and as stable as possible conditions given the existing geological and hydrological site surroundings. Also, the proposed location would minimize the quantity of contaminated material that would have to be moved. Section 3.2.3 has been revised to provide further clarification.

Various means of erosion protection for a Probable Maximum Precipitation (PMP) event and flood protection for a Probable Maximum Flood (PMF) also were evaluated. The use of a grouted mesh form (fabric form) instead of grouted riprap has been considered as a means to prevent river encroachment. Both concrete lined or grouted riprap lined channels are not long-term solutions and would require rather frequent long-term maintenance. However, since grout (fabric form) is less durable than grouted riprap and would have to be replaced more often, it has not been considered a viable solution and does not meet the intent of the EPA standards. The use of boulders in excess of 10 feet in diameter would reduce the long-term maintenance required for the grouted riprap. However, for the reasons explained in Section 5.21.9, the use of these boulders is not reasonable.

Use of an erosion control/vegetation mat on the pile slopes was also evaluated. However, a vegetation mat, no matter how well established, will not provide adequate erosion protection for the PMP.

Covering the stabilized pile (including riprap) with soil for a revegetation medium would increase the overall project cost without significantly improving the erosion protection to the pile.

As a result of these considerations, the design described for Alternative 2 is optimal given the technical concerns inherent with stabilization in place.

2. Comment

The NRC inquired as to the purpose of the grouted riprap blanket which is proposed for the interface between the stabilized tailings pile and the natural hillside. (490) The Southern Ute Indian Tribe asked whether surface-water runoff would seep beneath the cover layers causing piping and erosion of the cover layers or tailings. (473)

Response

The grouted riprap serves as erosion protection for surface runoff from Smelter Mountain. It is possible that water could cause piping and erosion; however, filter layers would be designed to protect against piping based on design procedures adopted by the U.S. Army Corps of Engineers (COE, 1970).

3. Comment

One commenter noted that the DEIS suggests that the surface of the stabilized pile would be protected against erosion by covering the clay cap with a two-foot layer of gravel, cobbles, and boulders up to 14 inches in diameter. The commenter indicated that the 14-inch maximum size is not adequate for control of long-term erosion on the pile surface. (491)

Response

Based on the Stephenson method (Stephenson, 1979) for flow over a plane sloping bed, the two-foot layer of gravel, cobbles, and boulders up to 14 inches in diameter would be adequate for control of long-term erosion on the pile surface. The calculations are available at the UMTRA Project Office in Albuquerque, New Mexico.

4. Comment

The Colorado Department of Health asked whether blasting would be required to quarry the huge boulders needed for river channel stabilization in Alternative 2. (493)

Response

Yes, blasting would be necessary to obtain the boulders for stabilization in place. However, if this alternative were to be implemented, grouted riprap would be used instead of boulders.

5. Comment

The Colorado Department of Health, NRC, and others questioned whether the design for stabilization in place at the Durango site would meet the EPA longevity requirements of 1000 years. Many commenters also questioned the longevity of the grouted riprap erosion protection and the rock lined drainage channels. They expressed the belief that the level of maintenance that would be required for stabilization in place is far greater than was intended by congress when passing the UMTRCA. Commenters also felt there was a strong likelihood that the Animas River might meander into the pile. (413, 490, 491, 493, 454, 483)

Response

Riprap for river erosion control would require more frequent maintenance than would be required for the other alternatives. The cost estimate for maintenance of Alternative 2 is $26,000,000 (1985 dollars), based on replacing 25 percent of the grout every 25 years for 1000 years following the completion of remedial action. This is one of the factors that led the DOE to select the Bodo Canyon alternative as the preferred alternative in this FEIS. River meander into the pile during a PMF flood would be prevented by use of grouted riprap.

6. Comment

Shear strength and unit weight parameters for all materials associated with Alternative 2 should be specified, along with the bases for selection of the parameters. In addition, the location of critical failure surfaces should be shown on Figure A-18, Appendix A, Conceptual Designs and Engineering Evaluations, Remedial Action Alternatives. (554)

Response

It is inappropriate to present a detailed discussion of stability analyses in this FEIS. The data as presented are adequate for comparison of alternatives among the various concepts. Minor changes in design can affect the final stability numbers and will be addressed in detail in the final design documents if Alternative 2 were to be implemented.

7. Comment

A local citizens organization said that the five-foot-thick radon barrier proposed for Alternative 2 is an insufficient thickness to reduce radon and gamma emissions. In comparison, the Shiprock pile, which has a lower level of radioactivity, will receive a seven-foot thick soil radon barrier. (515) The citizens group and others expressed concern that insufficient borehole data had been obtained to characterize the radioactive constituents and other parameters of the pile. (508, 509, 513, 515)

Response

Since little information is available for the physical properties (tailings moisture, porosity, radium content, diffusion coefficient, and emanating fraction) which determine the cover thickness required to meet the 20 pCi/m^2s flux standard, conservative engineering estimates of these parameters were made based upon data for other tailings piles. It should be noted that cover thickness is primarily a function of the diffusion coefficient of the materials selected for the cover. At Shiprock, the available cover material is composed of a larger percentage sand fraction. This makes the cover diffusion coefficient larger and results in a relatively thicker depth required to meet the radon standard. At the Durango site, more well-graded soils containing relatively more clays are available, thus reducing the cover thickness required, even for tailings with a higher radium content than those at Shiprock. In addition, the FEIS does not contain the detailed engineering design of each alternative. Once an alternative is selected for implementation, many samples will be used to engineer a cover that will meet the 20 pCi/m^2s flux standard.

8. Comment

Two commenters asked if a more aesthetically appealing access barrier could be designed for Alternative 2 in place of three foot concrete posts and steel cable. (424, 425)

Response

Using more aesthetically appealing materials such as wood rather than concrete may not meet the project maintenance and longevity requirements. The concrete posts and steel cable barrier were chosen because they would allow wildlife to enter the area while still provide a warning to people that this area is not to be entered or disturbed. In addition, the concrete posts and steel cable will have a long design life and require minimal maintenance. Other designs that provide equivalent protection will be evaluated during the preparation of the final design.

6.5.2 Hydrologic considerations

The NRC, the Durango Task Force, and others stated several concerns on water quality and potential future use of ground water at the Durango site.

1. Comment

The DEIS does not adequately discuss relevant Colorado State Water Quality Criteria and their application in the classification of ground waters potentially affected by remedial actions at Durango. (490)

Response

Section F.2.1.3, Appendix F, Water Resources Information, Volume II of the Durango DEIS, discusses regional water quality in aquifers potentially affected by the various remedial action alternatives. This discussion includes identification of those parameters which exceed state and/or Federal drinking water standards. Sections F.2.2.3 (Durango), F.2.3.3 (Bodo Canyon), and F.2.4.3 (Long Hollow) identify site-specific parameters which exceed Colorado drinking water standards, based on available analytical data from the sites.

Regarding state water-quality classification criteria, ground waters suitable for potable water supplies are classified as either Class 1 or Class 2. As noted beneath Table F.10, Class 1 ground waters are uncontaminated waters which meet all state water-quality standards without requiring treatment. Class 2 ground waters exceed one or more of the 22 parameter standards shown in Table F.10, and therefore would require some form of treatment to meet state domestic supply standards. Because all aquifers tested at Long Hollow and Bodo Canyon yielded water samples in exceedence of one or more of these standards (primarily TDS, sulfate, iron, and manganese), these ground waters would be classified as Class 2. These include waters associated with shaley alluvium/colluvium, the Cliff House Sandstone, the Menefee Formation, and the Lewis Shale. At the Durango processing sites (piles and ponds areas), ground waters in the shallow alluvial and gravel system are considered to be Class 2 waters at present due to elevated levels of some contaminants. Over time, contaminants in the shallow ground-water system would be completely flushed to the Animas River, and these waters conceivably could be reclassified later as Class 1. Ground waters from uncontaminated portions of the Point Lookout Sandstone and Menefee Formation beneath the ponds would be classified as Class 2, based on existing data (BFEC, 1983).

In addition to ground-water classification standards presented in Table F.10, the Colorado Department of Health has adopted standards for waters suitable for agricultural usage (irrigation and livestock watering). These standards are summarized below:

Parameter	Agricultural limit (mg/l)
Arsenic	0.1
Beryllium	0.1
Boron	0.75
Cadmium	0.01
Chromium	0.1
Copper	0.2
Cyanide	0.2
Lead	0.1
Manganese	0.2
Nickel	0.2
Nitrate (as N)	100
Selenium	0.02
Zinc	2.0

Ref. Colorado Water Quality Standards, CCR, Title 5, Chapter 1002, Article 8, as amended, through May 10, 1983.

Additional classification of state waters is possible under the Colorado Department of Health regulations; however, these apply only to surface waters and to "waters currently of a quality higher than necessary to support primary contact recreation and propagation of fish and wildlife." These "high quality waters" would exclude ground water.

Water quality standards for radionuclides have also been established by the Colorado Department of Health:

"Special considerations for radioactive contaminants have been established by the Colorado statutes. Radioactive materials in surface waters and ground waters shall be maintained at the lowest practical level. In no case shall radioactive materials in surface waters be increased by any cause attributable to municipal, industrial, or agricultural practices or discharges so as to exceed the following levels (CDH, 1979):

- Cesium 134 - 80 picocuries per liter (pCi/l)
- Plutonium 238, 239, and 240 - 15 pCi/l
- Radium-226 and 228 - 5 pCi/l
- Strontium 90 - 8 pCi/l
- Thorium-230 and 232 - 60 pCi/l
- Tritium - 20,000 pCi/l."

2. Comment

Section F.2.2.1 states that sandstone interbeds present in the Mancos Shale could provide pathways for contaminant migration at the Durango site. The EIS should present data on the depth, thickness, composition, and hydraulic properties of these interbeds. (554)

Response

The Mancos Shale beneath the tailings area was not cored or hydraulically tested, except within the upper five feet of its eroded surface (BFEC, 1983). No sandstone interbeds within the Mancos were encountered by the relatively shallow Bendix drill holes. Therefore, no data are available regarding the depth, thickness, and hydraulic properties of these interbeds. Sandstone layers which may be present in the upper Mancos Shale are described as fine-grained argillaceous or shaley sandstones, which are generally low permeability units. Core samples of Mancos sandstone strata have reported values of horizontal hydraulic conductivity on the order of 10^{-5} cm/sec (USGS, 1983). Bendix has concluded that the Mancos Shale does not represent a potential aquifer in the tailings area (BFEC, 1983).

3. Comment

For Tables F.21 through F.25 to be meaningful, characteristics of the monitor wells are needed. A summary table in the EIS should include data such as: well location, elevation, depth, screened interval, bentonite seal interval, filter pack interval, and well diameter and type. (554)

Response

Well locations are shown in Figures F.4, F.5, and F.6 in Appendix F, Water Resources Information, of the DEIS.

Tables F.41 and F.42 in the addendum to Appendix F in this FEIS contain monitor well data summaries.

4. Comment

Section 4.6.2 of the DEIS states that contaminants from the raffinate ponds are migrating downward through the fault zone toward the Point Lookout Sandstone and Menefee Formation. The EIS should assess the current extent of this contamination and actions planned to mitigate such contamination. (490, 554)

Response

Paragraph 7 of Section 4.6.2 has been revised to indicate that there is evidence of possible contamination of water-bearing zones in the Menefee Formation downgradient of the fault.

Recent analytical data from wells in the ponds area from March, 1985, indicate that contamination beneath the ponds area is present and concentrations of several contaminants continue to increase. Samples analyzed from well 2, located immediately downgradient of the old ponds and screened at approximately 50 to 70 feet in the Menefee Formation, illustrated the trend of contamination.

Analytical Results for Bendix Well 2

Date	U (ppb)	SO_4 (ppm)	Spec. conductance (umhos)
November '82	12	4810	5500
April '83	26	6700	11960
June '83	38	7100	14400
August '83	500	13000	18000
March '85	986	17000	22270

The primary source of this contamination could be vertical seepage from overlying pond areas or down-dip migration of contaminated waters from the fault zone bisecting the site (see Figure 4.2). Contamination of the underlying Point Lookout Sandstone has not been detected, except in the immediate area of the fault zone along the footwall (western) side.

The environmental impacts of local ground-water contamination within the Menefee (primary water-bearing zones are sandstone and coal layers) would be minimal. Highly reducing zones occur within deeper Menefee strata (especially coal seams); such reducing zones will limit uranium mobility (BFEC, 1983).

A preliminary evaluation of local well records shows that the closest downgradient domestic wells (state permit nos. 038291 and 044712) are approximately two miles southeast of the site. Also, the source of contamination in the ponds area will be removed from the site, regardless of the alternative selected by DOE.

Installation of additional monitoring wells is being considered to more precisely define the limits of contamination in the Menefee Formation and to verify that the Point Lookout Sandstone is not contaminated. These data would be used to evaluate the need to mitigate the effects of the contamination. An examination of the need to conduct aquifer restoration will be included in the final RAP. A decision to conduct restoration will be based on the results of the evaluation.

5. Comment

The effect of remaining ground-water contamination, especially in the raffinate ponds area, on future development of the Durango site should be assessed in the EIS. (490)

Response

The potential effects of residual ground-water contamination on future land uses at the Durango site will depend on specific land uses allowed and actual levels of remaining contaminants. Land uses which exclude the development of ground-water resources should be encouraged. Darcian analysis of current flow in shallow aquifers (based on Bendix data) predicts that non-reactive contaminants (e.g., sulfate) are being flushed to the Animas River at a maximum rate of 1.2 feet per day beneath the tailings pile (through alluvium) and 1.9 feet per day in the ponds area (via the fault zone). Reactive contaminants (e.g., radium and certain metals) will be adsorbed onto soils and geologic materials or precipitate out of solution at variable rates which depend on site-specific geochemical characteristics. The times required to completely flush these contaminants from the local aquifers cannot be predicted without data on quantities of disposed solids and liquids, contaminant concentrations within the wastes, and site-specific distribution coefficients (K_d's) for individual compounds.

New evidence of ground-water contamination 50 to 70 feet deep in the Menefee Formation beneath the ponds may necessitate the installation of additional monitor wells downgradient of the site, or at least restrictions on local ground-water development. The DOE would work with the State of Colorado Department of Health to assure that prospective buyers of the Durango site are cautioned against developing wells as a source of water for human consumption. Additionally, the Colorado Division of Water Resources would be notified and advised to examine the latest water-quality analyses prior to issuing water well permits for the Durango sites.

6. Comment

Additional information on the ground-water conditions at the two Durango sites (tailings piles and raffinate ponds) should be provided in the EIS, including geologic cross-sections, water table contour maps, and plume delineation maps for key contaminants. These are necessary in order to fully evaluate environmental impacts. (490, 554)

Response

Figures F.22 and F.23, in the addendum to Appendix F, Water Resources Information, in this FEIS, present geologic cross-sections through the two sites based on lithologic logs for Bendix boreholes (BFEC, 1983). Since DOE was denied on-pile access, the precise tailings soil interface is unknown, as are water levels within and below the piles.

Water table contour maps for the two sites were developed from numerical flow simulations conducted by Bendix using the Illinois State Water Survey Flow Model (BFEC, 1983). These maps are given in Figures F.26 and F.27 in the Addendum to Appendix F in this FEIS. The simulated water table surfaces generally agree with water level data collected at the sites (see Table F.41 in the Addendum to Appendix F). These water level data also illustrate the hydrologic connection between the Animas River and the shallow alluvial/gravel aquifer beneath the tailings piles. Hydrographs for Bendix wells 12, 14-16, 18, and 19 reflect Animas River stages as recorded at the gauging station less than one mile upstream of the piles. The Animas River seasonally (in early summer) recharges the shallow aquifer at least along the river bank area between the tailings piles and the Animas River.

The delineation of discrete contaminant plumes originating at the tailings piles and ponds area is difficult (and not meaningful) because the shallow aquifer flows directly to the Animas River, where contaminant levels are diluted to background levels. For deeper water-bearing zones in the raffinate ponds area, the definition of contaminant plumes (if present) would require additional downgradient monitor wells. Darcian analysis of shallow ground-water flow beneath the two Durango sites was completed and is found in the Addendum to Appendix F, in the FEIS.

7. Comment

The Durango Task Force requested, in the event the tailings are stabilized in place by using an alternative engineering design which permits landscaping and beautifying the pile, an evaluation of the possible dangers to ground-water contamination by virtue of precipitation or watering of the landscaped surface which may result in the leaching of contamination into the water table. (519)

Response

Sprinkling or irrigating the stabilized pile to perpetuate vegetation would not be wise due to the possibility of leachate generation. However, the stabilized pile would be designed so that precipitation and surface runoff are diverted from the pile's surface without significant infiltration, and, thus, the potential for leachate generation in this circumstance would be minimal.

8. Comment

Gross alpha levels measured from Animas River water samples (shown in Appendix F, Water Resources Information, Table F.11, page F-16 (Volume II) in the DEIS), show too great a variation to be accurate. (507)

Response

The water samples in question were collected all on the same day at three locations, immediately upstream of the site, immediately downstream of the site, and several miles downstream. The analytical results reported were 30.8, 6.3, and 0.0 pCi/l, respectively. The counting accuracy associated with these three measurements is 3.6, 21.3, and 17.2 pCi/l. The difference between the first and third values (the greatest difference) is not significantly different than zero at the 90 percent confidence level. This is due to the large uncertainties in the reported values. The gross alpha levels themselves are typical of those found in rivers of the western United States (EPA, 1973).

6.5.3 Geologic considerations

1. Comment

   Section F.2.2.1 describes the Point Lookout Sandstone as a gray-black shale, silty shale, and sandy shale. A more detailed lithologic description should be provided in the EIS, including its hydraulic properties. (554)

   Response

   Bendix lithologic logs describe the lower member of the Point Lookout Sandstone as "finely laminated gray to black shales, silty shales, and sandy shales" (BFEC, 1983). Bail-testing of an open borehole drilled 63 feet into the Point Lookout Sandstone (hole DR-82-03) yielded a hydraulic conductivity value of only 0.0062 ft/day (2.2×10^{-6} cm/sec). No significant flow of ground water is expected within the Point Lookout bedrock beneath the western portion of the raffinate ponds area (BFEC, 1983).

2. Comment

   What is the basis for concluding on page 88 of the DEIS that the fault underlying the raffinate ponds is inactive? (554)

   Response

   Trenches were excavated at the raffinate ponds area which confirmed the preliminary determination that the fault has not been active during the last 10,000 years (JEG, 1985b).

3. Comment

   Failure surfaces shown on Figure A-6, Appendix A, Conceptual Designs and Engineering Evaluations, Remedial Action Alternatives, are both extremely shallow. Were deeper failure surfaces through the Mancos Shale evaluated? (554)

   Response

   A broad range of failure surfaces were analyzed using computer aided analyses. The circles presented in Figure A-6 represent surfaces exhibiting the minimum safety factors for the conditions analyzed, including failure surfaces through the Mancos Shale.

6.6 BODO CANYON SITE: ENGINEERING, HYDROLOGIC, AND GEOLOGIC CONSIDERATIONS

Many comments were centered on the engineering design for relocation to Bodo Canyon and the hydrologic and geologic conditions encountered. The DOE's responses are presented below, following the individual comment summaries.

6.6.1 Engineering design

The EPA, NRC, Colorado Department of Health, and others raised issues relating to transportation alternatives, surface diversion ditches, slope stability, revegetation of the covered tailings, and capacity of the Bodo Canyon site.

1. Comment

The EPA stated that Sections 3.2.4 and A.5.2.1 (Appendix A, Conceptual Designs and Engineering Evaluations, Remedial Action Alternatives) present confusing and contradictory discussions regarding diversion ditches and drainage channels for the Bodo Canyon site. Section 3.2.4 states that the ditches would be preserved and sized for the PMP, while the appendix states that they would be abandoned following stabilization. (492)

Response

Section 3.2.4 is correct. The ditches would be preserved at the Bodo Canyon site. The appendix statement is incorrect.

2. Comment

Diversion channel sideslopes of 3 horizontal and 1 vertical were selected over flatter slopes in Section A.5.2.3 for Bodo Canyon. Discuss the specific slopes that were considered, the specific erosion protection that would be required, and the specific alignment and size of diversion channels needed. (554)

Response

In order to meet the longevity requirements as intended by PL95-604, good engineering judgement would dictate that major drainages are not blocked. The design was therefore constrained by using the maximum permissible sideslope that would provide the containment of all of the contaminated material and also not block any major drainages. The proposed embankment design meets these requirements and, therefore, additional design using flatter slopes and diversion channels was considered unnecessary.

3. Comment

Can reclaimed areas armored with gravel and rocks be further covered with soil to support vegetation for wildlife use? (493)

Response

A vegetative cover could be designed only for the flatter topslopes; the sideslopes are of such rock size and slope so as to virtually preclude a self-sustaining vegetative cover. Because of the limited area of topslopes, only a rock cover is under consideration at this time.

4. Comment

The NRC noted that the slope stability factors-of-safety in Section A.5.3.1 for the upstream and downstream slopes of the homogeneous embankments for Alternative 3 under seismic, end-of-construction conditions are reported as 1.3 and 1.1, respectively. These values should be re-checked for it would seem unlikely that the 1 (horizontal) to 1 (vertical) upstream slope would have a higher factor of safety than the 3 (horizontal) to 1 (vertical) downstream slope under the same loading conditions. (490)

Response

It is more appropriate to evaluate an embankment for seismic stability after completion of remedial action rather than at the end of construction of the embankments prior to tailings placement. The probability of a seismic event occurring at the end of construction, but prior to tailings placement is nearly zero. Although values were reported in Appendix A, Conceptual Designs and Engineering Evaluations, Remedial Action Alternatives, Table A-10 of the DEIS (page A-48) these should be ignored.

5. Comment

Will the Bodo Canyon site accommodate increased quantities of tailings in the event that DOE has underestimated the amount of tailings present in the piles? (549, 519)

Response

Yes, the Bodo Canyon site can accommodate at least 25 percent more tailings than the presently estimated quantities without increasing the disturbed area.

6. Comment

Section 5.6.2 mentions cutoff trenches as a mitigation measure to be used at the Bodo Canyon site. These trenches should be described in the conceptual design portion of the DEIS. (490)

Response

It is not now foreseen that cutoff trenches would be required for the Bodo Canyon alternative and the text has been modified to reflect this change (also see Table 1.1 and Section 5.6.1 of this FEIS).

7. Comment

What is the basis for the three-foot-thick riprap layers on the perimeter embankments in the Bodo Canyon design? (554)

Response

The three-foot layer of riprap on the 3 horizontal to 1 vertical embankment slopes is to prevent erosion due to runoff resulting from a PMP.

8. Comment

The calculation of the required cover thickness for Alternative 3 should include consideration of long-term erosional processes (sheet plus wind erosion). The proposed depth of cover should consist of the thickness required to attenuate radon plus the thickness expected to be eroded over 1000 years with an appropriate factor of safety. (554)

Response

The cover system has been revised to provide for both the attenuation of radon plus erosion protection for 1000 years. At Bodo Canyon there would be five feet of clayey soil for the radon barrier, two feet of rock on the topslopes, and three feet of rock on the perimeter embankments to prevent erosion from wind and runoff resulting from a PMP and to maintain radon releases over 1000 years to be within EPA standards. The text has been edited to reflect this change (see Sections 1.3.3, 1.3.4, and 3.2.4 of this FEIS).

9. Comment

Shear strength and unit weight parameters for all materials associated with Alternative 3 should be specified, along with the bases for selection of the parameters. In addition, the location of critical failure surfaces should be shown on Figure A-18, Appendix A, Conceptual Designs and Evaluations, Remedial Action Alternatives. (554)

Response

The purpose of the presentation of stability numbers in the EIS is for comparison of alternatives and is not intended to represent a rigorous design analysis of each site. A detailed analysis of the selected alternative will be completed for actual design. Therefore, additional information is not provided.

6.6.2 Hydrologic considerations

Comments on the hydrology and water quality of the Bodo Canyon site came from the NRC, the Durango Task Force, and others.

1. Comment

Section F.2.3.1, Appendix F, Water Resources Information, states that Bodo Canyon alluvium/colluvium has hydraulic conductivities ranging from 10^{-8} to 10^{-7} cm/sec, very low values for unconsolidated deposits. The basis for these values should be presented in the EIS. (554)

Response

The alluvial/colluvial deposits in Bodo Canyon are described in Dames & Moore and JEG boring logs as clayey to sandy silts and silty to sandy clays. The conductivity values (K) reported in the DEIS include samples of clay from a test pit (TP-4) located outside of Bodo Canyon. Dames & Moore's (1983) geotechnical study reports laboratory permeabilities for only two samples collected from Bodo Canyon (silty clay from 46.5 feet in boring B-1). The average of these two values is 5.5 x 10^{-4} feet/day (1.9 x 10^{-7} cm/sec).

Recent slug testing at well DUR03-602, screened at 39.5 to 49.5 feet in a sandy silt interval, yielded a horizontal K value of approximately 1.3 feet/day (4.6 x 10^{-4} cm/sec). This would translate to a vertical hydraulic conductivity on the order of 10^{-5} cm/sec. For finer-grained, clayey deposits, K values of approximately 10^{-6} cm/sec are likely.

2. Comment

The EIS should present additional hydrologic characteristics of the horizontal and lateral extent of the interbedded sands and shales of the Cliff House unit at the Bodo Canyon site. (490)

Response

An evaluation of existing Dames & Moore borehole logs and JEG logs from recently installed wells at Bodo Canyon confirms that the Cliff House Sandstone bedrock consists of sandy shale with occasional interbedded layers of fine-grained sandstone to depths as great as 120 feet. Hydraulic conductivity values from packer tests are greatest in the upper 10 to 40 feet of bedrock and at depth intervals associated with sandstone layers and fractured zones. Conductivity values for unfractured intervals of sandy shale at greater depths are two or three orders of magnitude less. Lateral flow of ground water in the Cliff House bedrock will occur primarily within these sandstone layers and fracture zones, although vertical seepage through the shale will also occur.

The hydrologic characteristics described are included in the Addendum to Appendix F, Water Resources Information, Section F.3.4, Table F.43, and Figure F.28 in this FEIS.

3. Comment

It is unclear from Table F.40 (page F-127) of the DEIS what hydraulic conductivity value was used in the modelling of leachate production rates at Bodo Canyon. The reported K value of 1.0 ft/yr for fractured shale is consistent with field-measured values at Long Hollow, but not at Bodo Canyon. The EIS should clarify this apparent inconsistency. (490, 554)

Response

The hydraulic conductivity (K) value of 1.0 ft/yr was used only in modelling leachate generation and ground-water flow at the Long Hollow site. The one-dimensional simulation of leachate production at Bodo Canyon was based on the hydraulic conductivity for soils and alluvium at the site (K = 0.1 ft/day). This should be recorded as a footnote beneath Table F-40 of the DEIS. Also, Figure F-19 (DEIS) on page F-135 should be re-titled "Pressure head and total head distribution for 1.0 in/yr infiltration for Long Hollow site" (Harlen, 1985).

4. Comment

The modelling studies reported in Section F.2.5 of the DEIS do not adequately represent the flow systems at Bodo Canyon and Long Hollow because initial and boundary conditions are not justified nor are the impact parameters site-specific. The assumption that atmospheric pressure will be maintained in the drainage blanket proposed at Long Hollow is not realistic. The modeling studies should be reevaluated. (490)

Response

As preliminary simulations of leachate generation at the two sites, the modeling studies reported in the DEIS are adequate. Of necessity, these studies utilized certain input parameters drawn from other tailings disposal sites. Now that additional site-specific data have been collected from these two sites, simple analytical models have been used to predict ground-water flow rates and leachate dilution/mixing parameters. The results of such analyses have been reported in this FEIS (Sections 6.6.2, 6.7.2, and the Addendum to Appendix F) and in the Bodo Canyon remedial action plan. Because disposal at Long Hollow is not the preferred alternative, further computer simulation of leachate transport is not warranted. If disposal at Long Hollow became the preferred alternative, then revision of the modelling reported in the EIS might be appropriate, and the results of the new modelling would be reported in a remedial action plan for Long Hollow.

5. Comment

The DEIS does not characterize adequately the attenuative capacity of the clays and sediments at the Durango, Bodo Canyon, and Long Hollow sites. The EIS should quantify the attenuative capacity of natural liner materials and surrounding soils and sediments at proposed disposal sites. (490)

Response

Geochemical data for the soils and alluvium at the Durango processing site and at the Long Hollow site have not been collected. However, nine soil and sediment samples from the Bodo Canyon disposal site have been laboratory tested recently to determine several key geochemical parameters (Pyrih & Associates, 1985). These soil and subsoil (alluvium) samples were collected from depths of 1.5 to 51.5 feet at the site, and constitute a natural, clay-rich barrier between tailings to be placed at the site and the shallow ground-water system. The tested samples had clay contents as high as 27.7 percent (by weight) and cation-exchange capacities (CEC) ranging from 13.9 to 57.2 meg/100g. Although low in carbonate content and acid-neutralizing potential, the Bodo Canyon soils contain traces of organic carbon (potential reducing agent) and iron and manganese hydroxides (potential contaminant scavengers). Overall, most of the soil and sediment samples from Bodo Canyon showed favorable geochemical properties for the attenuation of uranium tailings contaminants. The contaminants least likely to be geochemically trapped by Bodo Canyon subsoils include ammonia, sulfate, uranium, chloride, and selenium (Pyrih & Associates, 1985).

6. Comment

Section F.2.3 of the DEIS states that flow in the shallow aquifer in the Bodo Canyon area is toward the Animas River where it discharges.

It should be stated that this direction is coincident with the movement in the fractured bedrock. (490)

Response

Section F.2.3, Appendix F, Water Resources Information, already states this, referring to the fractured bedrock zone as "weathered bedrock."

7. Comment

The ground-water discussion of Bodo Canyon in the DEIS should include: (1) an assessment for the potential for ground-water contamination, (2) additional study of preventative measures, and (3) a plan for monitoring and correction or mitigation if future contamination of the ground-water should occur. (534, 490, 491)

Response

The potential for ground-water contamination at Bodo Canyon has been evaluated using an analytical modeling approach adopted from Gilbert and others (DOE, 1983). Section F.3.4 (Addendum to Appendix F in this FEIS) explains the analytical technique and the results.

A plan for ground-water monitoring and mitigation at Bodo Canyon will be included in the site-specific surveillance and maintenance plan, based on guidelines presented in the draft Project Surveillance and Maintenance Plan (DOE, 1985a).

8. Comment

Section F.2.3 of the DEIS states that all private wells in the Bodo Canyon area are upgradient of the site. However, well number 31279 (Figure F.7) appears to be downgradient. Its actual location should be clarified. (490)

Response

The location given in the DEIS for well 31279 is incorrect. According to the Ground Water Section of the State Engineer's Office, its correct location is within Range 8W, not 9W as it was reported in the DEIS. This puts the well approximately five miles east of Durango, far from the Bodo Canyon site. References to this well should be deleted from Section F.2.3, Table F.27, and Figure F.7 of the DEIS.

6.6.3 Geologic considerations

Written statements from the NRC, Colorado Department of Health, and three individuals focused on the geology and seismic activity of the Bodo Canyon site.

1. Comment

Section E.2.1.2, Appendix E, Soils, Geologic, and Seismic Information, describes the Cliff House Sandstone initially as interbedded calcareous sandstones, siltstones, and silty shales, and later as a sandy shale with sandstone beds. An accurate description of the lithology should be provided in the FEIS. (554)

Response

The initial description of the Cliff House Sandstone is a general description of the lithology (see Figure E-4 of the DEIS). The latter description is site-specific, referring only to the upper portion of the Cliff House Sandstone which constitutes the bedrock surface at the Bodo Canyon site. From available borehole logs, the Cliff House Sandstone at Bodo Canyon consists primarily of sandy shale interbedded with occasional thin layers of fine-grained sandstone.

2. Comment

Commenters pointed out that a topographic lineament runs north to south across the Bodo Canyon site and requested that a study be conducted to determine if the lineament is a fault and if design changes would be needed. Further investigation should be conducted into the possible extension of the Ridges Basin Fault and other faults into the Bodo Canyon site. (490, 493, 424, 425, 554) What is the possibility of contaminants reaching the proposed Ridges Basin Reservoir of the Animas-La Plata Project via the fault or other geologic structures? (519, 549)

Response

The seismic hazards and fault conditions at Bodo Canyon have been reevaluated in the field and in the literature (JEG, 1985a,b). The field program found no signs of active or inactive faulting in trenches intersecting linements at the Bodo Canyon site (JEG, 1985b).

The Seismic Evaluation, Appendix M (JEG, 1985a), concluded that the pile should be designed using an in-rock acceleration of 0.12g which corresponds to a recurrence interval of 10,000 years at the site.

The planned Ridges Basin Reservoir would be created behind a 313-foot-high earth fill dam located approximately 1.8 miles south of the Bodo Canyon disposal site. A review of several publications from the Waterways Experiment station indicates that reservoir induced seismicity has historically been related to only very large reservoirs such as Lake Mead. The recorded seismic events with large reservoirs have been small. Therefore induced seismicity is not expected to become a problem at the Bodo Canyon site.

Because no faults were found at Bodo Canyon, the potential for contaminated ground water to migrate from Bodo Canyon along a fault zone is extremely low. Recent field work also suggests that no faulting has occurred along the mapped trace of the Ridges Basin Fault within at least one mile of the site (JEG, 1985b). Two mapped fault traces east of the site, toward which shallow ground water may flow, contain fine-grained intrusive dikes and gouge material which would act as low-permeability barriers to subsurface flow.

6.7 LONG HOLLOW SITE: ENGINEERING, HYDROLOGIC, AND GEOLOGIC CONSIDERATIONS

Of the comments on Alternative 4, stabilization at Long Hollow, a few were directed at engineering factors; however, most comments focused on ground water. Summaries of the comments and related responses are given below. Additional comments and responses on the Long Hollow site are contained in Sections 6.4 and 6.8.

6.7.1 Engineering design

1. Comment

Six commenters questioned the longevity of the underdrain included in the design for Alternative 4. Commenters expressed the concern that the underdrain could eventually plug and become ineffective, or would provide an opportunity for erosion of the clay liner. Ground water could then rise into the stabilized tailings and become contaminated. (490, 442, 515, 491, 492, 493)

Response

If Alternative 4 were selected as the remedial action, the final design would include underdrain construction specifications that would meet the longevity requirements as set forth in the EPA Standards. The underdrain would be designed to ensure that plugging or erosion would not occur. Section 1.3.5 has been revised to clarify this point.

2. Comment

Additional analysis should be performed addressing the potential for gully erosion and the long-term alteration of surface drainage patterns at and near the Long Hollow site. (493, 424, 425)

Response

Currently, the nearest potential gully erosion is more than 800 feet from the Long Hollow site on the opposite side of a drainage divide. It is anticipated that the long-term drainage patterns would not differ to any great extent from the existing patterns. Therefore no additional analysis is required.

6.7.2 Hydrologic considerations

Comments were received addressing ground-water hydrology and water quality issues associated with Alternative 4, stabilization at Long Hollow. The comments came primarily from the NRC, the Colorado Department of Health, the New Mexico Environmental Improvement Division, the Durango

Uranium Mill Tailings Task Force, EPA, Environmental Defense Fund, and six individuals. The comments have been summarized and responses prepared as presented below.

1. Comment

Ground-water discharge rates at the Long Hollow site should be quantified in the EIS. Also, a water level contour map of the site should be included in the EIS in order to assess ground-water flow directions. (490)

Response

Using values of hydraulic conductivity from a 1978 geotechnical investigation of Long Hollow (FMFA, 1978) and recently collected water level data from the site, a range of ground-water discharge rates through the fractured Lewis Shale has been estimated. This information is presented in the addendum to Appendix F, Water Resources Information, in this FEIS.

2. Comment

Section 4.6.2 of the DEIS reports that hydraulic conductivity values in the fractured shale zone at Long Hollow range from approximately 10^{-9} to 10^{-6} cm/sec. These represent unusually low values for a fractured medium. (490, 554)

Response

The range of permeability values reported for fractured Lewis Shale in the DEIS represent laboratory-determined values for core samples of mixed "clay and weathered shale" from four- to nine-foot depths (FMFA, 1978). These low values (10^{-9} to 10^{-6} cm/sec) are reasonable for unfractured clay-dominated cores. Hydraulic conductivity values reported by FMFA for packer-tested borehole intervals five to 48 feet deep are for "generally fractured" to "slightly fractured" Lewis Shale. These values range from <0.0014 ft/day to 2.30 ft/day (4.9×10^{-7} cm/sec to 8.1×10^{-4} cm/sec), with an average value of approximately 0.5 ft/day (1.8×10^{-4} cm/sec). Packer testing of a recently installed well at Long Hollow (DUR04-608) produced a conductivity of 0.88 ft/day (3.1×10^{-4} cm/sec) in moderately weathered Lewis Shale, 10 to 15 feet deep (see Table F.45 of this FEIS). On the basis of the above, field hydraulic conductivities of the water-bearing fractured shale zone at Long Hollow are on the order of 10^{-4} cm/sec.

Section 4.6.2 of this FEIS has been modified to reflect these data and analyses.

3. Comment

Several commenters expressed the belief that the ground-water interceptor trench would not prevent ground water from contacting the tailings because the ground water could move toward the tailings from the east and could move under the interceptor trench. (490, 485, 491)

Response

The proposed two-foot thick compacted clay liner (see Appendix A, Conceptual Designs and Engineering Evaluations, Remedial Action Alternatives, Figure A-33, page A-83 of the DEIS) would be two to three orders of magnitude less permeable than the Lewis Shale through which ground water may be flowing: 10^{-7} cm/sec vs. 10^{-4} to 10^{-5} cm/sec (FMFA, 1978). Thus, any flow from below or from the east would flow laterally toward the interceptor trench along the clay contact. Seasonal ground-water level data for Long Hollow, collected during 1985, will more precisely characterize local flow gradients which may influence the final interceptor trench design. If necessary, a sand/gravel capillary break could be installed between the Lewis Shale and the compacted clay to ensure lateral ground-water migration in the trench. Should Alternative 4 (or 5) become the preferred alternative, these design considerations would be evaluated.

4. Comment

The potential impact on private wells in the Long Hollow area needs to be identified. (493, 424, 425, 447)

Response

As shown in Figure F.7, Appendix F, Water Resources Information, of the DEIS, there are only four registered private wells within a two-mile radius of the Long Hollow site. All wells are hydrologically upgradient of the site and located in different drainage basins than the site. These wells would not be impacted.

5. Comment

The dilution factors determined for leachate influx to the proposed ground-water drainage blanket at Long Hollow appear to be incorrect (as reported in Section F.2.5 of the DEIS). (485) Also, it is inappropriate to assume pore-water chemistry for the Durango tailings to be similar to Riverton tailings chemistry in performing the dilution calculations. (489, 490, 554)

Response

Dilution factors cited in Section F.2.5 in the DEIS for initial and long-term leachate contributions to ground-water flow in the underdrain are correct. However, the last sentence of paragraph 5 in Section F.2.5.3 should be corrected to read:

"Drainage from the tailings results in total inflow to the drainage blanket ranging from 2.48 cfs (2.3 + 0.18 cfs) during initial moisture redistribution to 2.31 cfs (2.3 + 0.01 cfs) over the long-term. The long-term steady flow rate from the base of the tailings (0.01 cfs) is equal to the net infiltration rate (one inch per year). This results in ground-water to leachate dilution ratios of 13:1 (initial) and 230:1 (long term)."

Pore water concentrations for Durango tailings were estimated from water extract data for tailings core samples presented by Markos and Bush (GECR, 1982). Using GECR water extract data (maximum levels of water-soluble contaminants in core samples from the small tailings pile at Durango) to estimate tailings leachate chemistry, the initial and long-term contaminant concentrations in leachate ground water mixtures discharging from the Long Hollow underdrain can be calculated. The following table summarizes these results, and should replace the last paragraph of Section F.2.5.3 of the DEIS.

Constituent	Concentration in tailings leachate[a]	Average concentration in Long Hollow ground water	Conc. in drainage effluent 13:1 (initial)	Conc. in drainage effluent 230:1 (long-term)
U	7.0	0.02	0.5	0.05
SO_4	55000	5590*	9100*	5800*
V	1200	<0.1	90	5.3
Fe	600	6.1*	50*	8.7*
Mn	12	0.7*	1.5*	0.75*
Ba	140	<0.1	10*	0.7
Pb	7.0	0.03	0.5	0.06
AS	30	<0.01	2.15*	0.14*

[a]All concentrations in mg/l. Estimated from GECR, 1982 (Figure 6.7).
[b]From data in Table F.39.
*Asterisks indicate those levels exceeding Federal drinking water MCLs.

6. Comment

Section 3.3.1 of the DEIS should state that the projected dilution of leachate at the Long Hollow site results in sulfate and iron concentrations that exceed National Secondary Drinking Water Standards. The DEIS should also identify other possible constituents which may be present in elevated concentrations in the resulting ground water. (489, 490)

Response

Agreed. Section 3.3.1 (paragraph 6) of this FEIS has been modified to reflect these comments.

7. Comment

The possibility of future contamination of the planned Ridges Basin Reservoir due to tailings disposal at Long Hollow or Bodo Canyon should be addressed in the EIS. Of particular concern is the potential for ground-water contamination through the Ridges Basin Fault. (424, 425, 427, 489, 490, 519, 549)

Response

The Long Hollow site is approximately three miles southwest of the proposed Ridges Basin Reservoir, and is separated from it by a regional surface drainage divide. The Long Hollow site will have no hydrologic impact on the proposed reservoir.

The Bodo Canyon site, although less than 0.5 mile from the proposed reservoir, also is separated from it by a surface drainage divide. Any potentially contaminated shallow ground water beneath Bodo Canyon will flow eastward toward the Animas River and have no impact on the reservoir. Deeper ground water at Bodo Canyon flows to the southeast, following the dip of bedrock strata; no impact to the proposed reservoir is expected.

A recently completed study of potential faulting at Bodo Canyon (JEG, 1985b) revealed that the Ridges Basin fault does not extend onto the Bodo Canyon alternate disposal site. Thus, the fault would not provide a route for contamination to migrate from Bodo Canyon to the proposed reservoir.

See Comment No. 2 in Section 6.6.3 for a related response.

8. Comment

The ground-water discussion of Long Hollow in the DEIS should include: (1) an assessment of potential for contamination, (2) a more thorough study of preventative measures, and (3) a plan for monitoring and correction or mitigation if contamination occurs in the future. (454, 491, 534, 535, 537, 485)

Response

If Alternative 4 or 5 were selected as the remedial action, numerous design features would be incorporated into the site plan to mitigate the potential for shallow ground-water contamination. For instance, moving the proposed tailings disposal area (see Figure A-22 of the DEIS) approximately 1000 feet to the southeast may be considered. Available water-level data show that ground-water depths in this location are generally greater than 10 feet. Other mitigative design features would be detailed in the Remedial Action Plan as well as this FEIS.

A site-specific monitoring and mitigation plan would be included in the site-specific surveillance and maintenance plan should one of the Long Hollow alternatives be selected. This plan would be based on guidelines given in the draft UMTRA Project Surveillance and Maintenance Plan (DOE, 1985a).

9. Comment

Additional monitor wells should be installed around the Long Hollow site for use in identifying possible future contamination. (489)

Response

Several additional monitor wells were constructed at the Long Hollow site in 1985. Well construction data and locations are given in the addendum to Appendix F, Water Resources Information, in this FEIS.

10. Comment

What effect would use of the Long Hollow site have on the existing irrigation ditch and downstream residents currently using the ditch? (453)

Response

The existing irrigation ditch flows seasonally from the La Plata River to the northern portion of Long Hollow where hay is cultivated. According to the site owner, Gary Farmer, water flows typically from May into June and sometimes in September (Farmer, 1985). It is likely that the existing ditch would be diverted so that it would flow to locations downgradient (south) of the Long Hollow disposal site.

11. Comment

The DEIS fails to state that the stock ponds at Long Hollow are fed by a small, spring-fed irrigation system. (537)

Response

The existence of this irrigation system had been previously unknown. See changes made to Section 1.4.3 of this FEIS.

12. Comment

Hydrologic conditions are unsuitable for use of the Long Hollow site as a remedial action site. The site crosses a drainage divide which could potentially pollute the Animas and La Plata drainages, the area is subject to flooding, and the Long Hollow stream volume is small. (537, 524)

Response

The site does not cross a drainage divide. The Long Hollow site is located within a shallow ground-water discharge area; however, Alternatives 4 and 5 incorporate measures to protect the shallow ground water. If Alternative 4 or 5 is selected by the DOE as the preferred alternative, more detailed ground-water mitigation measures would be presented in the follow-on RAP.

13. Comment

The modelling studies reported in Section F.2.5, Appendix F, Water Resources Information, of the FEIS do not adequately represent the flow systems at Bodo Canyon and Long Hollow because initial and boundary conditions are not justified nor are the impact parameters site-specific. The assumption that atmospheric pressure will be maintained in the drainage blanket proposed at Long Hollow is not realistic. The modelling studies should be re-evaluated. (490)

Response

See Section 6.6.2, Comment No. 4, in this FEIS for the response to this comment.

6.7.3 Geologic considerations

1. Comment

The EIS should address the potential for mudflows impacting the Long Hollow site in the future. (490)

Response

Mudflows occur only on the steeper slopes to the southeast of Long Hollow and extend to the valley floor (FOCERI, 1978); however, they do not reach the disposal pile. The Long Hollow site is located on a relatively flat area where there is no potential for future mudflows (see Section 4.5.2). Should the Long Hollow site be shifted to the southeast (see Section 3.3.1) away from the ground-water discharge area, there would also be no potential for mudflows.

2. Comment

Soils used for lining at the Long Hollow site are expansive, erosive, and possibly dispersive. Lining at the site would be subject to fast erosion and the ground would become desiccated. (537)

Response

Soil tests at the Long Hollow site have shown that the soils are not dispersive and therefore not erosive under the hydraulic gradients that would be encountered. The soils used for lining at the Long Hollow site are expansive; however, the expansion pressures are low and would be more than offset by the pressures exerted by the stabilized pile.

3. Comment

The borings taken at the Long Hollow site, which extend from depths of 19 to 48 feet, are too shallow to accurately identify subsurface materials that could be affected by construction of the facility. (491)

Response

All borings extended into the underlying Lewis Shale which is encountered at very shallow depths at the Long Hollow site. Additional borings have been drilled to depths of more than 50 feet, which give an accurate subsurface material identification for the purposes of this EIS. The underlying Lewis Shale is several hundred feet thick and is very uniform in character below the upper weathered layer (DOE, 1985c).

4. Comment

Section E.1.3, Appendix E, Soils, Geologic, and Seismic Information, does not adequately discuss the source of topsoil for reclamation at the Long Hollow site. Alternatives to using the Arboles soil should be discussed. (554)

Response

It is common construction practice to strip and stockpile the top six inches of topsoil for later use in restoration. At the Long Hollow site the topsoil happens to consist of the Arboles soil series, but it presently supports the surrounding vegetation and is natural for this area. However, in the event that this material proves to be unsuitable for revegetation, topsoil could be obtained from the Bodo Canyon borrow areas.

6.8 REPROCESSING AT THE LONG HOLLOW SITE: ENGINEERING AND DESIGN CONSIDERATIONS

Engineering and design issues of Alternative 5, reprocessing at Long Hollow, were the subject of several comments. Most of the geologic concerns with the Long Hollow site were addressed in Section 6.7. Comments were received from the Colorado Department of Health, the NRC, the New Mexico Environmental Improvement Division, a local citizens group, and four other individuals.

6.8.1 Engineering design

1. Comment

   No mention is made of the type of synthetic liner proposed for the Long Hollow site (i.e., will it resist the acid leachate). If the liner fails several years after final stabilization, how will the leak detection and recovery system be used to safely handle the leaking solutions? (485)

   Response

   The synthetic liner would be chosen to resist acid impregnated solutions. The detection system is planned to detect leaks only during reprocessing. After reprocessing, when the solutions have been removed, analyses have shown that little leachate would be generated. What little is generated would move laterally out of the system rather than downward.

2. Comment

   For Alternative 5, some provision should be made for removing the leachate that would accumulate from tailings drainage over many years after reprocessing due to moisture redistribution and infiltration. (485)

   Response

   The stabilized pile would be effectively drained of solutions at the end of the reprocessing operations. As described in Section F.2.5.2, Appendix F, Water Resources Information, of the DEIS, leachate produced by infiltration after reprocessing would be minimal and would be diluted to background levels after mixing with ground water in the drainage blanket. There would be no need for a leachate collection system.

3. Comment

   The EIS should address acquisition and disposal of the Durita mill equipment. (493)

Response

Sections 3.2.6 and A.7.3.1 (Appendix A, Conceptual Designs and Engineering Evaluations, Remedial Action Alternatives) of the DEIS describe how the acquisition of the Durita equipment would fit into the sequence of events for Alternative 5.

4. Comment

What problems were experienced at the Naturita (Durita) reprocessing facility in the operation of leach ponds and cleaning up of the site? Would the reprocessing buildings and equipment be moved off the Long Hollow site upon completion of the project and was that included in the cost estimate? (424, 425)

Response

The heap leaching operation at Naturita was the "Durita" facility operated by Ranchers Exploration and Development Corporation. The DOE is not aware of any problems encountered during operation of the facility.

Processing equipment and structures used at Long Hollow would be removed as a condition of final stabilization. The cost of such action is included in the cost estimate.

5. Comment

Alternative 5 would use already contaminated equipment from Naturita as well as the required transportation of thousands of gallons of acids and hazardous chemicals. What provisions will DOE take to ensure that the local population will not be affected by the transport and use of these materials? (515)

Response

Transportation of equipment from the Durita site near Naturita for Alternative 5 would be subject to the rules and regulations of the State of Colorado Department of Transportation. Residual contamination of the equipment is primarily in the form of coatings on equipment surface, and if an accident occurred during transportation, the possibility of effects to the local populace would be remote. Transportation of acid and other chemicals for reprocessing would be subject to compliance with the "Rules and Regulations Governing the Transportation of Hazardous Materials and Hazardous Wastes within Colorado" as established by the Public Utilities Commission.

6. Comment

The potential for ground-water problems could be reduced if the leach tanks could be made large enough to receive all contaminated material and the evaporation pond was not made into a disposal site. (493)

Response

Increasing the leach tanks and eliminating the evaporation pond would decrease the reprocessing efficiency and thus decrease the amount of uranium and vanadium produced. Because the cost estimate for Alternate 5 was based on the total project cost minus the value of uranium and vanadium produced, increasing the size of the leach tanks would increase the cost estimated for Alternative 5. Regardless of the costs, ground-water impacts would be minimized by the remedial action design presented in the DEIS.

7. Comment

Why would reprocessing at Long Hollow take longer than the reprocessing project took at Naturita? (493)

Response

There are approximately two times as many tailings at Durango than were processed at Durita. Therefore a longer reprocessing time would be required.

6.8.2 Hydrologic considerations

1. Comment

Several commenters requested that water usage, the means of water transport, and possible conflicts with existing water rights associated with Alternatives 4 and 5 be more clearly explained in the EIS. (454, 424, 425, 427, 493, 515)

Response

No conflicts with existing water rights in the Long Hollow area are anticipated. Water pumped from the Animas or La Plata Rivers or from deep wells for use during remedial actions and not evaporated, would ultimately be returned to the river(s) (see Section 5.6.1 of the FEIS). Water would be transported by trucks or temporary pipelines.

2. Comment

What would happen to the portion of the water used during reprocessing which would not be recycled? (490)

Response

The contaminated wash water would be pumped to the upper end of the Long Hollow site. Once the remedial action process is complete, the contaminated water storage reservoir would be retained until all the water has evaporated. The sides of the synthetic liner would then be folded in and a five-foot thick stabilization cover placed over the reservoir (see Sections 3.2.6 and 3.3.2 of this FEIS).

3. Comment

The condition of the tailings after reprocessing should be characterized more thoroughly to include such aspects as moisture content, pH, and concentration and solubility of radionuclides and heavy metals. (454)

Response

Little is known of the physical properties of the tailings such as bulk density, porosity, radium content, and the like. However, these parameters have been completely determined for numerous other tailings disposal sites which processed ore similar to (and in some cases the same ore) as was processed at Durango. The FEIS uses estimates of these parameters within the ranges of those found elsewhere. If reprocessing were selected, the physical properties of the tailings will be carefully determined throughout the activity. Even if reprocessing were not selected, the physical properties of the entire pile will be characterized as part of the RAP.

6.9 COSTS

A number of individuals criticized the DEIS preferred alternative, reprocessing at Long Hollow, because the cost would be much higher than for the other alternatives. Other comments disputed the accuracy or completeness of the DOE's cost estimates. Issues raised in the comments are summarized below as are the DOE's responses.

1. Comment

   Why does DOE propose to select the alternative with the highest cost? (429)

   Response

   Alternative 5 was selected jointly by the DOE and the state because of the potential for mineral recovery. Since Hecla Mining Company, the current owner, has stated that reprocessing is not feasible at this time, the preferred alternative described in the FEIS is Alternative 3, decontamination of the Durango site and stabilization of the contaminated material at a site in Bodo Canyon. This alternative is less costly than either Alternative 4 or 5.

2. Comment

   The contingency costs in the DEIS are 10 to 20 percent lower than industry standards. This would lead to cost overruns and inadequate construction supervision. (537, 515)

   Response

   For purposes of comparing alternatives, with an estimate with the amount of detail shown, a contingency of 15 percent is acceptable. Detailed project cost breakdowns are available at the UMTRA Project Office in Albuquerque, New Mexico.

3. Comment

   One commenter requested that the road construction and maintenance costs for all alternatives be included in the EIS. (493)

   Response

   The road construction costs including road maintenance for the alternatives are as follows:

On-site stabilization	$ 772,000

Stabilization at Bodo Canyon	
Truck option	$1,361,700
Long Hollow (Alternatives 4 and 5)	$2,821,700

The costs estimated in Table 1.2 of this FEIS have incorporated these costs.

4. Comment

Commenters expressed concern that the state legislators may not support the more costly Long Hollow alternative in favor of less costly alternatives that may be less desirable environmentally. (477, 514)

Response

There are many factors which must be considered when choosing a preferred alternative. The commenters concern that cost not be an overriding factor is noted. Although cost must be considered, other environmental impacts and mitigation measures weigh heavily in the Department of Energy's selection procedure.

5. Comment

Cost, as a criterion for selecting a preferred alternative, should consider costs to the public for treating and maintaining potential cancer victims. (530) The cost to the public of medical care for future cancer victims should be considered in selecting the remedial action. (530)

Response

The DOE believes that costs associated with medical treatment, income loss, and other "what might have been costs" from cancer-induced deaths over 1000 years cannot be estimated with any degree of confidence.

6. Comment

The cost estimates for the various alternatives should include the costs for implementing wildlife mitigation. (551)

Response

The DOE estimated costs for implementation of all mitigation measures proposed in the draft wildlife impact mitigation plan for Alternative 3 are shown in Table L.4.1 of Appendix L, Wildlife Mitigation Plan, in this FEIS. At this time, only relative wildlife mitigation cost comparisons are available; Alternative 3 would have the highest costs followed by Alternatives 5, 4, and 2.

7. Comment

Several commenters requested that land values from official appraisals be included in the cost assessments. (428, 493, 515)

Response

Appraisals of land values are performed for the State of Colorado by the U.S. Army Corps of Engineers. These appraisals are not yet completed, and therefore, are not included in this FEIS.

8. Comment

Many commenters requested that the long-term maintenance costs be included in the EIS for each of the alternatives. (490, 515, 534) Commenters expressed the belief that the high level of maintenance costs for stabilization in place would make it less cost effective than it appears by simply comparing the remedial action costs of the alternatives. Another commenter requested that the cost for maintaining the tailings in place (no action) be included in the cost estimate. The commenter also asked who or what entity would have the responsibility for future maintenance and what the source for meeting these expenses would be. (534)

Response

DOE agrees that the surveillance and maintenance costs should be included in the cost estimates. For Alternative 2 (stabilization in place) the cost of maintaining the grouted riprap for 1000 years would be approximately $26,000,000 (1985 dollars) if 25 percent of the grout is replaced every 25 years. All of the other action alternatives are designed to last 1000 years without maintenance.

The estimated cost for maintaining the tailings in place for 100 years (no action alternative) is $300,000. This cost estimate is only for establishing and maintaining a better vegetation cover on the tailings pile. However, under the no action alternative, the site does not meet the EPA standards and does not meet the requirements of UMTRCA. Federal or state funds would not be utilized under this alternative.

The DOE or another Federal agency to be designated by the President would have the responsibility for future surveillance and maintenance. Future costs would be provided by Congressional appropriation.

9. Comment

The costs for Alternatives 2 and 3 are biased because they do not reflect adequate control for river and gully erosion. (493)

Response

The DEIS included a design and cost estimate for Alternative 2 (stabilization in place) that provides for protection against a PMF event. Maintenance costs required for river erosion control for 1000 years would be approximately $26,000,000 based on 1985 dollars assuming that 25 percent of the grout would be replaced at 25-year intervals. Alternative 3 (Bodo Canyon) calculations for gully erosion have been prepared. The cost estimate for this rock erosion protection is $400,000. The cost estimates for Alternatives 2 and 3 are for construction only and exclude the costs for land, engineering, and construction management. Table 1.2 and other sections of this FEIS have been revised.

10. Comment

The cost of the Long Hollow site should include cost of a new road; County Road 141 should not be used. (455)

Response

Both Alternatives 4 and 5 were modified to include the construction of a haul road parallel to County Road 141. County Road 141 would not be used by haul trucks. The cost estimate for the Long Hollow haul road is $300,000. This cost is for construction only and excludes the costs for land, engineering, and construction management. Table 1.2 of this FEIS has been revised to incorporate these costs as have other sections of the text.

11. Comment

Two commenters said that an adjustment in the specific location of the Long Hollow site within the Long Hollow basin could alter the costs of this alternative and could significantly affect the preferred alternative. (492) Another commenter suggested that the design for disposal at the Long Hollow site could be altered to reduce the cost. (493)

Response

Location adjustments have a minor impact on costs and will not affect the estimated cost for the Long Hollow alternatives.

12. Comment

Several commenters stated that the costs in the EIS should include rights-of-way, legal, administrative, and land acquisition costs. (428, 429, 452, 515) The Colorado Department of Health requested that the costs of the alternatives be updated to reflect current transportation costs. (493)

Response

The costs referred to are difficult to predict because they are contingent on highly variable factors; consequently, they have not been included in the estimated project costs. The relative magnitude of the costs for the alternatives are expected to be approximately the same as they are reported in this FEIS. However, the project costs given in the DEIS have been updated in Tables 1.2 and 1.3 of this FEIS.

13. Comment

The potential increase in future land values may justify the cleanup of the raffinate ponds area at the owner's expense. (493)

Response

DOE will give this idea further consideration prior to the negotiations with the landowner for remedial action land access or property acquisition. For the purposes of this EIS, it is conservative to assume that the DOE and state would pay for the remedial action at the raffinate ponds area.

6.10 RADIATION EXPOSURES AND HEALTH EFFECTS

This section addresses a broad spectrum of issues ranging from health risks in the Durango community to the status of radiation surveys to techniques for protecting remedial action workers. Many of the comments expressed a fear of the dangers of low level radiation while others offered specific technical criticism of the radiation health risk evaluation methods.

6.10.1 Radiation monitoring

Several written statements concerned the adequacy or appropriateness of radiation monitoring that has been conducted or should be conducted prior to the remedial action.

1. Comment

The validity of the Durango site airborne particulate sampling results is questionable when compared with the Bodo Canyon results. Airborne concentrations of U, Th-230, and Ra-226 near the Durango site are two and three orders of magnitude greater than the Bodo Canyon concentrations. Additional data should be collected. (490)

Response

Prior to remedial action, an environmental monitoring program will be conducted at the project site and surrounding area. The program will proceed through the pre-operational, operational, and post-operational phases. Continuous air particulate sampling will be required at points around the existing site boundary, at a background location, and at the potential alternate site. Sampling will commence at least one month before remedial action to initially characterize background levels. Operational data will then provide documentation of off-site contamination generated by remedial action activities.

2. Comment

Section 4.2 of the EIS should explain the extent of contamination in the Animas River sediment and dry washes near the processing site. This information should also be shown in Figure 3.1. (490)

Response

The extent and depth of windblown contamination and water-transported contamination (in dry washes) in the vicinity of the tailings piles were determined during a radiological characterization survey (BFEC, 1984). There are few dry washes in the vicinity of the processing site.

Data on the extent of contamination in the Animas River sediment samples are presented in Appendix H, Radiological Information, (Section H.1.1) of the DEIS. In general, contaminated material from the processing site has not caused elevated radionuclide concentrations in sediments in the Animas River above typical background levels found in southwestern Colorado.

3. Comment

External gamma radiation measurements and radionuclide soil concentrations should be determined to characterize the haul road route between the tailings pile and County Road 211. (490)

Response

An extensive radiological site characterization survey was conducted (BFEC, 1984) which included gamma exposure rate and soil sample analyses in the area between the tailings piles and County Road 211. A gamma traverse survey and soil sampling would be conducted along the remainder of County Road 211 or the proposed haul road following the decision to relocate the tailings to an alternate disposal site. This would be done to characterize existing levels before commencing construction. Periodic monitoring during construction would then be performed to ensure there was no spillage during transportation.

4. Comment

Air sample monitors for detecting Rn-222 should be placed around the site before any remedial action to obtain background reference data. (507)

Response

Ambient average radon concentration data are presented in Section 4.8 of this FEIS. These data were collected several years ago at a few locations in the Durango area. They showed that the concentrations on the site averaged about 2 to 5 pCi/l with a rapid decrease with distance from the source to a background value of about 0.5 pCi/l. Recent one-year average measurements (data available at the UMTRA Project Office, Albuquerque, New Mexico) at 22 locations in the Durango area confirm these values. The elevated radon levels due to the site extend less than about 1000 feet to the east of the piles (toward downtown) but exist at a level of about 0.5 pCi/l above background about a mile to the south along the Animas River. Prior to remedial action, according to the alternative selected, additional continuous radon monitoring instruments will be installed to measure the site boundary concentrations during construction.

5. Comment

The radionuclide concentrations in the tailings used in Section H.1.1.2, Appendix H, Radiological Information, are 973 pCi/g for Ra-226, 1070 pCi/g for Th-230, and 103 pCi/g for U-238. Natural uranium (U-nat) concentration, not U-238, should be used in the DEIS analyses. U-nat concentrations would be twice that measured for U-238, or 206 pCi/g. Also, the Pb-210 concentrations should be estimated and used in the DEIS analysis. (490)

Response

The MILDOS model requires input of a U-238 concentration as was done in the DEIS. MILDOS considers U-234 to be in equilibrium with U-238 and accounts for U-234 in its dose estimation. The natural uranium air particulate lung dose to a worker would therefore be approximately equivalent to the Ra-226 air particulate lung dose of 124 mrem (Section H.3.2.2), which is a factor of 50 lower than the maximally exposed worker lung dose of 4.9 rem from inhalation of radon daughters. It is therefore considered that the difference in U-238 versus natural uranium air particulate health effects is negligible.

If the natural uranium concentration of 206 pCi/g were used in place of the U-238 concentration of 103 pCi/g for occupational dose estimation in Section H.3.2.2, the result would have approximately doubled for uranium air particulate health effects.

The dose from Pb-210 has been shown to be small when compared to the three principal radionuclides (U-238, Th-230, Ra-226). Assuming that 20 percent of the radon is released from the soil, the concentration of the Pb-210 and its decay product Po-210 would be approximately 80 percent of the Ra-226 concentration. Calculations presented in the ANL report (1983) show that the lung dose would increase by only six percent if PB-210 and Po-210 were considered.

6. Comment

The DEIS states on pages 108-109 that the effect of snow cover and frozen ground would decrease the ambient Rn-222 concentration for the Bodo Canyon baseline characterization of Rn-222 levels. This statement requires documentation. (554)

Response

Since the DEIS was written, additional radon concentration measurements have been made in the Durango vicinity. The Addendum to Appendix H, Radiological Information, in this FEIS contains a data table for Bodo Canyon location 919 and other monitoring locations. Also, a summary histogram is provided where the Bodo Canyon data are included in the "Group Background Locations" (TAC, 1985).

7. Comment

Radiological monitoring data for the Long Hollow site should include airborne particulate and radon monitoring and surface soil and vegetation sampling. Particulates and radon should be monitored in at least three locations; background, on the site, and downwind. Soil and vegetation should be sampled at a background and downwind location. (554)

Response

These data are acquired once the remedial action has been selected. It is not anticipated that natural background levels would be so high as to exclude a site from being used.

8. Comment

Section H.1.1.2 assumes that the radionuclides in the tailings piles are in secular equilibrium. Data elsewhere in the DEIS do not support this statement. (554) The assumption of secular equilibrium of Th-230 and Ra-226 cannot be made due to a lack of information regarding the error limits. (554)

Response

The assumption of secular equilibrium was used for calculation purposes only. For health effects calculations measured concentrations of the U-238, Ra-226, and Th-230 in the large pile, which comprises 79 percent of the tailings volume, were used.

9. Comment

Why were no Pb-210 sample concentrations determined during the radionuclide characterization studies described on page H-12? (554)

Response

Pb-210 concentrations in nearby soils are not considered as important as Ra-226, Th-230, and uranium. Only in areas of extremely high radon concentrations in the absence of the long-lived radionuclides would it be necessary to sample for Pb-210.

10. Comment

Radiation monitoring during and after the remedial action was the subject of several comments.

o Comment a

What is the lowest possible radon level that could be imposed during the remedial action for a one-week period as opposed to a 26-week or 52-week average? (549) Will a weekly radon emission limit be observed during the remedial action? (519)

o Response a

During remedial action, several continuous radon monitors will be operated around the tailings site. These monitors will be used to measure the cumulative radon concentration near the site boundary. Although the standard requires the annual average limit of radon to be less than 3 pCi/l, the Remedial Action Contractor will take steps to reduce the radon release when the continuous monitors indicate the approach of 3 pCi/l for a weekly average. This approach has been applied to past operations and ensures that the ambient annual average levels remain below the 3 pCi/l limit.

o Comment b

Will radiation monitoring records be made available to the public and the task force on a timely (daily) basis? (454, 549, 515) How often will periodic inspections occur at the remedial action site? Will these be unannounced or planned? (515)

o Response b

Radiation monitoring records of continuous radon concentration, air particulate activity, and Animas River water samples will be maintained on the site. The sampling effort will begin before construction activity begins and continue until after remedial action is complete. These records will be available through designated public agencies and task force members. The analyses of most samples will be performed at the site so that the records reflect current (weekly) results. A major intent of continuous monitoring of radon and air particulates is to protect on-site workers who receive larger doses than the public simply due to their proximity to the contamination. The monitoring results are used to control both radon and particulate emissions to protect the workers. This indirectly limits the exposure to the public as well.

In addition to the daily monitoring, quality assurance audits and health and safety audits of the remedial action would be conducted at least yearly. Less comprehensive quality assurance and health and safety surveillances would be conducted several times during each construction season. Most of the audits and surveillances are scheduled in advance with the remedial action personnel.

o Comment c

Would a radiological survey of the haul roads be conducted following remedial action? (489)

o Response c

Periodically during remedial action all haul roads involving transport of contaminated material (including those from vicinity properties) will be surveyed for contamination spills. Any contamination detected will be removed.

o Comment d

What is the amount of radiation now being released from the tailings and has this caused a higher than normal incidence of cancer? (414, 446)

o Response d

The amount of radiation being released for no action conditions (Alternative 1) was addressed in Table 5.1 and Appendix H, Radiological Information, of the DEIS. Associated excess health effects, based on the estimated radiation doses for Alternative 1 and best available risk factors, are also presented in Section 5.2 for no action conditions. Available research data indicate that elevated radiation exposure may slightly increase the risk of contracting cancer; however, the population of Durango is not large enough to detect any excess cancers caused by the tailings pile.

o Comment e

Radon gas emission testing should be performed as a part of surveillance following the remedial action. (507)

o Response e

Radon gas monitoring will be done as a part of the certification audit following completion of the remedial action. Ongoing radon monitoring is not deemed to be necessary considering the passive radon control features of the remedial action (e.g., soil radon barrier).

o Comment f

A citizens group questioned whether the Colorado Department of Health could do an adequate job of monitoring the health of the Durango community given funding and manpower constraints. (515)

o Response f

Radiation monitoring during remedial action would be conducted primarily by DOE contractors and subcontractors under the DOE project budget. The Colorado Department of Health would probably participate by reviewing the procedures and results of the field monitoring.

6.10.2 Health effects calculations, source terms, and pathways

The models used to calculate health effects based on radiation dose were the subject of numerous comments. Health effects calculations, models, and exposure pathways are addressed in this section.

1. Comment

Several commenters requested that the health effects to both workers and the public be recalculated based on more conservative (i.e., higher) radiological dose/health effects conversion factors. (478, 493, and 454) Other commenters noted the wide diversity of opinion among health physicists on the effects of low level radiation, and requested that DOE summarize the reasons for selecting the health effect model that was used. (515, 483, 491, 473) Another comment stated that use of the Evans health risk model is inappropriate due to deficiencies in the model. Use of the BEIR III model or another more conservative model was suggested. (537)

Response

The health effects calculated in the FEIS have been revised from those in the DEIS based on a reevaluation of risk factors. A complete review of recent work on the effects of low level radiation shows that the United Nations Scientific Committee on the Effects of Atomic Radiation quoted a range of 200 to 450 x 10^{-6} deaths per person-WLM (UNSCEAR, 1977), while the EPA in its Final Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites quoted 300 x 10^{-6} deaths per person-WLM (EPA, 1982). The BEIR-III report formulated an age-dependent model (NAS, 1980) for predicting the risk of lung cancer based on several studies of uranium and fluorspar miners. Evans et al. (1981) reviewed the BEIR-III study, lung cancer risk estimates published by other authors, and epidemiological evidence. They concluded that the most defensible upper-bound to the lifetime lung-cancer risk for the general population is 100 x 10^{-6} deaths per person-WLM. A compilation of these and other risk factor values is shown below:

Reference	Range (x 10^{-6} deaths per person-WLM)
UNSCEAR, 1977	200 to 450
NAS, 1980	200 to 1400
ICRP, 1981	150 to 450

Evans et al., 1981	100
EPA, 1982	300
NCRP, 1984a	100 to 200
USNRC, 1979	360

Recognizing the inadequate understanding of the risk factor, the FEIS text uses the approximate median of the values and ranges reported above: 300 x 10^{-6} health effects per person-WLM. The DEIS, Appendix H, Radiological Information, used a risk factor of 100 x 10^{-6} health effects per person-WLM; therefore, the bronchial epithelium doses presented in the FEIS text are a factor of three higher than the DEIS Appendix H MILDOS output doses. The risk factor of 300 x 10^{-6} health effects per person-WLM is equivalent to a dose conversion factor of approximately 15 rem per WLM (NCRP, 1984b).

2. Comment

Other commenters requested that further studies should be conducted of the relationship between tailings and birth defects and other health effects such as leukemia. (326, 458, 515)

Response

Radiation and its associated health effects have been studied more thoroughly than health effects from other carcinogenic agents. The evaluation of health effects caused by low-level radiation is, however, a difficult task, and many uncertainties are associated with the estimation of risks from radiation. The traditional approach for estimating risks from low-level radiation exposures is to extrapolate from effects observed at high radiation exposures using the linear dose-response and no threshold assumptions. Synergistic effects of other health effect agents (e.g., chemicals), are not considered in this FEIS.

The health effect estimations made in this FEIS are primarily based on data and models developed over the last ten years (see previous comment). Quantitative risk estimation of somatic effects for various organs of the body can be obtained using available human radiation exposure data. The manifestation of a cancer caused by radiation exposure would occur after a latent period of up to 25 years, depending on the type of cancer and the age of the person exposed. The risks from radiation will vary with adult age and sex, but are presented as average values where variation due to adult age and sex is small. No data are available that indicate whether risk estimates for adults are appropriate for radiation exposure during childhood. Research continues into the relation between health effects and chronic exposure to low levels of radiation, but progress is slow since the normal incidence (that unrelated to the presence of man-induced exposure) of health effects such as birth defects and leukemia is large compared to that due to man-induced exposure.

Regardless, UMTRCA acknowledges that potential health hazards exist and instructs the DOE to perform action in compliance with the EPA standards to minimize such risks. Such requested studies were, more appropriately, a part of the EPA standard setting process.

3. Comment

The lung cancer death rates should be presented in laymen terms and compared with death rate projections by other authors and recognized experts (424, 425).

Response

The health effects of radon diffusion from tailings arise from inhalation of the short-lived radon decay products (daughters) which then deposit energy from alpha particles in the lung. For radiation protection purposes, the International Commission on Radiological Protection (ICRP, 1977) proposed an individual lung-cancer risk factor of 20×10^{-6} per rem, or 20 excess cancer deaths where one million individuals each receive a one-rem lung dose equivalent from radon daughters. Other standards-setting organizations express the excess risk of lung cancer based on the unit of working level (WL) which is defined as any combination of short-lived radon daughters in one liter of air which, on completed decay, gives a total emission of 1.3×10^5 million electron volts of alpha radiation. The working-level month (WLM) is a unit defined as the exposure resulting from the inhalation of air with a concentration of 1 WL of radon daughters for 170 working hours. The most recent determination (NCRP, 1984b) of the dose conversion factor lists 14 rem/WLM as equivalent. This results in a risk factor of 280×10^{-6} health effects per person WLM which is quite similar to the risk factor used in the FEIS. (See comment 1.a.)

The Addendum to Appendix H, Radiological Information, in this FEIS provides an example of the excess risk to a maximally-exposed individual in the general population during one year of remedial action. The estimated excess risk to that individual of 0.00029 is the lifetime probability of that individual dying of cancer for an exposure time of one year. Another interpretation of that excess risk is that one person out of 3450 people would acquire a fatal cancer if all 3450 people lived immediately across the Animas River from the tailings pile and were exposed during the one-year remedial action period.

The excess risk estimates in the FEIS are for the entire population within 80 kilometers of the Durango tailings site during a 100-year period. For example, in Table 5.2 if no action occurred, 1.34 excess cancer deaths would occur in the general population over the next 100 years as caused by the tailings pile. As a comparison, only 2.66×10^{-2} (or 0.0266) excess cancer deaths would occur over the next 100 years if Alternative 3, stabilization at Bodo Canyon, were chosen. Since this number is much less than one, it is likely that no excess cancer caused by the tailings stabilized at Bodo Canyon could occur during the 100-year period.

4. Comment

The FEIS should present one exposure chart which represents both the radon and radiological emissions from both the vicinity sites and the tailings pile. The combined values must be presented as one value for a true representation of population exposure from both aspects of the project. (515)

Response

Although Appendix B, Vicinity Property Remedial Actions, Durango site, of the DEIS provides an analysis of the cleanup of vicinity properties, the intent of the EIS is a comparison of the alternatives to stabilizing the much larger volume of contaminated material within the tailings pile and associated processing facilities. Whatever alternative is chosen, the cleanup of vicinity properties will be undertaken pursuant to the EPA standards. Thus, the exposure due to the vicinity property remedial action is, in effect, superimposed upon all alternatives, and would not affect a comparison among alternatives.

5. Comment

A reference should be provided for the discussion on page H-42 of transportable particulate mean aerodynamic diameter. (554)

Response

See Appendix A (page A-3) of the report entitled: Data Base for Radioactive Waste Management - Impacts Analyses Methodology Report, NUREG/CR-1759, Vol. 3, U.S. Nuclear Regulatory Commission, Washington, D.C. (USNRC, 1981).

This was cited as NRC, 1981a in Appendix H, Radiological Information, of the DEIS.

6. Comment

Presentation of final tables of joint relative frequency distribution for each of six Pasquill stability classes to be used as input for a MILDOS run would assure the reader that a composite of Tables D-4 and D-6, Appendix D, Meteorological and Air-Quality Information, were actually used. (554)

Response

The joint frequency distribution used in the MILDOS runs is an array of 576 (16 x 6 x 6) frequencies of occurrence for each wind direction, wind speed class, and stability class, and is usually presented as a six-page table. In the interest of brevity, these tables were not presented.

7. Comment

Six comments were directed at the radiation exposure pathways that were considered in the DEIS.

- Comment a

  Radiation exposure calculations do not adequately account for the food pathway contribution from foraging animals. (454) Exposure to radon daughters should be reevaluated. (507)

- Response a

  There are five principal pathways which could potentially result in exposure of man to radiation from the tailings pile. These are: (1) inhalation of radon daughters; (2) direct exposure to gamma radiation emitted from the contamination area; (3) inhalation and ingestion of airborne radioactive particulates; (4) ingestion of ground and surface water contaminated with radioactive materials; and (5) ingestion of contaminated food stuff produced in areas contaminated by tailings. For calculations of health effects in the FEIS, only the most significant radiation exposure pathways are considered; they are inhalation of radon daughters, direct exposure to gamma radiation, and air particulate inhalation. Analyses for the latter two radiation exposure pathways lead to doses that are much smaller (several orders of magnitude) than doses from radon daughter inhalation and direct gamma radiation. The latter two radiation exposure pathways are not considered in this analysis.

- Comment b

  The EIS should include a discussion of the accumulation of radionuclides in the bone tissue of wildlife. (489, 534)

- Response b

  The DOE disagrees. The uncertainty in the effects of low-level radiation on humans is relatively large and the understanding of uptake and bioaccumulation in the bone tissue of wildlife is virtually non-existent. The food pathway to humans from wildlife bone tissue is insignificant.

- Comment c

  Commenters stated that inhalation of windblown particulates and ingestion of contaminated surface waters are greater potential radiological exposure pathways than was acknowledged in the DEIS. (489, 460, 454, 491)) o Response c

The modeling of the release and airborne transport of particulates in the DEIS was based on the best analytical tools currently available. Source terms were based on particulate release rates developed by the Air Quality Control Division of the Colorado Department of Health. These are generally considered to be conservative; however, it is recognized that there is some degree of uncertainty in their performance. Regardless, the same algorithms were used to develop the source terms for each alternative and therefore, comparison of the relative impacts of the alternatives can be made.

As discussed in response 7a in this section, inhalation of radon daughters and direct gamma radiation are the main pathways of concern with the remedial actions. Dose from ingestion of contaminated water is several orders of magnitude smaller. Consequently, evaluation of the water ingestion pathway has not been presented in this FEIS.

o Comment d

Section 5.8 should discuss the incremental increases in direct gamma and airborne particulates as a result of the remedial action. (490)

o Response d

The general public and nearby workers are presently being exposed to radon daughters and direct gamma radiation from the unstabilized piles. Radon is diffusing into the atmosphere where it is being dispersed by winds over a large area (i.e., inhalation pathway). Gamma radiation is being emitted and exposes any person living or working within 0.3 mile of the tailings (i.e., direct gamma exposure pathway).

During implementation of each of the alternatives except the no action alternative, the exposure to the general population from the radiological pathways would increase as the tailings are disturbed on the site and as the tailings are transported to an alternate site. Remedial action workers would also be exposed to these pathways during remedial action.

As presented in Appendix H, Radiological Information, the percentage increase in radon released from the tailings due to construction activities would be small relative to the radon released prior to remedial action. This is because a large radon flux is released from the existing tailings under the no-action alternative. During construction, increases in gamma exposure rates and airborne radioactive particulate concentrations would be larger than for radon concentration compared to levels prior to remedial action. This is due to an increase in gamma exposure rates as the pile is excavated and then mounded as a result of exposure of more tailings. Airborne particulate concentrations also would increase from near-zero background levels to measurable levels caused by disturbance of the tailings, and particulate concentrations could increase under adverse meteorological conditions. Air particulate dispersion would be controlled by mitigative measures during excavation activities.

The elevated gamma exposure rate primarily increases health effects to the remediation workers on the site. During remedial action the risk to workers from inhalation of air particulates would be a small percent of that from exposure to radon daughters or to gamma rays, and the air particulate exposure to the general population would be even less. Inhalation of radon daughters would continue to be the dominant source factor in the general population health effects calculation for no action and during remedial action.

o <u>Comment e</u>

It is not clear how incremental doses associated with vicinity property cleanup were estimated. Also, it is not clear if the incremental doses have been added to the doses resulting from the radiological assessments made of the Durango site alternative. (554) Appendix B does not address the difference between indoor and outdoor levels of exposure from buried and surface sources of contamination. (515)

o <u>Response e</u>

The average radiation exposure levels to radon daughters and gamma radiation were determined from data at 54 Durango vicinity properties as described in Section B.4.1, Appendix B, Vicinity-Property Remedial Actions, in the DEIS. Background radiation levels were subtracted from these average values. This resulted in excess exposure rates of 6 microR/hr and 0.021 WL. These values were applied to all vicinity properties. The values were based on a combination of indoor and outdoor readings. For radon daughters, indoor values are typically much higher than outdoor measurements.

The calculated exposures do not include the incremental effects from the Durango site. The health effects incurred by persons living on vicinity properties due to site activities are considered in the site health effects calculations. An upper bound of health effects for those persons living on a vicinity property could be determined by adding the health effects contribution from the site to the health effects expected for vicinity properties.

8. Comment

Several commenters expressed concern over apparent unequal treatment of radiation sources for the calculation of radiation exposures and projected health effects.

o Comment a

One commenter observed that the radon sources for Alternatives 3, 4, and 5 were underestimated while the sources for Alternative 2 were overestimated, making the stabilization in place alternative appear less desirable. (454)

o Response a

The DOE disagrees with this comment. The radon source term was calculated in virtually the same way for each alternative with the only difference being in the sequencing and amount of area exposed. Therefore, the relative health effects calculated from alternative to alternative are comparable. The methods for deriving the source terms for the various alternatives are described in Appendix H, Radiological Information, of the DEIS.

o Comment b

The analysis of the radon source term (Section H.3.1.2) during reprocessing fails to include several sources. Radon releases from the drying and crushing operations prior to the heap leach process were not determined. (490)

o Response b

In Section H.3.1.2, of the DEIS, it is stated that for the reprocessing alternative the tailings material would be wetted before transport and again on arrival at the Long Hollow site. It was assumed that the tailings would be transported and placed in leach tanks within two weeks; therefore radon would not build into a state of equilibrium or be released from the interstitial spaces. It was also assumed that the tailings would be kept saturated until they were heap-leached, and that drying or crushing would not be done before heap-leaching. The diffusion of radon through a saturated material is extremely limited compared to that through the same dry material. It is agreed that the assumption of no radon source term during this period is not conservative; however, it is believed that inclusion of a radon source term for this period of two weeks would add little to the health effects calculations.

o Comment c

On page H-71, Alternative 5, assuming a zero radon daughter dose for scooping up, transporting, and dumping of tailings into leach tanks is not appropriate unless the entire process is automated without any workers present. (554)

o Response c

If 1800 cy of tailings are placed in a leach tank per day after a maximum of a two-week delay, the amount of radon gas available for release would be equal to the amount produced in two weeks times the 0.2 emanating fraction or

$(973\ pCi/g) \times (1.57\ g/cm^3) \times (ft^3/3.531 \times 10^{-5}\ cm^3) \times$

$(yd^3/27\ ft^3) \times (1800\ yd^3/day) \times (Ci/10^{12}\ pCi) \times (0.2$

$\text{emanating fraction}) = 5.77 \times 10^{-4}\ Ci/day.$

Over the 51-month period $(5.77 \times 10^{-4}\ Ci/day) \times (51\ months) \times$

$(30\ day/month) = 0.883\ Ci.$

Since this total release is only 0.1 percent of the total radon release at Long Hollow, it is considered negligible.

o Comment d

Performing radon flux calculations based on a one-time sample for tailings moisture content is weak. Perhaps including the depth at which the sample was taken could add a little information. An average of several samples from both piles at different depths would be the best approach. (554)

o Response d

Page H-2, Appendix H, Radiological Information, last paragraph, acknowledges the fact that radon flux calculations based on a single measurement of moisture content can be misleading. For health effects calculations, a radon flux to radium content in the tailings of one is used. The flux that was used in this FEIS ($973\ pCi/m^2s$) is three times higher than the calculated flux, and is therefore conservative.

o Comment e

The relative contribution to dose from Pb-210 in the tailings should be addressed on page H-72. (554)

o Response e

If both Pb-210 and Po-210 are considered, the dose would increase by about six percent (ANL, 1983).

o Comment f

The use of a three-meter mixing height on page H-73 should be referenced or explained. Meteorological mixing heights are usually much higher, even in southwest Colorado. (554)

o Response f

Three meters is assumed as a conservative value (USNRC, 1980).

6.10.3 Exposures of specific populations

Several comments requested health risk evaluations of specific populations or groups of people, e.g., children at a day care center, boaters on the Animas River, and remedial action workers.

1. Comment

Risk to maximally exposed individuals as well as to general populations from radon gas exposure should be assessed and based on actual measured values at the site and not on predicted values. (454, 478, 491, 507),

Response

Risk to the maximally exposed individual has been calculated and is presented in the Addendum to Appendix H of this FEIS.

The excess risk of cancer to a remedial action worker is 0.00069 which is the life-time probability of an individual dying from cancer for an exposure time of one year. Another interpretation is that one person out of 1450 people would acquire a fatal cancer if there were 1450 workers on the tailings pile for the one-year period.

2. Comment

Residents near the Bodo Canyon and Long Hollow sites expressed concern over the health risks to their children as well as children attending a day care center in the Long Hollow area. (510, 511, 453)

Response

The Long Hollow area and day care center and the Bodo Canyon area would be expected to have lower radiation exposures than the locations near the existing site during remedial action. Following remedial action and independent of which alternative is selected, the disposal site would be constructed according to EPA standards and radiation levels caused by the tailings beyond the disposal site perimeter would be negligible in relation to natural background levels already existing. Appendix H, Radiological Information, Section H.3.2.1, of the DEIS presents the calculated radiation exposures for ten locations during remedial action for each of the alternatives.

3. Comment

The final EIS should address health hazards to recreational boaters on the Animas River. (504)

Response

The duration of time spent by a boater in the vicinity of the tailings pile would be so small that any excess radiation exposure would be virtually nil; even smaller than the excess radiation exposure to the general population during transportation of the tailings as calculated in Section H.3.3.2 of the DEIS.

4. Comment

The projected yearly radiation dose and whole body exposure for a truck driver hauling tailings seems to be unacceptably high. Could the truck cabs be shielded to reduce the exposure? Provide the basis for the data. (477, 554)

Response

The analysis referred to by the commenter takes no credit for the normal shielding which would exist between the driver and tailings. A discussion of the over-conservatism of this approach can be found in paragraph 3 on page H-72 of Appendix H, Radiological Information, Section H.3.2.2, of the DEIS. If credit is taken for about one inch of steel, the dose to the driver is calculated to about 200 to 300 mrem per year.

5. Comment

Section 5.2.4 should also include a discussion of the potential radiation dose to cleanup workers in the accident scenarios. (493)

Response

The radiation exposure from spilled tailings would be of short duration and extremely small, negligible when compared to exposures the workers would be receiving during the planned remedial action. The estimated health risks to workers for the remedial action alternatives are conservative and would incorporate any excess radiation exposure from cleanup of spilled material.

6. Comment

What measures will be used to reduce worker's radiation exposure during the remedial action? (408, 517) Remedial action workers should be protected against inhalation of radon gas. (507)

Response

Worker exposures during remedial action would be lessened by the wetting of contaminated material during construction activities, the wearing of respirators, frequent relocation of workers to areas not containing radioactive materials, and other shielding measures. These means for reducing worker's exposure would be employed if necessary during remedial action and will be described in detail in the Remedial Action Plan/Site Conceptual Design. General procedures are described in Section 5.21.2 of the DEIS.

7. Comment

Some commenters suggested that a review of medical records in the Durango area would provide a basis for cancer risk to the local population (159,177). Another commenter suggested that a cancer registry be established in Durango. (525)

Response

A review of medical records in Durango would be helpful in determining the number of persons contracting cancer in the Durango area. It is felt, however, that for purposes of this EIS the national incidence of cancer is adequate for relating the magnitude of cancer risk from remedial action to the natural incidence of cancer.

6.10.4 General radiation related comments

A number of comments posed general questions on radiation levels, standards, and other topics.

1. Comment

Plans should be made for rapid and effective response to truck accidents. These plans should include training of local medical personnel for the treatment of injuries involving radiation contamination. (493, 523, 534)

Response

While not specifically a part of the EIS, an emergency response procedure for handling accidents of virtually all types will be included in the Remedial Action Plan (which will be developed once the selection of an alternative is made). The Remedial Action Contractor will have trained personnel available at all times for potential responses to accidents. The radiation exposure to spilled tailings is extremely small and appropriate action is generally limited to rapid containment and removal of the material. Medical attention as a result of accidents is anticipated to be limited to the immediate treatment of non-radiation related injuries. However, the Remedial Action Contractor will provide information on the proper decontamination of injury victims to local emergency medical personnel. See Section B.4.1.2, Appendix B, Vicinity-Property Remedial Actions, of the DEIS.

2. Comment

Several commenters said that the need to reduce health effects requiring the pile to be moved from Durango has not been demonstrated. (428, 461, 479, 412, 515) There is no evidence of an increase in cancer incidence in Durango. (429, 444, 449, 450) Another comment stated that the DEIS did not clearly indicate the health hazard that is posed from long-term low dose radiation. (473)

Response

As shown in Appendix H, Radiological Information, of the DEIS and Table 1.3 of the FEIS, long-term excess health effects are very low and similar for each alternative. Providing long-term geomorphic stability of the stabilized pile thus preventing natural or human-caused dispersal of the tailings is the primary reason for relocation. Further, DOE is mandated by the UMTRCA of 1978 to perform remedial action in compliance with the EPA standards; demonstration of cancer incidence due to the tailings is irrelevant for purposes of this remedial action. The health effects for the no action alternative were calculated on the existing condition of the tailings, assuming that the status quo would be maintained in the future. The DOE cannot provide any assurance with the no action alternative that the tailings would not be dispersed by wind, water, or man, which would cause an increase in projected health effects above those described in this FEIS.

3. Comment

Could the amount of radiation being released from the pile be reduced without moving the pile? (414)

Response

Radiation levels could be reduced to meet EPA standards, as addressed in Alternative 2 in the DEIS; however, it is clear that there are difficulties in meeting the longevity standard of 200 to 1000 years.

4. Comment

How much radiation would be released if the pile were mixed. (414)

Response

The amount of radiation that would be released during construction for stabilization in place and for relocation is addressed in Section 5.2.

5. Comment

Tailings should be disturbed as little as possible; the radon gas coming off of the surface materials is different from what one would expect in the center of the tailings. As long as the center is not exposed it is of a relatively low hazard. (542)

Response

The DOE disagrees. The radon released from tailings is due to the disintegration of radium within the pile. A fraction (usually about 20 percent) of the radon produced is created within the interstitial pore space and is able to diffuse to the surface. Thus, the radon flux primarily depends on the radium content of the first several feet of material below the surface. Although little information exists on the distribution of radium within the Durango pile, analyses from many other uranium tailings piles shows that the distribution is relatively uniform. Thus, when the center of the pile is exposed, there would not be significantly more radon flux than is occurring at the present time.

6. Comment

What are the final EPA standards for radiation? (525)

Response

The EPA standards for inactive uranium mill tailings sites are presented in Section 2.2 of this FEIS.

7. Comment

Several commenters stated that the smelter stack on the Durango site should be decontaminated and left intact. (489, 482)

Response

The level of radioactive contamination of the smelter stack and the structural stability relative to withstanding on-site remedial action activities are factors which influenced the decision to demolish the smelter stack. See Section 6.16.

6.11 WILDLIFE

There were 26 comments relating to wildlife. Several commenters had concerns relating to the need for a wildlife mitigation plan which would include costs and kinds of mitigation. Others raised issues relating to the legality of using Bodo Canyon as a disposal site or the inappropriate use of a Wildlife Management Area which might set a precedence for other actions. Several others felt that wildlife values in Long Hollow were inaccurately portrayed in the DEIS. The comment summaries and responses are presented below.

1. Comment

   Comments on the wildlife values and impacts came from six individuals, the Wildlife Society, the League of Women Voters, and the State of Colorado.

   o Comment a

   Several commenters felt that wildlife values in Long Hollow were not accurately portrayed (as compared to Bodo Canyon) and that the wildlife impacts resulting from Alternatives 4 and 5 were not adequately addressed in the DEIS. (475, 488, 535, 537, 543, 376, 377)

   o Response a

   Since publication of the DEIS, wildlife variety, distribution, and abundance, and wildlife habitat have been re-examined in consultation with the Colorado Division of Wildlife (CDW). Additional information has been included in Sections 4.7.2 and 5.7 and Appendix L, Wildlife Mitigation Plan, of this FEIS.

   o Comment b

   Several commenters questioned the legality of using the Bodo State Wildlife Management area as a tailings disposal site or for borrow materials, and cited the original Nature Conservancy deed requirements. (456, 515) The Colorado Department of Health requested that a land usage arrangement be presented by the DOE for consideration by the Colorado Division of Wildlife and The Nature Conservancy. (493)

   o Response b

   The commenters are correct in that the deed restrictions on the Bodo property require that the land "....forever be held as wildlife habitat and for no purpose inconsistent therewith..." This restriction can only be modified through agreement by all parties (DOE, CDW, Nature Conservancy) and by finalizing a wildlife impact mitigation plan prior to transfer of the title to DOE by the state.

Meetings that have been held between the DOE, CDW, and the Nature Conservancy have resulted in substantial progress in moving toward an agreement for the long-term use of the Bodo Canyon site. In addition to preparing the draft wildlife mitigation plan for the truck transport option of Alternative 3, the DOE is preparing another draft mitigation plan to address wildlife impacts associated with the conveyor transport option.

o <u>Comment c</u>

One commenter was concerned about the precedent of depositing hazardous materials in wildlife management areas if Alternative 3 were selected. (475) The state owned Bodo wildlife area should be used only if other alternatives are shown to be less viable. (481)

o <u>Response c</u>

Although deposition of hazardous materials at the Bodo State Wildlife Area might be precedent setting, any and all future disposal sites sponsored and funded by the Federal Government would be subject to compliance with NEPA and, presumably, agreement by the state. Furthermore, the extent to which wildlife impacts are mitigated at Bodo Canyon would set a precedent for mitigation at other hazardous materials or radioactive waste disposal sites. Regarding the issue of alternative selection, the DOE recognizes wildlife values and the importance of the habitat in the Bodo Canyon area. However, the selection of an alternative is dependent upon many factors of which wildlife is only one. In recognition of the importance of wildlife, the DOE has developed a detailed plan to mitigate the impacts to wildlife (Appendix L, Wildlife Mitigation Plan).

o <u>Comment d</u>

The FEIS should address impacts to wildlife from truck traffic on C.R.211. (493, 516, 537, 456)

o <u>Response d</u>

These impacts have been addressed in Section 5.7 and Appendix L. Impacts that have been considered for each alternative include wildlife-vehicle accidents, loss of habitat from road widening and dust emissions, and loss of habitat utilization from increased traffic volumes.

o <u>Comment e</u>

The increasing real estate development in the Durango area is creating pressure on existing wildlife populations; use of Bodo Canyon for either a source of materials or for remedial action would further impact wildlife populations. (456, 516, 518) o <u>Response e</u>

Agreed. Since publication of the DEIS, impacts to wildlife have been thoroughly reviewed, revised, and described (Section 5.7). A draft Wildlife Mitigation Plan (Appendix L) to reduce, minimize, and eliminate impacts has been completed and submitted to the state for consideration.

o <u>Comment f</u>

It is stated that the entire Bodo Canyon area has been deeded to the State of Colorado by the Nature Conservancy. In this deed has the Natural Conservancy placed any restrictions on the use of the land which could affect the reclamation of the relocated tailings? (554)

o <u>Response f</u>

No. As stated in the response to comment b, deed restrictions specifically address use of the land and not reclamation requirements.

2. <u>Comment</u>

Numerous comments from government agencies, organizations, and individuals expressed concerns about wildlife mitigation particularly at Bodo Canyon.

o <u>Comment a</u>

Several commenters, including the State of Colorado, requested the inclusion of a wildlife mitigation plan for each of the alternatives, or, clear statements of how impacts to wildlife would be mitigated in each alternative. (489, 492, 493, 474, 475, 508, 509, 516, 551)

o <u>Response a</u>

A draft wildlife impact mitigation plan has been developed for Alternative 3, the preferred alternative, and is included as Appendix L in this FEIS. The elements of the plan are summarized in Section 5.21.7. Regardless of the alternative selected for remedial action, a mitigation plan will be an integral part of the project. In the event that Alternative 2, 4, or 5 is selected, a revised mitigation plan containing the same essential elements as the draft plan, included as Appendix L, would be developed and implemented.

- o Comment b

  Commenters requested that the EIS provide greater detail on the costs and terms of the biological mitigation plan that would be implemented if the Bodo Canyon site were selected. (492, 493, 451, 452, 508, 509, 515, 516)

- o Response b

  A draft mitigation plan containing various mitigation measures and estimated costs is included as Appendix L, Wildlife Mitigation Plan, of this FEIS. Table L.4.1 provides estimated costs for the following measures; education programs, speed restrictions, timing of remedial action activities, road signs, reporting of road kills, reimbursement of road kills, van pooling, timing of road construction activities, exhaust system checks, firearms restrictions, habitat enhancement and replacement, and others.

- o Comment c

  One commenter inquired how the CDW would be compensated and what additional costs would be incurred by them if the Bodo Canyon site were selected. (534)

- o Response c

  The DOE recognizes that the CDW would incur additional costs during remedial action (Section L.3.4 of Appendix L). Section L.4.1 of Appendix L discusses this issue.

3. Comment

   What would be the loss to recreationists using the Bodo Wildlife Area during truck travel, closing of County Roads 211 and 212, and other disposal operations? (534)

   Response

   Current estimated recreational use (11,850 days/year) of the Bodo wildlife area and estimated recreational loss (3946 days/year) during remedial action (Alternative 3) are provided in Sections 4.9.2 and 5.8 of this FEIS and Section L.3.3 of Appendix L.

4. Comment

   Before issuance of a final EIS, a wildlife mitigation plan should be issued with enough response time for the public to review and comment on it. (508, 509)

Response

The DOE acknowledges the commenter's desires to review the wildlife mitigation plan prior to the issuance of the FEIS. However, the DOE disagrees with the need for early public review of the plan. Appendix L of the FEIS contains a draft wildlife mitigation plan.

6.12 TRANSPORTATION

The majority of transportation related comments expressed concern that County Road 141 (Wildcat Canyon Road) would be used to transport tailings to Long Hollow. These concerns were almost exclusively from local area residents including people living in the Rafter J Subdivision who submitted a petition requesting that an alternate road be constructed. Other comments involved changes to the Bodo Canyon road and the effectiveness of dust control during truck haulage. The DOE's responses and comment summaries are given below.

1. Comment

Many commenters expressed concern over the use of Wildcat Canyon Road (County Road 141) for Alternatives 4 and 5. Commenters felt it would be very dangerous for haul trucks to use Wildcat Canyon Road since it is used as the major route for access to Durango by the residents that live in the Long Hollow area. Commenters recommended that a road be constructed to run parallel to Wildcat Canyon Road for use by haul trucks. (351 through 391, 422, 423, 424, 425, 447, 453, 455, 510, 511, 526, 537, 543, 521, 429, 439, 440, 447, 378, 379, 476, 492, 557, 558)

Response

Both Alternatives 4 and 5 were modified to include the construction of a haul road parallel to Wildcat Canyon Road. Wildcat Canyon Road would not be used by haul trucks. Sections 3.2.5, 3.2.6, and 5.14 of the FEIS indicate this change.

2. Comment

An individual asked if the Bodo Canyon Road would meet transportation standards. (513) A citizen organization asked other questions: What will be the level of access improvements from County Road 211 to the piles? Will road profiles and cross sections be prepared for inclusion in the final EIS? What maintenance measures will be necessary to prevent deterioration of the gravelled roadbeds? (487).

Response

The haul roads would be widened and improved and would comply with La Plata County road standards. A minimum width of 35 feet would be required for two-way traffic with the 25-ton-capacity haul trucks for Alternative 3a (transport of tailings to Bodo Canyon by truck). The haul road would be compacted, a geotextile fabric would be placed under a gravel surface, and a water or chemical dust palliative applied to minimize dust (Section 3.2.4). Additional improvements will include, where necessary, safety beams, drainage ditches, and culverts. Actual construction drawings for road profiles and cross sections are beyond the scope of the Final EIS. The haul road would be regraded and resurfaced as necessary to maintain road integrity during remedial action. The road would not have to be widened for Alternative 3b, stabilization at Bodo Canyon using a conveyor system.

3. Comment

What would be the effect of traffic increases past the CDW House in Ridges Basin? (453, 455)

Response

There would be no change in traffic patterns past the CDW House for Alternatives 1, 2, and 3. For Alternatives 4 and 5, County Road 211 would have to be widened and improved. A minimum width of 35 feet would be required for two-way traffic of the 25-ton-capacity haul trucks. As given in Table 1.3 of the EIS under Alternative 4, the estimated truck traffic would be 460 trips/day for five months and 534 trips/day for 15 months. Under Alternative 5, the maximum estimated truck traffic would be 72 trips/day for 51 months (Section 5.14 and Table 1.3).

4. Comment

Include a consideration of hard surfacing the Bodo Canyon road; describe cost estimates, impacts, and mitigations. (534)

Response

The cost estimate for hard surfacing (six-inch asphalt) the Bodo Canyon road is approximately $3 million more than simply resurfacing with gravel. At this time, hard surfacing is not under consideration.

5. Comment

Would DOE pay for the road maintenance program? (493)

Response

DOE will pay 90 percent and the state ten percent for the maintenance of roads on the sites. Maintenance of county/state roads is the responsibility of the county/state and is funded through taxes paid by all trucking firms. If County Roads 211 and 212 are totally dedicated during remedial action, maintenance will be paid for by the DOE (90 percent) and the state (10 percent).

6. Comment

A traffic signal may be needed at the intersection of County Road 211 and County Road 141 and at the turnoff to the Long Hollow site if either Alternative 4 or 5 is selected. (493)

Response

Alternative 4 was modified to include the construction of a haul road parallel to County Road 141. County Road 141 would not be used by haul trucks and therefore a traffic signal would not be needed. Sections 1.3.4, 3.2.5, 3.2.6, and portions of Section 5.0 have been revised accordingly.

7. Comment

The use of canvas tarps to cover truck loads of tailings or wetting of truck loads of tailings will not adequately control materials from being blown off trucks during transportation. (424, 425, 489) Another commenter stated that hauling tailings in uncovered trucks would cause widespread dispersal of radioactive dust. (512)

Response

Field observations at other remedial action projects and at UMTRA Project sites at Grand Junction, Shiprock, Salt Lake City, and Canonsburg have shown that canvas tarps and wetting adequately control release of airborne materials from trucks during transportation. Periodic UMTRA Project Health and Safety Audit surveys (available at the UMTRA Project Office, Albuquerque, New Mexico) are conducted to ensure that covers fit securely and that contaminated material is not clinging to loose edges of covers. In addition, a truck wash system would be constructed to cleanse the trucks' exterior prior to leaving the disposal site and prior to leaving the Durango site.

8. Comment

Traffic accident ratios for specific road segments should be used instead of national averages. (493)

Response

As in the case with any forecast that extrapolates from historical data, the predicted number of fatal/injury traffic accidents that is provided in this EIS may represent an underestimate of what actually will occur. However, the prediction also may be an overestimate of future accidents. A historical data base that is broader than the particular roadways that may be used in the remedial action was used because of a lack of traffic information specific to County Roads 211, 212, and 141 (see Section 4.12.7).

9. Comment

What is the potential for accidents involved in moving the tailings? (414)

Response

The potential for accidents under each remedial action alternative is quantified in Section 5.14 (Impacts on Transportation Networks) of the EIS.

10. Comment

Why are there more truck-related injuries for Alternative 5 than Alternative 4? (493)

Response

There are more truck trips and hence miles travelled to complete Alternative 5 than to complete Alternative 4.

The primary differences which translate into more miles travelled under Alternative 5 than Alternative 4 include:

- Relocation of the plant facilities used in reprocessing operations from Naturita to Long Hollow.
- Transport of materials used in the reprocessing operation from Gallup, New Mexico, and Grand Junction, Colorado, to Long Hollow.
- The transport of recovered uranium and vanadium from Long Hollow to Blanding, Utah.

6.13 LAND USE

A number of commenters inquired about the effects of the remedial action on the Animas-La Plata project or vice-versa. Other statements concerned county zoning approval, the use of privately owned land for a disposal site, future land use, and impacts to livestock grazing, public utilities, and the Southern Ute Indian Reservation. DOE's response to each of these issues is presented below, along with summaries of the comments.

1. Comment

The cumulative effects of the remedial action and the Ridges Basin Project (Animas-La Plata) should be addressed in the EIS. (454, 427, 439, 440, 493, 473, 515, 539, 537)

Response

In planning the remedial action, the DOE has considered the possible, likely, cumulative effects of the Bureau of Reclamation's Animas-La Plata Project. The Ridges Basin Reservoir component would inundate part of County Road 211 and a water intake structure would be constructed at the raffinate ponds location. Projecting the entire range of cumulative effects of the projects is not necessary because of the uncertainty of when construction of the Animas-La Plata Project would begin due to lack of funding from Congress. As the Animas-La Plata Project stands now, the schedule put forth in its Environmental Statement conflicts little with that of the Durango remedial action.

2. Comment

Disposal at Bodo Canyon or Long Hollow would require zoning approval by La Plata County. (493)

Response

The DOE agrees that coordination with the La Plata county government would be essential for any of the remedial action alternatives. However, La Plata County uses a land use change approval system rather than a land use zoning approach for managing land development. The DOE has reviewed the county regulations and will comply with local land use requirements.

3. Comment

Use of privately owned land as an alternative disposal site would be a mistake if publicly owned land is available. (439, 440)

Response

The choice of acceptable sites for the stabilization of uranium mill tailings is based on many factors (such as those described in Appendix C, Alternatives that were Considered but Rejected, page C-4 of the DEIS). Of primary concern are geotechnical characteristics. It is imperative that the site that is chosen be geotechnically suitable, enabling stabilization to be as secure and permanent as possible. Current and potential future land uses were considered in selecting alternate disposal sites. The use of private land is considered when the land offers beneficial characteristics which public land cannot.

4. Comment

The DOE should reevaluate the projections of future land use near the Long Hollow site with more emphasis on the expanding low-density residential development. (424, 425, 537)

Response

The EIS describes potential future land uses in the Long Hollow area (e.g., the suitability of the area for low density housing because of the flat terrain). The EIS also mentions that such development is occurring in the area, and that precise projections of residential development in the area are somewhat subjective. Thus, the approach utilized was to describe potential future uses rather than to make projections (see Section 4.9.3).

5. Comment

More emphasis should be placed on the use of Long Hollow as grazing land. (488)

Alternatives 4 and 5 would shut down sheep ranching operations during remedial action due to traffic and noise. (453, 488)

Response

The DEIS described, in Section 4.9.3, the current and historic uses of the Long Hollow site for sheep grazing and lambing. The land targeted for the proposed Long Hollow site (80 to 195 acres) and the immediate vicinity (1100 acres total) are used by the owner for grazing. This acreage is an important component of a 2000-head sheep operation. A loss of the entire parcel would disrupt the operation, forcing the owner to find other grazing land or discontinue the operation. The land use within a five-mile radius of the Long Hollow site is displayed on a detailed map in Appendix I, Information on Populations, Socioeconomics, and Land Use, page I-29, of the DEIS. The use of land at, and in the vicinity of, the proposed Long Hollow site for grazing is also presented in the text in Appendix I, page I-27, of the DEIS.

Section 5.8 in the FEIS has been revised to more clearly state the impact to sheep ranching in the area.

6. Comment

The EIS should address the impacts to utilities for all of the alternatives. (493)

Response

None of the alternatives are expected to place demands on utilities which cannot be met with existing facilities. This is expressed in Section 5.15. Although utility installations exist on or near both the Bodo Canyon and the Long Hollow disposal sites, remedial action would not affect these installations.

7. Comment

Commenters requested that DOE initiate consultation with the U.S. Department of Interior and/or the Southern Ute Indian Tribe concerning the impacts of Alternatives 4 and 5 because the Long Hollow site, although privately owned, is within the exterior boundary of the Southern Ute Indian Reservation. (473, 489, 522)

Response

The Long Hollow site is on the northern edge of the Southern Ute Indian Tribe Reservation boundary although the surface of the land is privately owned. Currently, Alternative 3, relocation to Bodo Canyon, is the preferred alternative. Implementation of this alternative would have little impact on the Southern Ute Reservation. If either Alternative 4 or 5 were selected, additional consultation with the Department of Interior would be undertaken.

6.14 MINERAL RESOURCES

Five mineral resource issues were evident in comments from the Colorado Department of Health, a local citizens group (CCAMP), the Durango Task Force, and the U.S. Department of Interior. The issues are stated below along with responses.

1. Comment

The EIS should state that future recovery of uranium would be much less expensive under Alternative 4 than under Alternatives 1, 2, or 3. (493)

Response

Agreed.

2. Comment

Another commenter said that if recovering the remaining uranium and vanadium values is so important, why have no mineral development companies shown an interest in the reprocessing concept. (515)

Response

Alternative 5, reprocessing of the tailings at Long Hollow, was included in the DEIS as the preferred alternative because of the estimated content of vanadium and uranium in the tailings and because the former owners (Ranchers Exploration and Development Corporation) had planned at one time to reprocess the tailings to recover the mineral values. The current owner, Hecla Mining Company, has indicated that reprocessing is not feasible at this time. To date, only one other firm has expressed a limited interest and, thus, relocation to Bodo Canyon is now the preferred alternative in this FEIS.

3. Comment

Sand and gravel deposits are available on private land across County Road 141 from Long Hollow. (493)

Response

The DOE is aware of commercial sand and gravel deposits which are presently west of the Long Hollow site.

4. Comment

What is the impact on the loss of mineral values, such as the coal underlying the Bodo Canyon site? (534) It is stated that the Bodo Canyon site is underlain by as much as 400,000 tons of potentially recoverable coal. Provide information concerning ownership of mineral rights at the site. (554) Alternative 3 will cause a loss of mineral resources to the Colorado Division of Wildlife. (493)

Response

These issues are discussed in Section 5.5 of the EIS.

5. Comment

DOE should describe how remedial action would affect the recovery of the mineral resources remaining in the smelter slag at the Durango site. (489, 493)

Response

Remedial action is likely to have little affect upon the possible recovery of minerals from the smelter slag. The slag remaining at the Durango site is the result of gold, silver, and lead smelting which occurred prior to the milling of uranium ore. High temperatures of the smelting processes fused the silica contained in the ores with the residual metals. Crushing and resmelting the slag would be a costly proposition in which no commercial venture has expressed interest. However, if Alternative 3, 4, or 5 is implemented, recovery of mineral resources will be decided upon by the current owner, Hecla Mining Company.

6. Comment

Section E.2.2, Appendix E, Soils, Geologic, and Seismic Information, discusses the mineral resources near the Durango, Bodo Canyon, and Long Hollow sites, but does not provide maps showing the locations of the coal mines near the Bodo Canyon site or other mineral sources. (554)

Response

Inactive, abandoned mines are present within the vicinity of the Bodo Canyon and Long Hollow sites. The nearest active coal mines are several miles distant.

7. Comment

One commenter suggested that radium and other radioactive elements could be recovered (as well as uranium) during processing. The radioactive materials could be stockpiled until the market price for the materials improves. (419)

Response

The future market for radium and other radioactive elements is highly speculative and is not significant enough to affect the remedial action decision. If a decision is made to reprocess the tailings, additional consideration would be given to by-product mineral recovery during preparation of the final design.

8. Comment

In view of the present uranium prices, reprocessing could be delayed for a period of at least 10 years until the price of uranium improves. (426)

Response

The DOE has been given a congressional mandate to complete the remedial action by March, 1990. Delaying the cleanup would not only fail to meet the requirements of UMTRCA; and there is no assurance that the price would improve sufficiently to warrant selection of the reprocessing alternative.

9. Comment

What effect would Alternatives 4 and 5 have on oil and gas potential at the Long Hollow site? (489)

Response

Oil and gas potential at the Long Hollow site is considered to be low to moderate, although developing a well would have a high risk (Meibos, 1985). Moving the tailings to Long Hollow would further reduce the probability of oil and gas development because of the high cost of angle drilling to recover reserves possibly beneath the site. Section 5.5 of the FEIS has been revised to clarify this point.

6.15 AIR QUALITY AND NOISE

Comments from the Colorado Department of Health, a local citizens group, and seven individuals related to air quality, meteorology, and noise. The majority of the comments focused on the dust which would be released during the remedial action. Summaries of the comments and DOE's responses are given below.

1. Comment

The DEIS does not adequately consider wind velocities (particularly at Long Hollow) and potential windblown dust. (510, 511, 537)

Response

The DEIS presents wind data for Durango and Bodo Canyon for the period February, 1982, through January, 1983. No meteorological data were collected at Long Hollow (see Comment and Response #4). As stated in the DEIS, wind direction in Long Hollow is probably more southwesterly than in Bodo Canyon due to the difference in orientation of each valley. Wind speeds in Long Hollow would be expected to be slightly higher than in Bodo Canyon because Long Hollow is flatter with less relief, and also has less vegetation which would tend to reduce wind speed.

Windblown dust or fugitive dust will occur; however, there are effective mitigation measures which would be implemented (e.g., application of water and/or chemical surfactants). Since the comment does not indicate what is lacking in the consideration of wind and dust, it is difficult to address the comment. TSP levels were predicted for Long Hollow, as for the other sites, by means of the Valley model.

2. Comment

Use of the existing Bodo Canyon Road (County Road 211) would create air quality problems. (535)

Response

Agreed. Estimates of maximum emissions and mitigation measures are discussed in Sections 5.3 and 5.21.2, respectively.

3. Comment

Due to inaccessibility of the Long Hollow site, the following data have been assumed to be the same as at the Bodo Canyon site, eight miles away: wind speed and direction, air stability, water quality, probable maximum precipitation, existing radionuclides, and total suspended particulates. This information must be provided in the FEIS based on "site-specific data" for the Long Hollow site. (515, 454).

Response

The owner of the Long Hollow site denied access to his property during the period. Consequently, there are little requested data which are available. Data collected at the Bodo Canyon site are not "assumed to be the same" as would have been measured at the Long Hollow site. Rather, it is reasonable to assume, in the absence of site-specific data, that, due to the short distance separating Long Hollow and Bodo Canyon, and due to the the topographical and surface similarities, no significant differences would be observed between measurements of the same parameter at each site. Significance relates, in this case, not to the statistical determination, but rather to the size of a difference that would influence the site selection process. Since there have been no hypotheses established ahead of time (e.g., does wind speed exceed X mph more than ten percent of the time?) as criteria by which to eliminate or favor sites, the lack of site- specific ambient environmental data for Long Hollow does not mean that reasonable conclusions cannot be drawn by examining proximal or regional data. Thus, the DOE believes that the information provided in this EIS is more than adequate to estimate impacts and provide for comparison among alternatives.

4. Comment

The dust emission estimates should include emissions generated by drying and crushing of tailings prior to reprocessing. (454)

Response

It is anticipated that drying of the tailings, should it prove to be required occasionally, would be largely accomplished during the loading, hauling, and unloading activities which would occur prior to reprocessing. Emissions from these activities were accounted for in the current emissions inventory. In the event that high moisture content necessitates a separate drying step prior to reprocessing, fugitive emissions would be minimal, especially since the entire tailings pile would not require special drying. Those portions of the pile which must be dried would be damp initially and little or no dust would be generated. The drying process would continue until the required moisture content is reached and the tailings would then be fed into the reprocessing system.

Due to the physical nature of the tailings, crushing would not be required. The tailings are a finely-grained sand-like material which is quite uniform in size. Throughout the existing pile it is likely that there are areas where agglomeration has occurred due to compaction over time. Such agglomeration would be broken up during the normal earthmoving, loading, hauling, and dumping activities. The mixing process would further reduce any large particles. While a portable crusher or screen may be required infrequently, there would be no routine crushing operation which requires consideration as a separate major source of fugitive dust.

5. Comment

Fugitive dust emissions during the remedial actions could be further reduced by adopting dust control measures such as: (1) speed controls for trucks on unpaved roads; (2) hydromulching material piles; (3) use of synthetic covers until revegetation is complete; and 4) covering trucks that will haul uncontaminated materials. (493)

Response

The above suggestions are all possible additional methods of increasing the effectiveness of mitigation measures (see Section D.2.14, Appendix D, Meteorological and Air-Quality Information, of the DEIS) for control of fugitive particulates. Each method will be evaluated by the state prior to issuance of an Air Pollutant Emissions Notice to the remedial action contractor.

6. Comment

Were the particulate releases from the hauling of cover materials and maintenance of on-site roads included in the calculations of total particulate releases? (493)

Response

Yes. See Section D.2.7, Table D.17, and Table D.18 of the DEIS.

7. Comment

The air particulate emissions calculations should take into account the fact that County Road 141 is paved. (493)

Response

The emission calculations in Appendix D in the DEIS assumed that County Road 141 was unpaved in order to place an upper limit on the potential air impacts. Alternative 5 has subsequently been revised to eliminate tailings haulage on County Road 141 in favor of using a gravel surfaced haul road which would be constructed for the remedial action. The emissions in the Addendum to Appendix D in this FEIS assume that the haul road is unpaved.

8. Comment

The explanation of wind stability should be rewritten in language that would be easier for laymen to understand. (424, 425)

Response

Section 4.3.4 of this FEIS has been so revised.

9. Comment

Would there be an impact to air quality for Alternative 1 (No Action)? (493)

Response

Yes. Please refer to Section 5.3, Impacts on Air Quality Alternative 1 - no action and Tables D-8 and D-9, Appendix D, Meteorological and Air-Quality Information, of the DEIS.

10. Comment

The EIS should contain a more comprehensive discussion of site-specific noise sources and impacts, particularly transportation-related noise. (493)

Response

In the absence of recorded ambient sound levels for any of the disposal sites, little more can be said beyond stating the typical values for ambient sound levels as described in Section 4.10 of the DEIS. Estimates of noise levels emitted by trucks and construction equipment were obtained from a noise-prediction model. The expected increases in sound levels due to construction and transportation are clearly described in Section 5.9 of the DEIS. It should be noted that the model is conservative with respect to predicted sound levels, i.e., values used to discuss impacts are high rather than low. Consequently, the DOE believes the existing DEIS sections related to noise levels and impacts are adequate.

11. Comment

What noisy activities mentioned in Section 3.3.2 would be restricted to 7am to 7pm? (493)

Response

The noisy activities include loading tailings or rubble onto trucks or conveyors, truck hauling, conveyor operation, and heavy equipment operation at the tailings pile or disposal site.

6.16 SCENIC, HISTORIC, AND CULTURAL

Key issues identified in comments relating to scenic, historic, and cultural resources were: (1) requests for more information on archaeological sites, (2) preservation of the historic smelter stack, and (3) impacts to the proposed La Plata Canyon National Natural Landmark. Comments came from the State of Colorado, the U.S. Department of Interior, the League of Women Voters, the Durango Task Force, the Wildlife Society, and five individuals. The comment summaries and DOE responses are given below.

1. Comment

   Several commenters expressed concern for impacts to cultural resources. (424, 425, 475, 493, 515, 519, 549)

   o Comment a

     Further information should be included on the archaeological, historical or cultural sites and how they may be affected by the remedial action. (424, 425) What specific mitigation measures will be implemented with regard to affected cultural resources at Bodo Canyon? (549, 519, 515)

   o Response a

     The DOE has conducted several Class III archaeological surveys including the Durango site, the Bodo Canyon site, the Long Hollow site, and adjacent transportation corridors. Sections 4.11.3 and 5.10 describe the results of the archaeological studies.

     Vibration due to heavy truck traffic would probably cause structural damage to the brick smelter stack at the Durango site. Because this would create an unsafe working condition, the stack will be dismantled. Ground vibration would not affect the archaeological sites in the area because none of them are standing structures.

     Mitigation measures for impacts to archaeological features may include:

     o Modification to the final design to avoid some significant archaeological sites.

     o Excavation of some significant archaeological sites to recover the maximum amount of scientific data that is reasonably possible.

     o Detailed mapping of surface features and collection of artifacts.

     Although the complete cultural resource mitigation plan for Alternative 3 has not been finalized, Section 5.21.6 describes the basic elements of the plan. The mitigation plan will be finalized in consultation with the Colorado State Historic Preservation Officer.

o Comment b

The costs of the archaeological mitigation plans need to be identified. (493)

o Response b

The preliminary cost estimates for mitigation of cultural resources in Bodo Canyon, along County Roads 211 and 212, and the smelter stack range from $100,000 to $130,000.

o Comment c

Archaeological surveys of the borrow sites and along County Roads 211 and 141 should be performed as soon as possible. (493)

o Response c

In addition to the archaeological surveys described in the DEIS, a Class III archaeological survey was conducted in November, 1984, along part of County Road 211. DOE is proceeding with cultural resource studies which would accomplish archaeological surveys, testing, and data recovery, where needed, for all of the action alternatives. This course of action is being taken to ensure that the project will not experience delays. After the record of decision has been published, DOE will discontinue archaeological studies on the alternatives that are no longer being considered. Protection of cultural resources is being facilitated by a Programmatic Memorandum of Agreement between DOE, the Colorado State Historic Preservation Office, and the Advisory Council on Historic Preservation. Sections 4.11.3 and 5.10 of this FEIS have been updated to reflect the current status of archaeological investigations.

o Comment d

The cultural site at Long Hollow should be tested as soon as possible. (493)

o Response d

By selecting Alternative 3, disposal at Bodo Canyon, as the preferred alternative, the DOE believes that there is not an urgent need to conduct subsurface testing at the referenced archaeological site. The cultural resource site in question is so small that an archaeological testing and data recovery program could be completed at a later date without delay to the remedial action (in the event that the Long Hollow site were selected for tailings disposal).

o Comment e

The State of Colorado stated that when the final alternative is chosen, the DOE must complete a determination of effect and develop a plan to avoid, minimize, or mitigate the adverse effects of any eligible cultural resource. (493)

o Response e

Agreed. The DOE has entered into a Programmatic Memorandum of Agreement (PMOA) with the Advisory Council on Historic Preservation and the Colorado State Historic Preservation Officer (SHPO) regarding the protection of cultural resources associated with the UMTRA Project in Colorado. The PMOA established procedures that the parties pledge to comply with in fulfilling the requirements of Section 106 of the National Historic Preservation Act of 1966.

o Comment f

Has a determination of eligibility for nomination to the National Register of Historic Places (NRHP) been made for cultural resources which would be affected? (489)

o Response f

The status of the eligibility determinations is given in Table 4.10 of this FEIS.

2. Comment

Two commenters stated that the smelter stack on the Durango site should be decontaminated and left intact. (489, 482) Another commenter requested that the preservation of the smelter stack be included in the cost estimate and presented in the EIS. (493)

Response

With tailings disposal at Bodo Canyon as the preferred alternative, the stack will have to be demolished for safety reasons and because of the difficulty in decontaminating the stack.

The cost estimate for decontaminating the stack is $100,000 and does not include the cost for stabilization of the stack. This cost is not part of the cost estimate as presented in the DEIS because it is assumed that the stack would be demolished. Concurrence on the decision to demolish the stack has been requested from the Colorado Historic Preservation Officer.

3. Comment

The EIS should be revised to indicate that the Colorado State Historic Preservation Officer (SHPO) has determined that the smelter stack is eligible for nomination to the National Register of Historic Places. (493)

Response

Agreed. See revised Sections 4.11.3 and 5.10 of this FEIS.

4. Comment

Several commenters suggested that the tailings pile be made into a historical monument because of its role in the production of early nuclear weapons. (159, 414, 421, 443)

Response

Although the tailings pile may have historical value, DOE's directive from Congress is to conduct remedial actions that will promote public health and safety in compliance with the EPA standards rather than to memorialize the past. However, DOE is not opposed to the establishment of a historical marker.

5. Comment

One commenter requested that DOE address the potential impacts of remedial action on the Animas River Valley, a potential National Natural Landmark which includes a section of the northwestern portion of the Durango site. (489)

Response

The Durango processing site is located on the south end of the 32,000-acre portion of the Animas River Valley which has been proposed for listing on the National Registry of National Landmarks. The Registry is a listing of nationally significant ecological and geological features in the United States. Section 4.11.2 has been revised to recognize the geologic and ecological values present in the Animas River Valley. As noted in Section 5.10 of the FEIS, remedial action at the processing site is not expected to diminish the scenic value of the proposed landmark which extends from Durango north to Silverton.

6.17 SOCIOECONOMICS

Loss of tourism, changes in income, tax revenue, and employment, and economic hardship of adjacent landowners were among the socioeconomic topics mentioned in the comments. Tourism impacts were the concern of 372 commenters, making it one of the issues of greatest public interest. The DOE's response to each socioeconomic issue is given below following each comment summary.

1. Comment

Many commenters requested that the FEIS include a discussion of the impacts of the remedial action on the tourist industry in Durango. The majority of these comments were submitted by means of form letters. (1 through 350, 392 through 406, 413, 448, 463, 482, 483, 513, 515, 516, 536, 550)

Response

Appendix N, Tourism Evaluation, of this FEIS presents the results of a study which evaluated the effects of the alternatives on the Durango tourism industry. Various sections of this FEIS have been modified to account for the new data. Tourist response to construction of any type is highly variable. Tourism impacts at Durango would hinge upon the level of attention that is given to the remedial action by the media and tourist perceptions of personal risk associated with the project.

2. Comment

The FEIS should include a statement on the psychological impacts to residents and visitors. (482, 493, 545)

Response

Psychological impacts from remedial action are extremely difficult to assess. As determined by the U.S. Supreme Court (U.S. Nuclear Regulatory Commission vs. People Against Nuclear Energy), evaluation of indirect psychological impacts is beyond the scope of NEPA, and thus, is not considered in this EIS.

3. Comment

Several inquiries were made as to the impacts to owners of disposal sites and adjacent lands.

o Comment a

The FEIS should evaluate and consider the impact on the livelihood, lifestyle, and quality of life on the nearby property owners. (453, 488, 493, 521, 535, 537, 543) o Response a

The grazing of livestock is the primary use of land by property owners in the vicinity of the proposed Bodo Canyon and Long Hollow sites. This land use and, thus, the livelihood and lifestyle of property owners in the vicinity of either proposed site would be affected to some extent during the remedial action. However, the remedial action is a relatively short-term activity and post-remedial action impacts would be minimal. Property owners whose land is directly affected by remedial action operations could have their livelihoods and lifestyles impacted, for example, by the need to change their grazing operations. The severity of such impacts would depend on the adaptability of these operations to changes brought by remedial action activity, as well as on the effectiveness of mitigation measures undertaken.

The quality of life of property owners near remedial action sites would be affected by dust, noise, and any changes in livelihood or lifestyle necessitated by the remedial action. Mitigation measures designed to minimize dust, noise, and changes in livelihoods and lifestyles of property owners near remedial action activity would reduce impacts on the quality of life of property owners.

o Comment b

Impacts to sheep ranching operations at Long Hollow have not been adequately addressed. Sheep ranching at Long Hollow would not be viable if Alternative 4 or 5 were selected. (488, 455)

o Response b

A stabilized tailings pile at the proposed Long Hollow site would not be expected to affect land use adjacent to the site. Thus, the grazing of sheep could continue on land currently used for that purpose, except for the estimated restricted land occupied by the tailings (80 acres under Alternative 4 and 195 acres under Alternative 5).

There would be some effects on operations adjacent to the tailings piles or along travel routes during the remedial action period. Sheep are timid animals, sensitive to noise and unfamiliar movements. Trucks on roads and construction activity at the proposed site would tend to drive sheep to the edges of grazing areas, away from activity and noise. The lack of proper grazing and anxiety caused by unfamiliar activity could lower weight gains and reproduction rates, according to information from California State Polytechnic University, Pomona (1985). A suggested mitigation measure designed to reduce noise and block activity from view, thereby reducing the negative impact to sheep operations, would be the construction of a fence that is high enough to block the sheeps' view of the activity and made of material that would reduce noise levels reaching grazing areas. The selection of such mitigation measures would be made during preparation of the final design and in concert with the affected landowner.

o Comment c

Owners of property that will be acquired by the state or Federal government as part of the remedial action should receive compensation at fair market value. (519)

o Response c

The State of Colorado obtains fair market value estimates from the U.S. Army Corps of Engineers. An offer is made to the property owner based on the valuation by the U.S. Army Corps of Engineers.

o Comment d

The existing day care center at the Long Hollow site would be disrupted if Alternative 4 or 5 were selected. (453)

o Response d

The DOE does not agree that the operations of the day care center located west of the proposed Long Hollow site would be disrupted. Construction noise, dust, and traffic, as well as fears of low level radiation exposure are recognized as concerns. However, traffic impacts would be minimal as a new road would be built parallel to County Road 141 which would carry remedial action truck traffic. Maximum annual concentrations of particulate matter are expected to settle at points south of the site, while most of the particulate matter settling in the direction of the day care center is expected to settle before reaching the center. Additional applications of a dust palliative could reduce dust settling in the direction of the day care center to a degree. Noise from the remedial action would have its greatest impact on the center during the first 10 months of construction under Alternative 4; noise levels under Alternative 5 would be lower than under Alternative 4, but would occur for a longer period.

o Comment e

The economic impact to land owners adjacent to the remedial action locations should be addressed and potential mitigation measures should be identified. (424, 425, 427, 447, 453, 454, 493, 521, 537)

o Response e

The land adjacent to both the Long Hollow and Bodo Canyon sites is used by private owners primarily for the grazing of livestock. This use would be unaffected by the presence of a stabilized tailings pile. Thus, little permanent impact would be expected on grazing activity. Temporary impacts to sheep operations adjacent to remedial action activity may occur due to the reaction of sheep to unfamiliar noise and activity. Mitigation measures which may serve to reduce temporary adverse impacts on sheep ranchers include the coordination of sheep movements to and from pastures with remedial action activities so as to lessen the stress on the animals and the construction of a fence which would both block the view of remedial action activity from the animals and lessen noise impacts.

Impacts on property values at the processing site and alternate sites were addressed in the EIS (Section 5.13). Studies and other research suggest that development and adjacent land values are not affected by unstabilized tailings piles. In Grand Junction, Colorado, residential and commercial developments have increased over the last 10 years on land adjacent to the tailings site; 50 to 60 housing units, several warehouses and commercial businesses, a sawmill, and a lumber yard were built according to Mr. Karl Metzner, Director of City Planning in Grand Junction (May 17, 1984). Thus, a stabilized tailings pile at either Bodo Canyon or Long Hollow would be expected to have little impact on land values of property near the pile or on residential or commercial development near the pile.

4. Comment

Do the employment figures include personnel involvement in remedial action at vicinity properties and in road construction and maintenance? (493)

Response

The impact of each remedial action alternative on the level of employment was estimated by using employment and income directly associated with the particular alternative (including road construction and maintenance work). The vicinity properties cleanup is a separate activity. The impacts of vicinity properties cleanup, considering a separate workforce, are described in Appendix B, Vicinity Property Remedial Actions, Durango Site, of the DEIS.

5. Comment

One commenter requested that the economic impacts be revised to reflect a commitment to maximize local expenditures, including requirements to pay state and local taxes. (493)

Response

In estimating economic impacts, it was assumed that all labor, materials, and equipment which could be obtained locally would be obtained locally. Impacts on property and income tax receipts were addressed for each alternative. Materials purchased for Federal projects are not subject to sales tax upon application for exemption by contractors. Thus, local and state sales taxes would be affected only indirectly through spending on taxable items by those employed as a result of the project. This indirect effect was regarded as minimal since impacts on income for each of the alternatives were small.

6. Comment

The socioeconomic impacts caused by the remedial action would be more significant than is indicated by the statement in Section 1.5; there would be "little impact on the economy or social infrastructure of Durango or La Plata County." (493)

Response

The DOE agrees that the impacts would be better described by using the term "moderate short term." Section 1.5 of this FEIS has been revised.

6.18 VICINITY PROPERTIES

Comments from the Durango Task Force, a local citizens group (CCAMP), and three Durango area residents referred to a number of aspects of vicinity property cleanup. Summaries of the comments and responses are stated below.

1. Comment

A general description of the problem of radon gas in society and at Durango vicinity properties should be provided. (519)

Response

The only member of the uranium-238 decay series that is not a solid is radon. Radon is an inert gas and does not react chemically with other elements; it therefore can diffuse out of matter and into the atmosphere. Atmospheric radon concentration is measured in units of picocuries per liter (pCi/l). In the uranium milling process, radium-226, the parent of radon, is left in the tailings, which then become a source from which radon diffuses into the atmosphere. Once in the atmosphere, radon is transported downwind and, according to its 3.8-day half-life, decays into the short-lived radon daughters which can attach to particulates in the air. Since radon is an inert gas, it is inhaled and exhaled, contributing very little radiation exposure to the lungs. The radon daughters are solids, however, and once inhaled can deposit in, or attach to, the lung and then decay, transmitting alpha energy in the lung. Because of the short half-life, these daughters will decay before being removed from the lung. Trace amounts of uranium-238 and its daughters are found everywhere on the earth; therefore, radon and its short-lived daughters contribute to the natural background radiation exposure of the general population.

Ever since the uranium mill tailings piles near Durango, Colorado, were formed, wind and water have transported small amounts of the tailings to lands adjacent to the Durango site. In addition, some of the tailings may have been used as fill and construction material at locations in and around Durango at a time when the potential health hazard of uranium mill tailings was unrecognized. Thus, elevated gamma-radiation levels and radon-daughter concentrations may occur at various locations off the Durango site. Those properties at which elevated radiation levels exceed EPA standards (40 CFR Part 192) because of the presence of uranium mill tailings are called "vicinity properties."

There have been several investigations at Durango to locate vicinity properties. In December, 1983, the DOE formally designated candidate properties for further research and possible cleanup. This designation list included 137 properties in Durango. Additional research on these properties (on-site surveys) will provide more detailed estimates of radiation levels and volumes of contaminated materials. It should be noted that additional properties may well be identified in the future as potential cleanup candidates in Durango. The tailings at the vicinity properties emit small amounts of radon gas and low-level alpha and gamma radiation. Radon gas is of particular concern because it can build up in enclosed structures until potentially hazardous levels are reached (40 CFR Part 192.12). The EPA's standards for cleanup of tailings (EPA, 1983) require cleanup of contamination only when the amount and location of the tailings causes an indoor radon daughter concentration of 0.02 to 0.04 WL. The standards provide criteria to assist in this determination. The EPA estimates that perhaps more than half of the identified locations of such contamination do not present a hazard sufficient to warrant cleanup. To eliminate radiation hazards at those properties where EPA standards are exceeded, the DOE is proposing to remove the residues through the cleanup activities.

The proposed actions for the vicinity properties are explained in Section B.1.3 of Appendix B, Vicinity Property Remedial Actions, (DEIS).

2. Comment

One commenter said that the vicinity properties must be treated in as much detail as the pile itself including how many properties might be involved, the extent and location of contamination, the current radon and gamma levels, the time required for individual vicinity property cleanup, and the like. (454) Another comment from a group of local citizens stated that the lack of detailed vicinity property information makes Appendix B unacceptable and that the DOE should issue a new Appendix B. (515) The Durango Task Force commented that the DEIS did not provide sufficient information for readers to understand the vicinity property program. (519)

Response

The DOE disagrees with the need to readdress all issues associated with vicinity properties and has elected not to revise and reissue Appendix B. For purposes of complying with NEPA, it is sufficient to estimate, conservatively, the volumes of material involved and major impacts associated with cleanup (e.g., health, transportation) for inclusion in the body of the EIS. This has been done with the DEIS.

Regarding the other comments, property-specific information concerning radon and gamma levels is available on some properties but not all at this time. This is because some properties have been identified by a mobile van scan which indicates only that a property has gamma values above a given background threshold. The mobile survey does not provide for refinement of these types of data.

Those properties that do have this information are listed along with the information in the UMTRA Project's Vicinity Properties Data Management System (VPDMS). A copy of the specific report which shows this radiological information is available at the Durango Planning Department for reference. This report along with others, is issued monthly by the DOE to participatory agencies and contractors. The properties are noted by number to protect the privacy of the property owners and tenants.

The time required for individual vicinity property cleanup is determined each year based upon the size and complexity of each property. The specific time required for individual vicinity property cleanups is between two and 60 weeks. The DOE will continue to provide updated information to the local Task Force.

- <u>Comment a</u>

  A group of Durango residents expressed concern that Appendix B (Vicinity Property Remedial Actions) is uncertain as to the number of vicinity properties in Durango. If the DOE can provide only vague, contradictory information, when may a coherent, well thought out plan for remedial actions be expected? (515)

- <u>Response a</u>

  At this point in time, the DOE has data on Durango vicinity properties based upon aerial surveys, mobile surveys and on-site surveys. New information is being developed every day. As this information is developed, the accuracy of the property estimates will be improved. The commenter is correct in assuming that at this point in time the total number of properties to be cleaned up in Durango is not known. The commenter is incorrect in assuming that a coherent, well though out plan is not available. The surveys are being used to continuously refine the estimate of the numbers of properties. Based on current information, and new information hopefully input by local citizens, the DOE will confirm total property estimates in Durango by the spring of 1986. Additional details are available in the Vicinity Properties Management and Implementation Manual (VPMIM) (DOE, 1984b) and Vicinity Properties Data Management System (VPDMS) computation printouts at the Durango Public Library.

- <u>Comment b</u>

  Three written comments stated that the discussion of vicinity property remedial actions should have been discussed in Volume I of the DEIS rather than being confined to Appendix B of Volume II. (454, 515) The major expenditure ($7.8 million) estimated for vicinity property cleanup makes it "completely inappropriate that the vicinity properties be relegated to a mere 16 pages buried in the appendices." (454) The Durango Task Force also stated that Appendix B is insufficient. (519)

- <u>Response b</u>

  The comments imply that treatment of vicinity properties in Appendix B in some way minimizes the importance of remedial action and the resulting impacts analysis; this is not true. The description of the range of cleanup activities was presented in full in the appendix and the resulting incremental impacts (i.e., in addition to those from remedial action at the site) were factored into the text where their inclusion was relatively substantial (e.g. transportation). However, it was recognized that the majority of the impacts are anticipated from remedial action at the mill site and that regardless of the action alternative selected, remedial action at vicinity properties and its associated impacts would remain unchanged. Thus, the justification of the approach described in Appendix B.

3. Comment

Four comments were received specifically relating to the vicinity property remedial action process.

o Comment a

The Durango Task Force and a local citizens group requested that the EIS include a detailed description of the steps involved with a vicinity property from the initial survey to the completed remedial action. (519, 515)

o Response a

The details of the vicinity property process are provided in the Vicinity Properties Management and Implementation Manual (VPMIM) and are not germane, per se, to the estimation of impacts from the various alternatives. This document has been provided to the Task Force for use by the community. In addition, public meetings to be held over the next two years will emphasize descriptions of this process.

o Comment b

The Durango Task Force also recommended that a Critical Path Method (CPM) schedule would be useful in planning vicinity property cleanup. (519)

o Response b

This is a good recommendation. Critical Path Method (CPM) schedules are currently being checked by the project participants to track progress on vicinity properties and to identify problems. The schedules are designed for groups of properties in bid packages and are traced through completion of the vicinity property cleanup process. The critical path activities in Durango currently are: (1) engineering reviews by the State of Colorado, and (2) Remedial Action Agreement approvals by individual property owners.

The Durango vicinity property effort is currently on schedule.

o <u>Comment c</u>

Another request of the Durango Task Force and a local citizens group was to identify all of the participants in the vicinity property program along with their specific responsibilities. (519, 515)

o <u>Response c</u>

The vicinity property process is implemented by six parties, each responsible for various activities. The implementing agencies are the DOE, NRC, and the State of Colorado. The Project's prime contractors are Oak Ridge National Laboratory, Morrison-Knudsen Company, and Jacobs Engineering Group Inc. A detailed description of the vicinity property process and of each one of these party's responsibilities was presented to the Durango Citizens' Task Force in August of 1984, and again in April, 1985. In July, 1985, brochures describing vicinity property cleanup were transmitted to the Task Force for distribution to the public.

To supplement this information, a brief summary of each agency's and contractor's responsibility on the project is presented below along with the identification of contacts within those organizations.

o <u>Comment d</u>

How does the DOE plan to implement consultation and coordination with local authorities and concerned citizens throughout the vicinity property cleanup? A group of Durango residents recommended that a Citizens Advisory Committee could facilitate the coordination. (515)

o <u>Response d</u>

A citizen's Task Force has been developed in Durango to help disseminate information regarding the project's plans and progress to the local Durango public and to act as a mechanism for local input. This Task Force has been in place since 1979. Last year (August, 1984) Project Office representatives met in a public meeting with the Task Force to discuss the vicinity properties process and to describe plans and schedules. This meeting was publicized and well attended. Since that time occasional meetings have been conducted with the Task Force to discuss progress and issues. Now that activity has stepped up on Durango vicinity properties, these meetings will be held more often. In addition, a number of other techniques for dissemination of information and for feedback are being considered for application in Durango. Recommendations in this regard are welcome.

Organization	Function	Contact
U.S. DOE	Responsible for management of all efforts to identify and clean up vicinity properties. Responsible for budget of 90 percent total cleanup cost.	Mr. Richard Sena, Uranium Mill Tailings Project Office 5301 Central Ave, NE Suite 1700 Albuquerque, NM 87108 (505) 844-3941
State of Colorado	Responsible for approving all remedial action plans and monitoring project activities. Also responsible for budget of 10 percent total cleanup cost.	Mr. Paul Ferraro Colorado Department of Health 4210 East 11th Ave. Denver, CO 80220 (303) 320-8333
U.S. NRC	Responsible for approving all remedial action plans.	Mr. Dan Martin, U.S. Nuclear Regulatory Commission Mail Station 623-55 Washington, D.C. 20555
Oak Ridge National Laboratory	Responsible for identification of all vicinity properties and "screening" radiological surveys.	Mr. Craig Little, Oak Ridge National Laboratory P.O. Box 2567 Grand Junction, CO 81501 (303) 242-8621
Morrison-Knudsen Co.	Responsible for remedial action design and property cleanup.	Mr. John Pepin Morrison-Knudsen Co. P.O. Box 9136 Albuquerque, NM 87119 (505) 766-3076
Jacobs Engineering Group Inc.	Responsible for management, planning, and monitoring of cleanup activities. Also responsible for public participation.	Mr. Philip Stassi Jacobs Engineering Group Inc. 5301 Central Ave., NE Albuquerque, NM 87108 (505) 846-4030

4. Comment

The Durango Task Force requested that the DOE publish a list of the historical radiation surveys that have been conducted in Durango, the level of efficiency that was achieved, and how their results were utilized. (519)

Response

In 1971, a mobile gamma scan of the Durango area was conducted for the EPA by Atomic Energy Commission personnel. This street-by-street scan of the city identified the location of 358 gamma radiation anomalies. All but 10 of these locations were subsequently investigated by the EPA during preliminary property surveys. These on-site surveys found evidence of, or the potential for, the presence of tailings at over 100 locations.

At the request of the DOE, in August, 1980, an aerial radiological survey of the Durango area was performed by EG&G, Inc. This survey highlighted numerous locations within the Durango area exhibiting above-background gamma-radiation levels. Ground-level investigation of these areas was recommended by EG&G to further define the locations of the anomalies and provide more detailed information on the source of the elevated activity.

As part of the second phase of DOE's activities in Durango, a mobile gamma scan of selected areas in and around the city was conducted by Oak Ridge National Laboratory (ORNL) during the period from November 2 to 6 and 18 to 20, 1981. The purpose of the scanning activity was to:

- o Provide the ground-level follow up surveying support for the aerial survey conducted by EG&G in 1980.
- o Provide cross correlation data between the scanning system and the results of the previous EPA scan to determine the validity of that historical data.
- o Conduct street-by-street scanning of those areas of town not previously scanned by EPA in 1971.

The product of this scanning survey was a listing of properties that required more detailed radiological characterization. This listing, provided in an internal report to DOE, classified the subject properties into three categories for future study. Within two of these categories, additional mobile scanning with a refined ORNL scanning system was recommended to obtain spectral information to help in determining the need for on-site investigations.

In response to that recommendation, ORNL was directed in March, 1982, to make measurements with the refined ORNL system of the gamma radiation fields associated with each of the properties identified from the earlier study, analyze the resulting spectral information, and provide a prioritized listing of the properties requiring future on-site surveys. The 1981 scan survey using the EPA gross count scanning system was limited to the anomalous areas identified by the EG&G aerial survey and those areas not surveyed previously by the EPA. The 1982 ORNL survey concentrated on those properties identified by previous surveys.

In order to eliminate the possibility that contaminated properties may have remained unidentified, a comprehensive street-by-street mobile scan survey of the remaining sections of Durango was conducted by ORNL during the period of October 24 to November 4, 1983. These surveys concluded the aerial and mobile van scan screening activity.

As a follow-up to the mobile van scans, on-site radiological surveys are now being conducted by ORNL to determine whether or not contamination on each identified property exceeds the EPA standards. These on-site surveys were started in June, 1982, and will be completed in 1986. Thus far over 100 on-site surveys have been completed. A summary of the past screening and inclusion surveys is provided below.

Survey type	Organization	Dates	Properties evaluated	Possible contaminated properties identified
Preliminary mobile van	EPA/AEC	1971	3,338	358
Follow-up mobile van	EPA	1972	362	118
Aerial	DOE/EG&G	1980	Regions	Regions
Follow-up mobile van	DOE/ORNL	1981	--	--
Follow-up mobile van	DOE/ORNL	1982	120	80
Final mobile van	DOE/ORNL	1983	--	--

The information from these surveys was summarized and presented in Appendix B, Vicinity Property Remedial Actions, of the DEIS.

5. Comment

The DOE's lists of included vicinity properties and designated vicinity properties were the subject of two comments.

o Comment a

The public should be told which vicinity properties were designated by the DOE for remedial action. (525, 538) o Response a

The designated list is public information. However, the DOE has a responsibility to the designated property owners to protect them against harassment and to honor their rights to privacy. For these reasons the DOE does not feel it is prudent to publish the list of designated properties.

The DOE has provided a list of designated properties to the state health department. It is hoped that the state will use this information to reduce the possibility of new construction taking place on designated properties before the DOE has an opportunity to perform cleanup activities. In addition, the Durango City Planning Department has received the designation list and receives updates of the list each month.

Requests for data on the status of specific properties should be addressed to Mr. G. Hoch, Durango City Planner (303) 247-5622, or Mr. Al Hazle, Colorado Department of Health, (303) 320-8333.

o Comment b

The DOE should re-evaluate its list of identified vicinity properties that will undergo remedial action. The commenter feels that since the Durango municipal swimming pool was not on the DOE list but should have been (as the result of an independent survey) that the DOE list may be incomplete. (538)

o Response b

The designation list is a summary of all properties for which data indicated possible contamination, at the time of the list's publication. Undoubtedly, additional properties will be discovered before remedial action work is completed in Durango. As referenced in the comment, the UMTRA Project Inclusion Survey Contractor has already identified an additional 48 properties in Durango with the modified van scan, which had not been identified at the time the designation list was published. DOE does not believe, however, that a significant number of additional undiscovered properties now exist in Durango. To verify this, the DOE intends to advertise in the local newspapers for information on any properties which may be contaminated. Based on the response to this advertisement, additional properties may be added to the current list.

6. Comment

Several questions inquired about the vicinity property remedial action implementation.

o <u>Comment a</u>

What procedures would be implemented to temporarily relocate individuals during vicinity property cleanup? (515)

o <u>Response a</u>

Temporary relocation of property owners during vicinity property remedial action is required in certain situations. Those situations are evaluated on a case-by-case basis.

If relocation is required, owners or tenants are moved to temporary accommodations and a specified per diem financial allowance is paid to them by the DOE. All reasonable relocation costs are borne by the DOE. However, relocation of owners or tenants is not encouraged due to the inconvenience it poses to the property occupants.

o <u>Comment b</u>

Appendix B (Vicinity Property Remedial Actions) does not provide enough detail about how DOE would handle an accidental spill of contaminated materials on city streets during vicinity property clean up. (515)

o <u>Response b</u>

The DOE's Remedial Action Contractor (RAC) maintains a specific health and safety plan consistent with the UMTRA Project's health and safety requirements. The RAC's plan provides for emergency response to accidental spills of tailings during vicinity property remedial action.

Basically, all contaminated material spilled from the truck would be returned to a transport vehicle using physical means (e.g., shovels, brooms). The material would be removed from the street and placed back in the truck. If the truck driver is injured, an emergency phone number would be provided for use by civilians or local police. Spilled material would be removed from the streets and placed in the tailings repository as quickly as possible.

o <u>Comment c</u>

The time required to clean up vicinity properties is another concern of the Durango citizens group (CCAMP). Why does Section B.1.3 present two different time estimates (one year versus two years) for the transport of vicinity property contaminated material to the Durango site? Is DOE planning to transport the contaminated materials directly to one of the alternate disposal sites? Such inconsistencies suggest that the DOE has very little idea as to how it will implement the vicinity property remedial action. (515)

o Response c

The DOE started cleaning up vicinity properties during September, 1985. Until such time as a disposal site is selected, and the appropriate receiving facilities can be developed, the DOE will move vicinity property material to a temporary storage site. All attempts had been made to secure the final disposal area prior to the beginning of vicinity property cleanup. However, since this has not been done to date, current plans are to move vicinity property material to a temporary storage site (currently the existing tailings pile). This material will eventually be moved to an alternate disposal site or stabilized on the site, depending upon the alternative selected in the Record of Decision (ROD).

o Comment d

Another concern of the Durango citizens group is interruption of services during vicinity property cleanup. (515)

Section B.4.2 (Appendix B, Vicinity Property Remedial Actions). "Impacts on Transportation Networks and on Accidents" states that "No interruption of public services is expected during the cleanup activities." However, Section B.4.3. "Impacts on Population, Land Use, and Economics," states that "some commercial establishments may have to be closed temporarily during remedial actions." Since Table B-1 includes La Plata County's "hospitals, schools, churches, hotels, and commercial properties," can one assume that there will be no significant disruption to public services? No information is presented as to how hospitals and schools will function during remedial action. (515)

o Response d

The commenter is correct in assuming that disruption of public services will be minimal. Arrangements would be made on individual vicinity properties to temporarily relocate property owners/tenants or to temporarily relocate businesses or services, if required. This arrangement will be evaluated on a case-by-case basis. There is always the possibility that certain properties will not be usable for the time required to clean up these properties. Of course, measures will be taken on a case-by-case basis to maintain critical public services during cleanup.

This statement referenced by the commenter in Section B.4.2, refers to only the transportation networks and not public services. There are no inconsistencies in the statements referenced.

o Comment e

According to Section B.1.3, DOE plans to bring contaminated vicinity properties into compliance with EPA standards. This implies that some level of contamination may be left in place which is allowed by the standards. The commenter believes that there is no safe level of radiation and that all traces of tailings should be removed from vicinity properties. (515)

o Response e

The EPA standards are based primarily on potential exposure and risk to individuals working and/or living in a structure built over material meeting the standards and are not within the scope of this EIS. This EIS serves to compare the various alternatives upon a common basis. It is not intended to justify the EPA standards. EPA prepared a Final EIS for Remedial Action Standards for Inactive Uranium Processing Sties (EPA 520/4-82-013-1, October, 1982), which it used in establishing standards.

In addition, field guidance currently being implemented during vicinity property remedial actions in Colorado requires:

- When excavating away from structures, all tailings in excess of the 5 pCi/gm above background for the top 15 cm of material, and in excess of 15 pCi/gm above background below the top 15 cm shall be removed since their removal may uncover larger hidden deposits. Averaging techniques over 100 square meters (15 cubic meters volume) should only be utilized when tailings removal would result in excessive costs.

- When working around or underneath structures and around underground utilities routed to structures, the aforementioned logic should also be applied. However, if there are contaminated materials which are measured not to exceed the EPA soil standards of 5 pCi/gm and 15 pCi/gm above background but exceed normal background, consideration should be given to removing these materials. This is recommended in certain situations in order to be assured that completed remedial actions performed underneath or around structures will meet the EPA indoor radon daughter concentration (RDC) standard.

7. Comment

If cleanup of 137 vicinity properties is estimated to cost $11,896,000 (Section B.4.3) what will cleanup of the 31 designated sites cost? (515)

Response

There are two levels of cost estimates for vicinity property remedial action. Until this year, the estimate used in the DEIS was all that was available. At this time, property-specific estimates are being developed on Durango vicinity properties. As these estimates are developed, they will be incorporated into the overall cost estimate. It is premature at this point to generate any cost estimates which are different from those published in the DEIS.

8. Comment

At a public meeting in Durango, a DOE contractor indicated that elevated radiation readings at Greenmont Cemetery are a natural anomaly. A commenter stated that evidence is available demonstrating that tailings are present in the cemetery contrary to what the DOE contractor stated. (515) What criteria will DOE use to identify contaminated vicinity properties? What proof does a resident have to provide to the DOE to qualify as a vicinity property? How does the DOE intend to guarantee that all contaminated properties in the community will be identified and addressed? (519)

Response

The DOE had information in January, 1985, to prove that contamination at the Greenmont Cemetery was due to residual radioactive materials (tailings). If any project participant implied anything contrary, it was in error. This information was derived from soil sample analyses which were conducted by the Inclusion Survey Contractor, ORNL, in July, of 1983. This contractor is responsible for determining whether or not each property being considered for remedial action exceeds the EPA standards.

The EPA standards were published in 40 CFR Part 192 and dictate acceptable levels for contamination due to remedial radioactive material from the processing sites (tailings). Since the inclusion survey on this property was completed in July, 1983, this information has been officially developed by this project and the property has been included in the UMTRA Project. The DOE apologizes for any confusion regarding this property.

The methods by which contamination is detected, and the verification of contamination and cleanup, have been fully described in response to comments 3a, 3c, and 4 of Section 6.18.

6.19 EDITORIAL COMMENTS

A number of comments pointed out typographical or editorial errors in the DEIS. Each of these comments has not been summarized with a separate response. However, the text of this FEIS has been revised as appropriate.

6.20 COMMENTS OUTSIDE THE SCOPE OF THE EIS

The CEQ regulations governing the preparation of environmental documents such as this FEIS state that "the NEPA process is intended to help public officials make decisions that are based on understanding of environmental consequences, and take actions that protect, restore, and enhance the environment." In the present instance there is the problem of what should be done about the Durango tailings. The decision to be made is to choose among the reasonable alternatives for remedial action. This FEIS is intended to provide the environmental input to that decision; however, it will not be the only input, there will also be policy and financial inputs.

A number of the comments made orally and in writing on the DEIS are not really relevant to the environmental inputs to that decision. In spite of their not really being relevant to the purpose of this FEIS, the DOE does recognize their existence in the subsections that follow, even though a number have been mentioned earlier. The DOE has responded to some of these out-of-scope comments.

6.20.1 Public participation and personal preferences

Public Participation

The issue of public participation was raised in many written statements and oral comments. Most of these comments were requests to extend the public comment period on the DEIS. The issues that were expressed are stated below along with the DOE's response.

1. Comment

   Written and oral statements from 372 individuals requested that DOE extend the comment period on the DEIS to enable the public more time to evaluate the various alternatives and provide comments to the DOE. Most of these comments were submitted by means of a form letter which stated, in part, "I urge that the DOE extend the comment period for an additional 120 days since both the public meeting and public hearing were held during the Christmas holiday season. In addition, the DOE must provide additional essential information within 30 days so that we can complete our evaluation of the alternatives you presented." (1-325, 327-350, 392-406, 420, 428, 446, 454, 460, 463, 481, 494-503, 562)

   Response

   The original comment period for the DEIS began on November 16, 1984, and closed January 11, 1985. In response to the requests, the official comment period was extended an additional 45 days through February 25, 1985. The DOE believes that the 45-day extension provided ample time for the public to evaluate the DEIS. Regulations require a public comment period of a minimum of 45 days, whereas the total comment period for this DEIS was 101 days.

Additional information has been provided by DOE in a public meeting held on December 18, 1985, and at open meetings of the Durango Uranium Mill Tailings Task Force on January 30, 1985, March 13, 1985, April 17, 1985, and June 5, 1985.

2. Comment

The DOE did not solicit separate input from the owner of the Long Hollow site during the preparation of the DEIS. (488)

Response

The DOE disagrees with the commenter's observation. The Long Hollow site has been visited many times by DOE and contractor personnel, the DOE and the owner of the Long Hollow site have an existing access agreement, the owner and DOE contractor personnel have had many telephone and face-to-face discussions and the owner, like any citizen, has had full opportunity to comment throughout the EIS process.

3. Comment

Several commenters expressed the idea that local decision making input should be considered past the DEIS stage in the form of a joint review process with the state. Before a preferred alternative is selected, the recommendations by DOE would be reviewed by the public in Durango and that public's recommendation would be included with the state process before the selection of a preferred alternative would occur. (538, 545, 483, 493, 555)

Response

After this FEIS is released, a 30-day review period is provided before the official Record of Decision is issued.

The DOE does recognize the desire of citizens of Durango's being apprised during development of the FEIS and intends to continue to meet with the Durango Task Force to address any concerns the community might have. The State of Colorado will review the FEIS at agreed upon stages in the document's development. Any recommendations the citizens of Durango may make to the state agencies involved are likely to weigh heavily in the state's review of the FEIS.

The Colorado Joint Review Process is designed for mining projects, energy projects, and ski resort development. The DOE and the state chose not to use the Joint Review Process, although a comparable review and decisionmaking process is in place with the UMTRA Project.

4. Comment

Public information and education should be continuously available to the residents and visitors of Durango during all phases of the remedial action program to ensure public understanding of the radiation hazard and to alleviate concern over the nature of the activities taking place. (536, 515, 582)

Response

Public information is an important element of the UMTRA Project. A Durango Task Force consisting of local officials and citizens was established early in the program, to act as a liaison between the community and the DOE. Regular meetings were held with the Task Force to provide updates on the project's progress, and learn of any community concerns there might be. These meetings have always been open to the media and the public.

The DOE anticipates continuing to meet regularly with the Task Force throughout the remedial action construction, and will also hold public meetings at the beginning and end of the construction season to keep the citizens of Durango apprised of cleanup activities. Radiation monitoring results will be available to the Task Force, and will also be available at the remedial action contractor's field office during remedial action construction.

5. Comment

The Durango Uranium Mill Tailings Task Force requested a meeting with DOE in Durango once the information which was not ready at the time of the draft publication is available. In addition, they requested permission to present a written statement representing the city of Durango's position to DOE and that such statement be considered when DOE makes a decision on a preferred alternative. **[(483)]**

Response

The DOE has already attended several meetings in 1985 and will schedule one or more additional meetings with the Durango Task Force to address as fully as possible any identified information needs. When the DOE receives the Task Force's written statement, those comments will be given consideration in the final decision.

Personal Preferences

Some letters and statements did not discuss any specific issues in the DEIS but expressed the authors' preference for one or another of the alternatives examined in that document. Even those letters and statements that did comment on specific issues usually also stated preferences. These preferences distribute themselves as shown in Table 6.1.

Table 6.1 Personal preferences expressed by commenters

Alternative	In favor	Total by alternative	Opposed	Total by Alternative
Alternative 1 No action	327, 366, 367, 380, 381, 412, 432, 433, 439, 440, 451, 452, 510, 511, 479, 528, 529, 552	18	485, 486, 481, 487	4
Alternative 2 Stabilization in place at the Durango site	325, 368, 369, 370, 371, 374, 375, 378, 379, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 518, 455, 409, 410, 411, 413, 421, 422, 423, 428, 429, 430, 431, 434, 435, 436, 437, 518, 438, 439, 440, 443, 441, 442, 444, 447, 448, 456, 458, 459, 460, 462, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 475, 504, 505, 513, 520, 521, 226, 533, 524, 548, 553, 559, 561	74	407, 419, 426, 485, 481, 487 560	7
Alternative 3 Relocation and stabilization at Bodo Canyon	376, 377, 493, 416, 417, 418, 439, 440, 447, 557, 558, 560	12	460, 456, 473, 475, 479, 487 518	7
Alternative 4 Relocation and stabilization at Long Hollow	492	1	372, 373, 378, 379, 413, 424, 425, 447, 453, 453, 460, 488, 486, 473, 475, 479, 481, 487, 492, 537, 521, 524, 527, 528, 535, 542, 543	25

Table 6.1 Personal preferences expressed by commenters (Concluded)

Alternative	In favor	Total by alternative	Opposed	Total by Alternative
Alternative 5 Relocation, reprocessing, and stabilization at Long Hollow	419, 426, 482, 492, 556	5	372, 373, 376 377, 378, 379, 413, 422, 423, 424, 425, 431, 437, 433, 438, 434, 440, 446, 447, 453, 460, 508, 509, 488, 486, 473, 475, 479, 481, 487, 524, 527, 528, 532, 535, 536, 537, 542, 543	39
Other options (not identified)			445, 461, 487	3

1. Comment

Twelve commenters stated that since one area is presently contaminated, there is no need to disrupt another area or impact more people. (451, 452, 504, 530, 543, 366, 367, 374, 375, 382, 383, 449, 450, 561)

2. Comment

A local citizens organization, CCAMP, presented the results of an opinion poll concerning the DOE plans for remedial action. The survey of 506 local residents indicated that 69 percent of those interviewed preferred the stabilization in place alternative. Issues that were considered to be most important to those surveyed were: (1) minimize the release of radioactive dust and gas, (2) avoid contaminating another site or watershed, and (3) minimize contamination of ground water. (515, 454)

3. Comment

A statement expressing the owner preferences of the Bodo Canyon, Long Hollow, and present tailing sites should be included in the FEIS and considered by the DOE before making their decision on the preferred alternative. (534)

Response

Owners of the sites under consideration (existing site, Bodo Canyon, Long Hollow) have had the opportunity to express their preferences as part of the EIS process. Their preferences have been noted, recorded, and considered in Section 6.0 of this FEIS.

6.20.2 Bias

Several comments claimed that the DEIS was biased against one alternative or was merely an attempt to justify the preferred alternative.

1. Comment

The alternatives presented in the EIS are biased against stabilization in place, primarily due to down playing the significance of dust from tailings haulage. (445)

2. Comment

The DOE was unduly biased against the Bodo Canyon site because of the wildlife present in the area. (488)

3. Comment

The DEIS lacks any real analysis and evaluation of all the facts presented and how they relate to and could affect existing area residents for each alternative. (455)

4. Comment

The DEIS seems to justify the preferred alternative rather than evaluate all impacts of all actions. (461)

5. Comment

"The DOE did not choose stabilization in place because, simply the DOE favors the company that owns the pile. Hecla Mining should have the opportunity to reprocess it. So said the DOE, I say, their profit at our expense." (325)

6. Comment

Alternatives 3, 4, or 5 would serve the interests of private developers who would want to develop the 136-acre Durango site. (515).

6.20.3 Other comments

Miscellaneous comments not otherwise categorized are summarized below.

1. Comment

DOE has stated that land for the Long Hollow alternative will be taken under eminent domain. Why cannot the current Durango site be taken under this same authority, immediately, so that DOE can begin to perform borings and identify exactly what is in the pile and where? (515)

Response

The comment apparently refers to a statement made by DOE officials regarding the acquisition of a disposal site for the Durango tailings. The comment does not recognize that there are two phases of acquisition, with the state responsible for the actual purchase or condemnation of the Durango mill site or disposal site and DOE responsible for access to the site prior to a remedial action decision. Under the Uranium Mill Tailings Radiation Control Act, the State of Colorado is primarily responsible for acquisition of a disposal site. If condemnation is required, the state will pursue legislative authority for such eminent domain authority. With respect to acquisition of the Durango mill site, there is no authority to condemn the site without prior agreement on the remedial action option by the DOE, the state, and the NRC. Prior to a remedial action decision, DOE is responsible for negotiating access to the tailings pile and candidate disposal sites for the purpose of data gathering in connection with the preparation of an environmental document and the conceptual design for remedial action. Access was negotiated for the Long Hollow site, the Bodo Canyon site, and the Durango site. Access could not be obtained for drilling on the pile because of disagreement with the owner regarding the extent of the liabilities to be assumed by DOE in connection with the drilling program and the current license conditions imposed by the Colorado Department of Health.

2. Comment

Three written comments raised the issue of the type of permits that would be required for the remedial action and the schedule for obtaining the permits. (490, 493, 519)

Response

DOE has researched, with other government agencies, the laws and regulations which would probably apply to remedial actions at Durango. A list of the permits and agencies has been developed for the FEIS and is presented in Appendix O, Permits, Licenses, and Approvals. The time required for preparation, processing, and approval of permit applications could take as long as eight months or possibly longer.

3. Comment

Future technology might allow for other more environmentally-safe means of moving the contaminated materials; and the economic benefits might be greater. What would be the real harm in saving expenditures of energy now and keeping entropy low until new and better techniques are developed? (482)

Response

The direction provided by Congress in the UMTRCA requires remedial action with completion by 1990. Another concern is that the tailings pile could shift unexpectedly causing need for an urgent, unplanned cleanup before "new technology" is developed. Intentional misuse of tailings is also conceivable for tailings that have not been permanently stabilized.

4. Comment

Because the authorization for UMTRCA officially ends in 1990, how will the extension of this law be guaranteed, allowing the project to be completed after 1990 if necessary? (515)

Response

The DOE will monitor the progress of remedial action and revise the estimated completion date periodically. If the projected completion date is after March 7, 1990, DOE will propose to Congress that the UMTRCA be extended and that the required funds be provided. DOE would take timely action to avoid halting the remedial action prior to completion due to the expiration of UMTRCA.

5. Comment

DOE does not have adequate experience in conducting remedial actions of uranium tailings for the public to show confidence in DOE's plans. (515)

Response

The DOE and its predecessor agencies (Energy Research and Development Administration and Atomic Energy Commission) have been the lead agencies in planning and conducting uranium mill tailings remedial actions since such work was first envisioned in 1972. DOE has facilitated remedial action for vicinity properties at Grand Junction, Colorado; Salt Lake City, Utah; and Canonsburg, Pennsylvania. Remedial actions at tailings piles are underway at Canonsburg, Salt Lake City, and Shiprock. Other contaminated sites have been cleaned up under the Formerly Utilized Sites Remedial Action Project (FUSRAP) and others. DOE is quite confident that remedial action will be achieved expediently, and in compliance with the standards.

6. Comment

One commenter stated that using the Long Hollow site for the disposal of the Durango tailings, could eventually lead to the expanded use of the site as a regional disposal site for other mill wastes which would become an annoyance to local residents. (477)

Response

The DOE does not anticipate that this would be a likely scenario due to the high cost of transporting tailings from the nearest active/inactive mill sites (all more than 60 miles distant).

7. Comment

One written comment stated the opinion that the main reason that DOE selected the Long Hollow site as the preferred alternative is because Ranchers Exploration had proposed to use Long Hollow for tailings reprocessing. However, DOE has not offered the Long Hollow landowner a land exchange proposal that is equivalent to the Ranchers offer. (488)

Response

The basis of selecting alternative disposal sites is discussed in Section 1.1 of the FEIS and Appendix C, Alternatives Considered But Rejected, of the DEIS. Acquisition of tailings disposal sites and alternate tailings disposal sites is outlined in the Cooperative Agreement between DOE and the State of Colorado. Briefly, that process involves the State of Colorado obtaining fair market appraisals of sites to be affected and the state acquiring the lands from the owners. The issue of matching previous offers related to former commercial projects is not relevant to the UMTRA Project remedial action proposed at Durango.

8. Comment

The piles have been stabilized and any type of action would disturb the established equilibrium and cause more health related problems and risks than are presently occurring. (451, 452, 455, 456)

Response

The tailings pile has been partially stabilized by establishing a thin, vegetative cover; however, this does not decrease the amount of radon emitted by the tailings. Remedial action must be performed as required by the Uranium Mill Tailings Radiation Control Act of 1978 (PL95-604) and radiation levels must be reduced to meet EPA standards for remedial action of these tailings piles. Health effects during and after remedial action are addressed in Section 5.1.

9. Comment

Several individuals said that money was being wasted on the project. Some presented the concern that tax dollars could be put to better use on other projects or that excessive costs warrant a decision for no action. (327, 412, 428, 429, 432, 433, 449, 450, 451, 452, 479, 561)

Response

DOE must perform remedial action in compliance with the EPA standards.

10. Comment

The NRC recommended that the smelter slag should be subjected to additional testing for characteristics of corrosivity and reactivity to determine whether it is a hazardous waste on those grounds. (490)

Response

Further testing of the slag was not deemed necessary for the following reasons: (1) the fused, glassy structure of the slag makes it relatively inert especially in its uncrushed condition; (2) many other smelter slags have been evaluated and found not to qualify as hazardous wastes.

11. Comment

Several commenters felt that one or another of the alternatives has greatest cancer risks, largest number of traffic deaths and accidents, least public support, and/or is the most expensive. (521, 553, 436, 438, 439, 440, 514, 177, 515, 518,)

12. Comment

The basis for selection of the remedial action should be a reduction in health effects rather than the least cost as was emphasized in the DEIS. (515)

13. Comment

The commenters feel that it is important to stress the health effects of whichever alternative is chosen. (512, 513, 530, 543)

14. Comment

Cost effectiveness of proposed remedial actions needs to be evaluated against the existing situation. The commenter questions effectiveness of spending between $16 to $58 million dollars to prevent 0.4 death in 100 years. (461)

15. Comment

The commenter believes it is possible to stabilize the tailings in place and would like to make a model of the site. (546)

16. Comment

There are increased hazards inherent in all the alternatives to move the tailings, including the possibilities of increasing the release of radon gases, radiological illnesses or deaths, occupational injuries, and transportation hazards. Considered cumulatively, are these hazards worth the disruption, public anxiety, and adverse economic effects of moving the piles? (482)

17. Comment

If the main reason for selecting Alternative 5 is to obtain an economic return, then the government should pay the owners of the pile, and allow the project to proceed in the least costly and most cost efficient manner. (515)

18. Comment

If a Probable Maximum Flood ever occurs at flow levels stated in the EIS, the least worry would be the tailings pile. Durango would be destroyed. (520)

6.21 LISTING OF HEARING COMMENTERS AND AUTHORS OF WRITTEN STATEMENTS

The names and affiliations of individuals who gave oral testimony at the public hearings or submitted written comments are listed in Tables 6.2 and 6.3. Table 6.2 lists commenters sequentially according to the index number that was assigned by the DOE. Table 6.3 is an alphabetical listing of commenters.

Table 6.2 Index of persons submitting written comments or who gave oral testimony at a public hearing

Index number	Name	Affiliation	Origin - letter (L) or hearing (H)
1	Laura Sholten	Citizen of La Plata County	L
2	Margaret Walsh	Citizen of La Plata County	L
3	Tierney Rupp	Citizen of La Plata County	L
4	Ralph E. Rupp, II	Citizen of La Plata County	L
5	Sarah Butler	Citizen of La Plata County	L
6	Pamela S. Goguen	Citizen of La Plata County	L
7	John M. Wells	Citizen of La Plata County	L
8	Miriam Barton	Citizen of La Plata County	L
9	Robert Gregorio	Citizen of La Plata County	L
10	Cassandia J. Austin	Citizen of La Plata County	L
11	Sondra Dierksen	Citizen of La Plata County	L
12	Jenny Chamberlin	Citizen of La Plata County	L
13	Lillian E. Peebles	Citizen of La Plata County	L
14	Berkeley C. Bryant	Citizen of La Plata County	L
15	Greg Metcalf	Citizen of La Plata County	L
16	Adele Presby	Citizen of La Plata County	L
17	Maggie Bowes	Citizen of La Plata County	L
18	Susan Dahl	Citizen of La Plata County	L
19	Stanley Cook	Citizen of La Plata County	L
20	Chris May	Citizen of La Plata County	L
21	Faye Lynn Harris	Citizen of La Plata County	L
22	Penny Biffar	Citizen of La Plata County	L
23	Joe Stockman	Citizen of La Plata County	L
24	Ted A. Tubbs	Citizen of La Plata County	L
25	Louise Y. Locke	Citizen of La Plata County	L
26	Gary P. Kavanagh	Citizen of La Plata County	L
27	Claudia J. Parker	Citizen of La Plata County	L
28	Carol A. Johnson	Citizen of La Plata County	L
29	Sandra M. Todeschi	Citizen of La Plata County	L
30	Gladys Todeschi	Citizen of La Plata County	L
31	Margaret Todeschi	Citizen of La Plata County	L
32	Anne E. Seaman	Citizen of La Plata County	L
33	Becky Padilla	Citizen of La Plata County	L
34	Martha Winters	Citizen of La Plata County	L
35	Arayce Gutierrez	Citizen of La Plata County	L
36	Patricia L. Russell	Citizen of La Plata County	L
37	C. J. Willis	Citizen of La Plata County	L
38	Marie Malarsie	Citizen of La Plata County	L
39	Patty Sinl	Citizen of La Plata County	L
40	Barb Edwards	Citizen of La Plata County	L
41	Joe Graves	Citizen of La Plata County	L
42	Judith Zelk	Citizen of La Plata County	L
43	Elisa B. Peterson	Citizen of La Plata County	L
44	Thomas V. Peterson	Citizen of La Plata County	L

Table 6.2 Index of persons submitting written comments or who gave oral testimony at a public hearing (Continued)

Index number	Name	Affiliation	Origin - letter (L) or hearing (H)
45	Carlan Maynes	Citizen of La Plata County	L
46	Mildred Maurer	Citizen of La Plata County	L
47	Jay Weisnel	Citizen of La Plata County	L
48	Kathryn A. Souder	Citizen of La Plata County	L
49	Kathleen Lau	Citizen of La Plata County	L
50	Sunny Hallower	Citizen of La Plata County	L
51	W. Michael Elliott	Citizen of La Plata County	L
52	Robert McDaniel	Citizen of La Plata County	L
53	Stephen P. Sproul	Citizen of La Plata County	L
54	Toni E. Duval	Citizen of La Plata County	L
55	William E. Locke	Citizen of La Plata County	L
56	Pete L. Gomez	Citizen of La Plata County	L
57	Linda Snider	Citizen of La Plata County	L
58	Clarissa Yanez-Thernley	Citizen of La Plata County	L
59	Carla Feijoo	Citizen of La Plata County	L
60	Gary Ader	Citizen of La Plata County	L
61	J. E. Winegardner	Citizen of La Plata County	L
62	Nancy Vohs	Citizen of La Plata County	L
63	Nancy Vermevlen	Citizen of La Plata County	L
64	Kristy Henning	Citizen of La Plata County	L
65	Karen Davey	Citizen of La Plata County	L
66	John Ridenour	Citizen of La Plata County	L
67	Debra Hammond	Citizen of La Plata County	L
68	Virginia Royce	Citizen of La Plata County	L
69	Margaret Poteet	Citizen of La Plata County	L
70	Mary E. Emrich	Citizen of La Plata County	L
71	Louis P. Rea	Citizen of La Plata County	L
72	Marilyn Snair	Citizen of La Plata County	L
73	Gabriela Torres	Citizen of La Plata County	L
74	Joyce Roseberry	Citizen of La Plata County	L
75	Roger Hillmeyer	Citizen of La Plata County	L
76	Marsha Pavlek	Citizen of La Plata County	L
77	Jerry Dalla	Citizen of La Plata County	L
78	Mel Caskey	Citizen of La Plata County	L
79	Vicki Caskey	Citizen of La Plata County	L
80	Dale McClanahan	Citizen of La Plata County	L
81	Lauris Reynolds	Citizen of La Plata County	L
82	Karen S. Howard	Citizen of La Plata County	L
83	Cliff Cox	Citizen of La Plata County	L
84	Chris Duran	Citizen of La Plata County	L
85	Richard L. Peterson	Citizen of La Plata County	L
86	Arthur L. Peterson	Citizen of La Plata County	L
87	Becky L. Rockford	Citizen of La Plata County	L
88	David L. Rice	Citizen of La Plata County	L
89	Dan Hylant	Citizen of La Plata County	L

Table 6.2 Index of persons submitting written comments or who gave oral testimony at a public hearing (Continued)

Index number	Name	Affiliation	Origin - letter (L) or hearing (H)
90	Teresa Rogers	Citizen of La Plata County	L
91	Dana C. Helvey	Citizen of La Plata County	L
92	Earl McMahel	Citizen of La Plata County	L
93	Miriam McMahel	Citizen of La Plata County	L
94	Lida P. Bowen	Citizen of La Plata County	L
95	Jill E. Engmark	Citizen of La Plata County	L
96	Jill C. Gaffney	Citizen of La Plata County	L
97	Sally M. Hall	Citizen of La Plata County	L
98	Marie Mestas	Citizen of La Plata County	L
99	Paula J. Brooks	Citizen of La Plata County	L
100	Kathy Larricq	Citizen of La Plata County	L
101	Sharee Erickson	Citizen of La Plata County	L
102	Genevieve T. Rankin	Citizen of La Plata County	L
103	Joy L. Martinez	Citizen of La Plata County	L
104	Sherry Sanford	Citizen of La Plata County	L
105	Pete C. Maisel	Citizen of La Plata County	L
106	Bob Luse	Citizen of La Plata County	L
107	Ryker Smith	Citizen of La Plata County	L
108	Ralph T. Correll	Citizen of La Plata County	L
109	Rose M. Havel	Citizen of La Plata County	L
110	David Loucks	Citizen of La Plata County	L
111	Nikki Anderson	Citizen of La Plata County	L
112	Kay M. Niggli	Citizen of La Plata County	L
113	David M. Turner	Citizen of La Plata County	L
114	Gloria Resnick	Citizen of La Plata County	L
115	Joan F. Cullen	Citizen of La Plata County	L
116	Steve Osborne	Citizen of La Plata County	L
117	Beth Silbergleit	Citizen of La Plata County	L
118	Beverly Conner	Citizen of La Plata County	L
119	Linda J. Hansen	Citizen of La Plata County	L
120	M.T. Smylie	Citizen of La Plata County	L
121	John E. Ogier	Citizen of La Plata County	L
122	Rick Dekdebrun	Citizen of La Plata County	L
123	Carol Martin-Hatch	Citizen of La Plata County	L
124	Ronald E. Gaddie	Citizen of La Plata County	L
125	John B. Houge	Citizen of La Plata County	L
126	Colette Bossow	Citizen of La Plata County	L
127	Jean Tipotsch	Citizen of La Plata County	L
128	H. Jackson Clark, II	Citizen of La Plata County	L
129	Betty Hibbard	Citizen of La Plata County	L
130	Rose M. Clark	Citizen of La Plata County	L
131	Rhonda Sumrall	Citizen of La Plata County	L
132	Eldon T. McCoy	Citizen of La Plata County	L
133	Anna McCoy	Citizen of La Plata County	L
134	Aimy Dickson	Citizen of La Plata County	L

Table 6.2 Index of persons submitting written comments or who gave oral testimony at a public hearing (Continued)

Index number	Name	Affiliation	Origin - letter (L) or hearing (H)
135	Laura Rickard	Citizen of La Plata County	L
136	Skip Zeller	Citizen of La Plata County	L
137	Penne McDonald	Citizen of La Plata County	L
138	Kerry Drulis	Citizen of La Plata County	L
139	Herman L. Todeschi	Citizen of La Plata County	L
140	Louise M. Jaquez	Citizen of La Plata County	L
141	Shirley Osborne	Citizen of La Plata County	L
142	Christine Veba	Citizen of La Plata County	L
143	Henry King	Citizen of La Plata County	L
144	Charles F. Bishop	Citizen of La Plata County	L
145	Steve Carson	Citizen of La Plata County	L
146	Annette V. Carson	Citizen of La Plata County	L
147	Greg Burger	Citizen of La Plata County	L
148	Kelly Ray	Citizen of La Plata County	L
149	Blair Wiles	Citizen of La Plata County	L
150	Beth Cadwallader-Flory	Citizen of La Plata County	L
151	Cap Allen	Citizen of La Plata County	L
152	Walter J. Osterhoudt	Citizen of La Plata County	L
153	David L. Trantmann	Citizen of La Plata County	L
154	Ruth G. Mackay	Citizen of La Plata County	L
155	Sherman Rice	Citizen of La Plata County	L
156	Vikki LeClaire	Citizen of La Plata County	L
157	Oma Walls	Citizen of La Plata County	L
158	Mary C. Thompson	Citizen of La Plata County	L
159	Virginia L. Repert	Citizen of La Plata County	L
160	Dorothy H. Myers	Citizen of La Plata County	L
161	Rose M. Janes	Citizen of La Plata County	L
162	E. Joe Barni	Citizen of La Plata County	L
163	M.M. Carnes	Citizen of La Plata County	L
164	Mikala Moore	Citizen of La Plata County	L
165	Tilton W. Macy	Citizen of La Plata County	L
166	Ann Schwarz	Citizen of La Plata County	L
167	Grace Rice	Citizen of La Plata County	L
168	James and Emily Millard	Citizen of La Plata County	L
169	Deborah B. Brown	Citizen of La Plata County	L
170	Rebecca J. Bronson	Citizen of La Plata County	L
171	Zackary Zachary	Citizen of La Plata County	L
172	Anita Barnes	Citizen of La Plata County	L
173	Dylan Brown	Citizen of La Plata County	L
174	Carol Robertson	Citizen of La Plata County	L
175	Kim Cromwell	Citizen of La Plata County	L
176	Philip Taylor	Citizen of La Plata County	L
177	Donna H. Fleming	Citizen of La Plata County	L
178	Howard R. Arnold	Citizen of La Plata County	L
179	Beth A. Sherwood	Citizen of La Plata County	L

Table 6.2 Index of persons submitting written comments or who gave oral testimony at a public hearing (Continued)

Index number	Name	Affiliation	Origin - letter (L) or hearing (H)
180	William H. Sageser	Citizen of La Plata County	L
181	Marlene J. Baker	Citizen of La Plata County	L
182	Joan K. McNitt	Citizen of La Plata County	L
183	Jim R. Wannamaker	Citizen of La Plata County	L
184	Nancy Napheys	Citizen of La Plata County	L
185	Karen M. Lamb	Citizen of La Plata County	L
186	Peg Ochsenreiter	Citizen of La Plata County	L
187	James R. Sinton	Citizen of La Plata County	L
188	Tom S. Sinton	Citizen of La Plata County	L
189	Ruth E. Rosenberg	Citizen of La Plata County	L
190	John C. Miernyk	Citizen of La Plata County	L
191	Christine A. Bryant	Citizen of La Plata County	L
192	Christine A. Thompson	Citizen of La Plata County	L
193	Martin Pearson	Citizen of La Plata County	L
194	Lyndie Pearson	Citizen of La Plata County	L
195	Dawn L. Petersen	Citizen of La Plata County	L
196	Brett L. Wells	Citizen of La Plata County	L
197	Renee Parsons	Citizen of La Plata County	L
198	Vicki L. Kirkpatrick	Citizen of La Plata County	L
199	Richard W. Sidwell	Citizen of La Plata County	L
200	Leslie W. Bohn	Citizen of La Plata County	L
201	George Moore	Citizen of La Plata County	L
202	Randy Murphy	Citizen of La Plata County	L
203	E. Esther Williams	Citizen of La Plata County	L
204	Stephen Swisher	Citizen of La Plata County	L
205	Fred Mestas	Citizen of La Plata County	L
206	Richard Bonaventura	Citizen of La Plata County	L
207	Gail Greve Watts	Citizen of La Plata County	L
208	James K. Wothyns	Citizen of La Plata County	L
209	John Bresnahan	Citizen of La Plata County	L
210	Rick Lane	Citizen of La Plata County	L
211	Sharon Jaworsky	Citizen of La Plata County	L
212	Sharon Nelson	Citizen of La Plata County	L
213	Robert D. Jacobson	Citizen of La Plata County	L
214	Russell Monell	Citizen of La Plata County	L
215	Greg Stone	Citizen of La Plata County	L
216	Jane Keeler	Citizen of La Plata County	L
217	George Bird	Citizen of La Plata County	L
218	Daniel C. Guiet	Citizen of La Plata County	L
219	Robert V. Kling	Citizen of La Plata County	L
220	Mary Kostanski	Citizen of La Plata County	L
221	Wendy Bryant	Citizen of La Plata County	L
222	Maryellen Morrow	Citizen of La Plata County	L
223	Katherine A. Larson	Citizen of La Plata County	L
224	David P. Eppich	Citizen of La Plata County	L

Table 6.2 Index of persons submitting written comments or who gave oral testimony at a public hearing (Continued)

Index number	Name	Affiliation	Origin - letter (L) or hearing (H)
225	Beverly B. Capelin	Citizen of La Plata County	L
226	Edna Fiorini	Citizen of La Plata County	L
227	Jean Fiorini	Citizen of La Plata County	L
228	Raymond Fiorini	Citizen of La Plata County	L
229	Barrie Anne Bryant	Citizen of La Plata County	L
230	Sara O'Meara Chanbelan	Citizen of La Plata County	L
231	Edward R. Galston	Citizen of La Plata County	L
232	Ernst Baer	Citizen of La Plata County	L
233	Regan Kauer	Citizen of La Plata County	L
234	Matthew Bourgeois	Citizen of La Plata County	L
235	Kathryn Eppich	Citizen of La Plata County	L
236	Jacquie Davenport	Citizen of La Plata County	L
237	Thomas G. Maynard	Citizen of La Plata County	L
238	Kathleen Johnson	Citizen of La Plata County	L
239	Kathy Evans	Citizen of La Plata County	L
240	Rebecca E. Jenkins	Citizen of La Plata County	L
241	Lance K. Clay	Citizen of La Plata County	L
242	Stuart Cohen	Citizen of La Plata County	L
243	Jim Rockelmann	Citizen of La Plata County	L
244	Gary Kolman	Citizen of La Plata County	L
245	Cindy Farley	Citizen of La Plata County	L
246	Bonnie Pietropaulo	Citizen of La Plata County	L
247	Fred D. Robin	Citizen of La Plata County	L
248	Jennifer Sullivan Carney	Citizen of La Plata County	L
249	Robbyn Smith	Citizen of La Plata County	L
250	Carol Durrschmidt	Citizen of La Plata County	L
251	Mary Mickelson	Citizen of La Plata County	L
252	Kurt Conrad	Citizen of La Plata County	L
253	Scott D. Henning	Citizen of La Plata County	L
254	Clayton B. Vedder, Jr.	Citizen of La Plata County	L
255	Aaron Ray	Citizen of La Plata County	L
256	Andrea G. Maynard	Citizen of La Plata County	L
257	Linn Stump	Citizen of La Plata County	L
258	D. Brian Soignier	Citizen of La Plata County	L
259	Kathleen Shadell	Citizen of La Plata County	L
260	Jeanne Thompson	Citizen of La Plata County	L
261	Camille Sebestyen	Citizen of La Plata County	L
262	J.M. Schlageter	Citizen of La Plata County	L
263	Judie Vagneur	Citizen of La Plata County	L
264	Richard N. Sandlin	Citizen of La Plata County	L
265	Patricia Sandlin	Citizen of La Plata County	L
266	Karen P. Armstrong	Citizen of La Plata County	L
267	Thomas Grandin	Citizen of La Plata County	L
268	James M. Perkins	Citizen of La Plata County	L
269	Janet L.S. Gerhardt	Citizen of La Plata County	L

Table 6.2 Index of persons submitting written comments or who gave oral testimony at a public hearing (Continued)

Index number	Name	Affiliation	Origin - letter (L) or hearing (H)
270	Joan B. Taylor	Citizen of La Plata County	L
271	Sonya P. Guest	Citizen of La Plata County	L
272	Clifford E. Johns	Citizen of La Plata County	L
273	Kim Hofferber	Citizen of La Plata County	L
274	Brian J. Loveless	Citizen of La Plata County	L
275	Ron Shinn	Citizen of La Plata County	L
276	William F. Binger	Citizen of La Plata County	L
277	Alice Kirk	Citizen of La Plata County	L
278	Charles J. Larson	Citizen of La Plata County	L
279	Anna M. Price	Citizen of La Plata County	L
280	Roswitha McBroom	Citizen of La Plata County	L
281	Pam Bohn	Citizen of La Plata County	L
282	Teri Freyschlag	Citizen of La Plata County	L
283	Kathleen Fine	Citizen of La Plata County	L
284	Elizabeth L. Boles	Citizen of La Plata County	L
285	Jim Verce	Citizen of La Plata County	L
286	Brian Clark	Citizen of La Plata County	L
287	Margaret McSherry	Citizen of La Plata County	L
288	Joan Jaggers	Citizen of La Plata County	L
289	Lynn McKee	Citizen of La Plata County	L
290	Teresa M. Offutt	Citizen of La Plata County	L
291	Glenn Barhnouse	Citizen of La Plata County	L
292	Dudley Engle	Citizen of La Plata County	L
293	Karen Lee Binger	Citizen of La Plata County	L
294	Kristen L. Boyer	Citizen of La Plata County	L
295	Richard E. Winn, Jr.	Citizen of La Plata County	L
296	Robert Dexter	Citizen of La Plata County	L
297	Carla Whitney	Citizen of La Plata County	L
298	Mildred E. McCoy	Citizen of La Plata County	L
299	Angie Candelaria	Citizen of La Plata County	L
300	R.J. McMullen	Citizen of La Plata County	L
301	Esther Fritz	Citizen of La Plata County	L
302	Teesa Kutowy	Citizen of La Plata County	L
303	Chris Perryman	Citizen of La Plata County	L
304	Daniel B. Conway	Citizen of La Plata County	L
305	Phil L. Gonzales	Citizen of La Plata County	L
306	Linda H. Graves	Citizen of La Plata County	L
307	Ronald M. Nelen	Citizen of La Plata County	L
308	William R. Burdick	Citizen of La Plata County	L
309	Patricia Kuttler	Citizen of La Plata County	L
310	Thomas N. Hansen	Citizen of La Plata County	L
311	Stephen L. Gilsdorf	Citizen of La Plata County	L
312	Janet Leech	Citizen of La Plata County	L
313	Patti Reese	Citizen of La Plata County	L
314	Christine Tafoya	Citizen of La Plata County	L

Table 6.2 Index of persons submitting written comments or who gave oral testimony at a public hearing (Continued)

Index number	Name	Affiliation	Origin - letter (L) or hearing (H)
315	Jeffrey H. Vandiver	Citizen of La Plata County	L
316	Clay Earl Randolph	Citizen of La Plata County	L
317	Cecilia Jamison	Citizen of La Plata County	L
318	Paul Byington	Citizen of La Plata County	L
319	Mark Trail	Citizen of La Plata County	L
320	Jeanne Farmer	Citizen of La Plata County	L
321	Gary R. Farmer	Citizen of La Plata County	L
322	Harold E. Luzar, Jr.	Citizen of La Plata County	L
323	Cindy Gilliland Kent (aka Cindy A. Kent)	Citizen of La Plata County	L
324	Pamela Leigh	Citizen of La Plata County	L
325	Jane E. Leonard	Citizen of La Plata County	L
326	Robert G. Carney	Citizen of La Plata County	L
327	Frank J. Sinton	Citizen of La Plata County	L
328	Wendy Bryant	Citizen of La Plata County	L
329	Art E. Berg	Citizen of La Plata County	L
330	Joe Righter, Jr.	Citizen of La Plata County	L
331	Lori Kunder	Citizen of La Plata County	L
332	James Bruvold	Citizen of La Plata County	L
333	Nancy R. Heck	Citizen of La Plata County	L
334	Leslie Wheeler-Dobbs	Citizen of La Plata County	L
335	Mamie Rasmussen	Citizen of La Plata County	L
336	Jerald M. Bruck	Citizen of La Plata County	L
337	Martha Simpson	Citizen of La Plata County	L
338	Ruth M. Katzin	Citizen of La Plata County	L
339	Foy Cogburn	Citizen of La Plata County	L
340	Mrs. A. J. Mayer	Citizen of La Plata County	L
341	Michael Flickinger	Citizen of La Plata County	L
342	Cindy L. Conway	Citizen of La Plata County	L
343	Maria Holt	Citizen of La Plata County	L
344	Russell Barnes	Citizen of La Plata County	L
345	Patricia I. Berg	Citizen of La Plata County	L
346	Pam Peavey	Citizen of La Plata County	L
347	Kathy Kindle	Citizen of La Plata County	L
348	Elizabeth C. Strain	Citizen of La Plata County	L
349	Robert L. Andrews	Citizen of La Plata County	L
350	Daniel G. Officer	Citizen of La Plata County	L
351	Bill & Jennifer Springstead	Citizen of La Plata County	L
352	Ira O. Hartsock	Citizen of La Plata County	L
353	Patricia Hartsock	Citizen of La Plata County	L
354	Joyce Rosebury	Citizen of La Plata County	L
355	Ken Shivers	Citizen of La Plata County	L
356	Linda Shivers	Citizen of La Plata County	L
357	James D. Appel	Citizen of La Plata County	L

Table 6.2 Index of persons submitting written comments or who gave oral testimony at a public hearing (Continued)

Index number	Name	Affiliation	Origin - letter (L) or hearing (H)
358	Marjorie S. Appel	Citizen of La Plata County	L
359	Linda H. Hansen	Citizen of La Plata County	L
360	Bill Bray	Citizen of La Plata County	L
361	Lleta M. Bray	Citizen of La Plata County	L
362	L. C. Widder	Citizen of La Plata County	L
363	J. R. Widder	Citizen of La Plata County	L
364	Lucinda S. Chavez	Citizen of La Plata County	L
365	Freddie Chavez	Citizen of La Plata County	L
366	Walter Punke	Citizen of La Plata County	L
367	Charlotte Punke	Citizen of La Plata County	L
368	Joyce M. Capp	Citizen of La Plata County	L
369	Jeff Capp	Citizen of La Plata County	L
370	N. R. Mills	Citizen of La Plata County	L
371	Charlotte Mills	Citizen of La Plata County	L
372	Pamela Graves	Citizen of La Plata County	L
373	Claude Graves	Citizen of La Plata County	L
374	K. Gombart	Citizen of La Plata County	L
375	Edith Gombart	Citizen of La Plata County	L
376	Tina M. Ellis	Citizen of La Plata County	L
377	Robert W. Ellis	Citizen of La Plata County	L
378	Joe Byrket	Citizen of La Plata County	L
379	Deborah S. Byrket	Citizen of La Plata County	L
380	Ann Schwarz	Citizen of La Plata County	L
381	Andrew F. Schwarz	Citizen of La Plata County	L
382	Mr. Park	Citizen of La Plata County	L
383	Mrs. Park	Citizen of La Plata County	L
384	Whitley C. Scrivner	Citizen of La Plata County	L
385	Katherine B. Scrivner	Citizen of La Plata County	L
386	Vicki Fyfe	Citizen of La Plata County	L
387	Gary Fyfe	Citizen of La Plata County	L
388	Brian Clark	Citizen of La Plata County	L
389	Lois C. Bartig	Citizen of La Plata County	L
390	Marianne L. Williams	Citizen of La Plata County	L
391	Larry H. Williams	Citizen of La Plata County	L
392	Michael Gerber	Citizen of La Plata County	L
393	Linda Gerber	Citizen of La Plata County	L
394	John R. Rice	Citizen of La Plata County	L
395	Wendy K. Rice	Citizen of La Plata County	L
396	Roland Rustad	Citizen of La Plata County	L
397	Pat Rustad	Citizen of La Plata County	L
398	Shelly Petrucka	Citizen of La Plata County	L
399	John Petrucka	Citizen of La Plata County	L
400	Daniel W. Boone	Citizen of La Plata County	L
401	Kathryn V. Boone	Citizen of La Plata County	L
402	Rodynie D. Cook	Citizen of La Plata County	L

Table 6.2 Index of persons submitting written comments or who gave oral testimony at a public hearing (Continued)

Index number	Name	Affiliation	Origin - letter (L) or hearing (H)
403	Cynthia L. Ferguson	Citizen of La Plata County	L
404	Karen Tnys	Citizen of La Plata County	L
405	Jerry Shryker	Citizen of La Plata County	L
406	Tamara Brennan	Citizen of La Plata County	L
407	Jackson Tallmadge	Citizen of La Plata County	L
408	Kara Bertholf	Citizen of La Plata County	L
409	Joanna G. Joiner	Citizen of La Plata County	L
410	Halford W. Joiner	Citizen of La Plata County	L
411	Lisa S. Joiner	Citizen of La Plata County	L
412	Kenneth A. Beegles	Citizen of La Plata County	L
413	Michael B. Stuart	Citizen of La Plata County	L
414	Rene' Larricq	Citizen of La Plata County	L
415	Deborah Powell	Citizen of La Plata County	L
416	C. W. Mertz	Citizen of La Plata County	L
417	Lynn Berger	Citizen of La Plata County	L
418	Donald E. Berger	Citizen of La Plata County	L
419	Jesse Crawford	Citizen of La Plata County	L
420	Hortense Kelley	Citizen of La Plata County	L
421	Bill Boland	Citizen of La Plata County	L
422	Jack Graham	Citizen of La Plata County	L
423	Jean Graham	Citizen of La Plata County	L
424	Marlo W. Schulz	Citizen of La Plata County	L
425	R. Gail Schulz	Citizen of La Plata County	L
426	Charles R. Butler	Citizen of La Plata County	L
427	Edward E. Moses	Citizen of La Plata County	L
428	John R. Cooley	Citizen of La Plata County	L
429	Kathleen M. Cooley	Citizen of La Plata County	L
430	Caryl R. Helmin	Citizen of La Plata County	L
431	Susan Myers	Citizen of La Plata County	L
432	Becky Speelman	Citizen of La Plata County	L
433	Cathy Mueller	Citizen of La Plata County	L
434	Brian Woods	Citizen of La Plata County	L
435	Bobby Turner	Citizen of La Plata County	L
436	Matt Evans	Citizen of La Plata County	L
437	William M. Browne	Citizen of La Plata County	L
438	John Dunsmord	Citizen of La Plata County	L
439	Al Kleemeyer	Citizen of La Plata County	L
440	Debra Kleemeyer	Citizen of La Plata County	L
441	William Rutneld	Citizen of La Plata County	L
442	Marion L. Rutneld	Citizen of La Plata County	L
443	Bill Boland	Citizen of La Plata County	L
444	Leslie C. Brissette	Citizen of La Plata County	L
445	Robert Schwarz	Citizen of La Plata County	L
446	Donna M. Fleming	Citizen of La Plata County	L
447	Craig N. Larson	Citizen of La Plata County	L

Table 6.2 Index of persons submitting written comments or who gave oral testimony at a public hearing (Continued)

Index number	Name	Affiliation	Origin - letter (L) or hearing (H)
448	Daniel G. Officer	Citizen of La Plata County	L
449	Nicholas J. Heidy	Citizen of La Plata County	L
450	Helen R. Heidy	Citizen of La Plata County	L
451	Violet L. Gwaltney	Citizen of La Plata County	L
452	Steward Ranch	Citizen of La Plata County	L
453	Charles D. Semmler	Citizen of La Plata County	L
454	Paul Bent	Citizen of La Plata County	L
455	Georgiana Spencer	Citizen of La Plata County	L
456	Thomas Lepisto	Citizen of La Plata County	L
457	Wendy Bryant	Citizen of La Plata County	L
458	Jerry Carney	Citizen of La Plata County	L
459	Kara Bertholf	Citizen of La Plata County	L
460	Jane E. Leonard	Citizen of La Plata County	L
461	Cap Allen	Citizen of La Plata County	L
462	Cheryle Brandsma	Citizen of La Plata County	L
463	Timothy A. Buzzard	Citizen of La Plata County	L
464	Nanna Alford	Citizen of La Plata County	L
465	Ethel Dyer	Citizen of La Plata County	L
466	Velena Eggleston	Citizen of La Plata County	L
467	Ruth Parkinson	Citizen of La Plata County	L
468	Evelyn Bugg	Citizen of La Plata County	L
469	Wilma DeNier	Citizen of La Plata County	L
470	Martha Simpson	Citizen of La Plata County	L
471	Margaret Dunn	Citizen of La Plata County	L
472	S. V. Alford	Citizen of La Plata County	L
473	Robert Jefferson, Chris Baker	Southern Ute Indian Tribe	L
474	Sydney S. Macy	The Nature Conservancy	L
475	Richard W. Hoffman	Colorado Chapter of the Wildlife Society	L
476	Karen Preston	Ratter J. Landowners Association	L
477	Kirk M. Cunningham	Sierra Club	L
478	James B. Martin	Environmental Defense Fund	L
479	Mr. Laverne Gwaltney	La Plata County Farm Bureau	L
480	Thomas B. Cochran	Natural Resources Defense Council	L
481	Margaret Puls	Future	L
482	Peg Langworthy	League of Women Voters of Durango	L
483	Tim LaFrance	Durango Uranium Mill Tailings Task Force	L
484	Andrea G. Maynard	Citizens Concerned about Moving the Pile (CCAMP)	L

Table 6.2 Index of persons submitting written comments or who gave oral testimony at a public hearing (Continued)

Index number	Name	Affiliation	Origin - letter (L) or hearing (H)
485	Felix R. Miera	Environmental Improvement Division, State of New Mexico	L
486	R.T. Scott	La Plata County Commissioner	L
487	Lois Remple	Citizens for Safe Energy	L
488	James C. Anesi	Citizen of La Plata County	L
489	Bruce Blanchard	U.S. Department of Interior	L
490	Leo B. Higginbotham	U.S. Nuclear Regulatory Commission	L
491	James B. Martin	Environmental Defense Fund	L
492	Kerrigan G. Clough	U.S. Environmental Protection Agency	L
493	Tom Looby	Colorado Department of Health and other Colorado state agencies	L
494	Eleanor E. Gass	Citizen of La Plata County	L
495	Lawrence C. Gass	Citizen of La Plata County	L
496	Rebecca Griswold	Citizen of La Plata County	L
497	Rich Griswold	Citizen of La Plata County	L
498	David Porter	Citizen of La Plata County	L
499	Jeanne Porter	Citizen of La Plata County	L
500	William M. Browne	Citizen of La Plata County	L
501	Gladys L. Browne	Citizen of La Plata County	L
502	Barbara Garlick	Citizen of La Plata County	L
503	Bruce Garlick	Citizen of La Plata County	L
504	Jennifer Sullivan Carney	Citizen of La Plata County	L
505	Jerry Carney	Citizen of La Plata County	L
506	Tim Lahdekorpi	Citizen of La Plata County	L
507	James Bruvold	Citizen of La Plata County	L
508	Lewis McCool	Citizen of La Plata County	L
509	Susan McCool	Citizen of La Plata County	L
510	Amanda White	Citizen of La Plata County	L
511	Richard White	Citizen of La Plata County	L
512	John Ryan	Citizen of La Plata County	L
513	M. Lynne Womble-Kenney	Citizen of La Plata County	L
514	Ken Francis	State of Colorado, Department of Local Affairs	L
515	Andrea G. Maynard	Citizens Concerned about Moving the Pile (CCAMP)	L
516	James G. Erickson	Citizen of La Plata County	L
517	Debra McCaffery	Citizen of La Plata County	L
518	Tamara Wiggans	Citizen of La Plata County	L
519	Timothy La France	Durango Uranium Mill Tailings Task Force	L
520	Bruce Honisch	Citizen of La Plata County	L
521	Charles Semmler	Citizen of La Plata County	H

Table 6.2 Index of persons submitting written comments or who gave oral testimony at a public hearing (Concluded)

Index number	Name	Affiliation	Origin - letter (L) or hearing (H)
522	Robert Jefferson	Env Specialist for Southern Ute Indian Tribe	H
523	Randy Jernigan	Emergency Med Phys at Regional Training Center	H
524	Duane Taylor	Citizen of La Plata County	H
525	Robert Muhlheim	Citizen of La Plata County	H
526	Karen Preston	Rafter J. Landowners Association	H
527	Harry Edinger	Citizen of La Plata County	H
528	Ann Schwarz	Citizen of La Plata County	H
529	Gladys Browne	Citizen of La Plata County	H
530	Donna Fleming	Citizen of La Plata County	H
531	James Martin	Env Defense Fund Rocky Mtn. Regional Office	H
532	Roy Craig	Citizen of La Plata County	H
533	Tim La France	Southwest Colorado Bar Association	H
534	Harold Steinhoff	Durango UMTRA Task Force	H
535	James Anesi	Attorney for Gary Farmer	H
536	Judith Lent	Durango League of Women Voters	H
537	Bill Ehler	Citizen of La Plata County	H
538	Gregory Hoch	Citizen of La Plata County	H
539	Edward Moses	Citizen of La Plata County	H
540	Donald McDonald	Senator Gary Hart's Office	H
541	Richard Montoya	Citizen of La Plata County	H
542	Paul Bendt	Citizen of La Plata County	H
543	R.T. Scott	Citizen of La Plata County	H
544	Mark English	Citizen of La Plata County	H
545	Rick Lane	Citizen of La Plata County	H
546	Ernie Roberge	Citizen of La Plata County	H
547	Bob Hatfield	Citizen of La Plata County	H
548	Bob Haggerty	Citizen of La Plata County	H
549	Tim La France	Citizen of La Plata County	L
550	Rick Lane	Citizen of La Plata County	L
551	Wayne Sandfort	Colorado Wildlife Federation	L
552	Barbara Duncan	Citizen of La Plata County	L
553	Jim Zick	Citizen of La Plata County	L
554	Leo Higgenbotham	U.S. Nuclear Regulatory Commission (Denver Submission)	L
555	Andrea Maynard	Citizen of La Plata County	L
556	Albert Hazle	Colorado Department of Public Health	L
557	Karen Preston	Citizen of La Plata County	L
558	Howard Preston	Citizen of La Plata County	L
559	Christopher Meyer	Citizen of La Plata County	L
560	Christopher Ryan	Citizen of La Plata County	L
561	Ethel Purcell	Citizen of La Plata County	L
562	Paula Dahlke	Citizen of La Plata County	L

Table 6.3 Alphabetic listing of commenters

LAST NAME	FIRST NAME	INDEX NUMBER
ADER	GARY	060
ALFORD	NANNA	464
ALFORD	S. V.	472
ALLEN	CAP	151
ALLEN	CAP	461
ANDERSON	NIKKI	111
ANDREWS	ROBERT	349
ANESI	JAMES	488
ANESI	JAMES	535
APPEL	JAMES	357
APPEL	MARJORIE	358
ARMSTRONG	KAREN	266
ARNOLD	HOWARD	178
AUSTIN	CASSANDIA	010
BAER	ERNST	232
BAKER	MARLENE	181
BARANI	E. JOE	162
BARHNOUSE	GLENN	291
BARNES	ANITA	172
BARNES	RUSSELL	344
BARTIG	LOIS	389
BARTON	MIRIAM	008
BEEGLES	KENNETH	412
BENDT	PAUL	542
BENDT	PAUL	454
BERG	ART	329
BERG	PATRICIA	345
BERGER	DONALD	418
BERGER	LYNN	417
BERTHOLF	KARA	408
BERTHOLF	KARA	459
BIFFAR	PENNY	022
BINGER	KAREN	293
BINGER	WILLIAM	276
BIRD	GEORGE	217
BISHOP	CHARLES	144
BLANCHARD	BRUCE	489
BOHN	LESLIE	200
BOHN	PAM	281
BOLAND	BILL	421
BOLAND	BILL	443
BOLES	ELIZABETH	284
BONAVENTURA	RICHARD	206
BOONE	DANIEL	400
BOONE	KATHRYN	401
BOSSOW	COLETTE	126
BOURGEOIS	MATTHEW	234
BOWEN	LIDA	094
BOWES	MAGGIE	017
BOYER	KRISTEN	294
BRANDSMA	CHERYLE	462
BRAY	BILL	360
BRAY	LLETA	361
BRENNAN	TAMARA	406
BRESNAHAN	JOHN	209

Table 6.3 Alphabetic listing of commenters (Continued)

LAST NAME	FIRST NAME	INDEX NUMBER
BRISSETTE	LESLIE	444
BRONSON	REBECCA	170
BROOKS	PAULA	099
BROWN	DEBORAH	169
BROWN	DYLAN	173
BROWNE	GLADYS	501
BROWNE	GLADYS	529
BROWNE	WILLIAM	437
BROWNE	WILLIAM	500
BRUCK	JERALD	336
BRUVOLD	JAMES	332
BRUVOLD	JAMES	507
BRYANT	BARRIE	229
BRYANT	BERKELEY	014
BRYANT	CHRISTINE	191
BRYANT	WENDY	221
BRYANT	WENDY	328
BRYANT	WENDY	457
BUGG	EVELYN	468
BURDICK	WILLIAM	308
BURGER	GREG	147
BUTLER	CHARLES	426
BUTLER	SARAH	005
BUZZARD	TIMOTHY	463
BYINGTON	PAUL	318
BYRKET	DEBORAH	379
BYRKET	JOE	378
CADWALLADER-FLORY	BETH	150
CANDELARIA	ANGIE	299
CAPELIN	BEVERLY	225
CAPP	JEFF	369
CAPP	JOYCE	368
CARNES	M. M.	163
CARNEY	JENNIFER SULLIVAN	504
CARNEY	JERRY	458
CARNEY	JERRY	505
CARNEY	ROBERT	326
CARSON	ANNETTE	146
CARSON	STEVE	145
CASKEY	MEL	078
CASKEY	VICKI	079
CHAMBERLIN	JENNY	012
CHANBELAN	SARA O'MEARA	230
CHAVEZ	FREDDIE	365
CHAVEZ	LUCINDA	364
CLARK	BRIAN	286
CLARK	BRIAN	388
CLARK	H. JACKSON, II	128
CLARK	ROSE	130
CLAY	LANCE	241
CLOUGH	KERRIGAN	492
COCHRAN	THOMAS	480
COGBURN	FOY	339
COHEN	STUART	242
CONNER	BEVERLY	118

Table 6.3 Alphabetic listing of commenters (Continued)

LAST NAME	FIRST NAME	INDEX NUMBER
CONRAD	KURT	252
CONWAY	CINDY	342
CONWAY	DANIEL	304
COOK	RODYNIE	402
COOK	STANLEY	019
COOLEY	JOHN	428
COOLEY	KATHLEEN	429
CORRELL	RALPH	108
COX	CLIFF	083
CRAIG	ROY	532
CRAWFORD	JESSE	419
CROMWELL	KIM	175
CULLEN	JOAN	115
CUNNINGHAM	KIRK	477
DAHL	SUSAN	018
DAHLKE	PAULA	562
DALLA	JERRY	077
DAVENPORT	JACQUIE	236
DAVEY	KAREN	065
DE NIER	WILMA	469
DEKDEBRUN	RICK	122
DEXTER	ROBERT	296
DICKSON	AIMY	134
DIERKSEN	SONDRA	011
DRULIS	KERRY	138
DUNCAN	BARBARA	552
DUNN	MARGARET	471
DUNSMORD	JOHN	438
DURAN	CHRIS	084
DURRSCHMIDT	CAROL	250
DUVAL	TONI	054
DYER	ETHEL	465
EDINGER	HARRY	527
EDWARDS	BARB	040
EGGLESTON	VELENA	466
EHLER	BILL	537
ELLIOTT	W. MICHAEL	051
ELLIS	ROBERT	377
ELLIS	TINA	376
EMRICH	MARY	070
ENGLE	DUDLEY	292
ENGLISH	MARK	544
ENGMARK	JILL	095
EPPICH	DAVID	224
EPPICH	KATHRYN	235
ERICKSON	JAMES	516
ERICKSON	SHAREE	101
EVANS	KATHY	239
EVANS	MATT	436
FARLEY	CINDY	245
FARMER	GARY	321
FARMER	JEANNE	320
FEIJOO	CARLA	059
FERGUSON	CYNTHIA	403
FINE	KATHLEEN	283

Table 6.3 Alphabetic listing of commenters (Continued)

LAST NAME	FIRST NAME	INDEX NUMBER
FIORINI	EDNA	226
FIORINI	JEAN	227
FIORINI	RAYMOND	228
FLEMING	DONNA	177
FLEMING	DONNA	446
FLEMING	DONNA	530
FLICKINGER	MICHAEL	341
FRANCIS	KEN	514
FREYSCHLAG	TERI	282
FRITZ	ESTHER	301
FYFE	GARY	387
FYFE	VICKI	386
GADDIE	RONALD	124
GAFFNEY	JILL	096
GALSTON	EDWARD	231
GARLICK	BARBARA	502
GARLICK	BRUCE	503
GASS	ELEANOR	494
GASS	LAWRENCE	495
GERBER	LINDA	393
GERBER	MICHAEL	392
GERHARDT	JANET L. S.	269
GILSDORF	STEPHEN	311
GOGUEN	PAMELA	006
GOMBART	EDITH	375
GOMBART	K.	374
GOMEZ	PETE	056
GONZALES	PHIL	305
GRAHAM	JACK	422
GRAHAM	JEAN	423
GRANDIN	THOMAS	267
GRAVES	CLAUDE	373
GRAVES	JOE	041
GRAVES	LINDA	306
GRAVES	PAMELA	372
GREGORIO	ROBERT	009
GRISWOLD	REBECCA	496
GRISWOLD	RICH	497
GUEST	SONYA	271
GUIET	DANIEL	218
GUTIERREZ	ARAYCE	035
GWALTNEY	MR. LAVERNE	479
GWALTNEY	VIOLET	451
HAGGERTY	BOB	548
HALL	SALLY	097
HALLOWER	SUNNY	050
HAMMOND	DEBRA	067
HANSEN	LINDA	119
HANSEN	LINDA	359
HANSEN	THOMAS	310
HARRIS	FAYE	021
HARTSOCK	IRA	352
HARTSOCK	PATRICIA	353
HATFIELD	BOB	547
HAVEL	ROSE	109

Table 6.3 Alphabetic listing of commenters (Continued)

LAST NAME	FIRST NAME	INDEX NUMBER
HAZLE	ALBERT	556
HECK	NANCY	333
HEIDY	HELEN	450
HEIDY	NICHOLAS	449
HELMIN	CARYL	430
HELVEY	DANA	091
HENNING	KRISTY	064
HENNING	SCOTT	253
HIBBARD	BETTY	129
HIGGENBOTHAM	LEO	554
HIGGINBOTHAM	LEO	490
HILLMEYER	ROGER	075
HOCH	GREGORY	538
HOFFERBER	KIM	273
HOFFMAN	RICHARD	475
HOLT	MARIA	343
HONISCH	BRUCE	520
HOUGE	JOHN	125
HOWARD	KAREN	082
HYLANT	DAM	089
JACOBSON	ROBERT	213
JAGGERS	JOAN	288
JAMISON	CECILIA	317
JANES	ROSE	161
JAQUEZ	LOUISE	140
JAWORSKY	SHARON	211
JEFFERSON	ROBERT	522
JEFFERSON/BAKER	ROBERT/CHRIS	473
JENKINS	REBECCA	240
JERNIGAN	RANDY	523
JOHNS	CLIFFORD	272
JOHNSON	CAROL	028
JOHNSON	KATHLEEN	238
JOINER	HALFORD	410
JOINER	JOANNA	409
JOINER	LISA	411
KATZIN	RUTH	338
KAUER	REGAN	233
KAVANAGH	GARY	026
KEELER	JANE	216
KELLEY	HORTENSE	420
KENT	CINDY GILLILAND	323
KINDLE	KATHY	347
KING	HENRY	143
KIRK	ALICE	277
KIRKPATRICK	VICKI	198
KLEEMEYER	AL	439
KLEEMEYER	DEBRA	440
KLING	ROBERT	219
KOLMAN	GARY	244
KOSTANSKI	MARY	220
KUNDER	LORI	331
KUTOWY	TEESA	302
KUTTLER	PATRICIA	309
LA FRANCE	TIM	483

Table 6.3 Alphabetic listing of commenters (Continued)

LAST NAME	FIRST NAME	INDEX NUMBER
LA FRANCE	TIM	533
LA FRANCE	TIM	549
LA FRANCE	TIMOTHY	519
LAHDEKORPI	TIM	506
LAMB	KAREN	185
LANE	RICK	210
LANE	RICK	545
LANE	RICK	550
LANGWORTHY	PEG	482
LARRICQ	KATHY	100
LARRICQ	RENE'	414
LARSON	CHARLES	278
LARSON	CRAIG	447
LARSON	KATHERINE	223
LAU	KATHLEEN	049
LE CLAIRE	VIKKI	156
LEECH	JANET	312
LEIGH	PAMELA	324
LENT	JUDITH	536
LEONARD	JANE	325
LEONARD	JANE	460
LEPISTO	THOMAS	456
LOCKE	LOUISE	025
LOCKE	WILLIAM	055
LOOBY	TOM	493
LOUCKS	DAVID	110
LOVELESS	BRIAN	274
LUSE	BOB	106
LUZAR	HAROLD	322
MACKAY	RUTH	154
MACY	SYDNEY	474
MACY	TILTON	165
MAISEL	PETE	105
MALARSIE	MARIE	038
MARTIN	JAMES	478
MARTIN	JAMES	491
MARTIN	JAMES	531
MARTIN-HATCH	CAROL	123
MARTINEZ	JOY	103
MAURER	MILDRED	046
MAY	CHRIS	020
MAYER	MRS A. J.	340
MAYNARD	ANDREA	256
MAYNARD	ANDREA	484
MAYNARD	ANDREA	515
MAYNARD	ANDREA	555
MAYNARD	THOMAS	237
MAYNES	CARLAN	045
MC BROOM	ROSWITHA	280
MC CAFFERY	DEBRA	517
MC CLANAHAN	DALE	080
MC COOL	LEWIS	508
MC COOL	SUSAN	509
MC COY	ANNA	133
MC COY	ELDON	132

Table 6.3 Alphabetic listing of commenters (Continued)

LAST NAME	FIRST NAME	INDEX NUMBER
MC COY	MILDRED	298
MC DANIEL	ROBERT	052
MC DONALD	DONALD	540
MC DONALD	PENNE	137
MC KEE	LYNN	289
MC MAHEL	EARL	092
MC MAHEL	MIRIAM	093
MC MULLEN	R. J.	300
MC NITT	JOAN	182
MC SHERRY	MARGARET	287
MERTZ	C. W.	416
MESTAS	FRED	205
MESTAS	MARIE	098
METCALF	GREG	015
MEYER	CHRISTOPHER	559
MICKELSON	MARY	251
MIERA	FELIX	485
MIERNYK	JOHN	190
MILLARD	JAMES & EMILY	168
MILLS	CHARLOTTE	371
MILLS	N. R.	370
MONELL	RUSSELL	214
MONTOYA	RICHARD	541
MOORE	GEORGE	201
MOORE	MIKALA	164
MORROW	MARYELLEN	222
MOSES	EDWARD	427
MOSES	EDWARD	539
MUELLER	CATHY	433
MUHLHEIM	ROBERT	525
MURPHY	RANDY	202
MYERS	DOROTHY	160
MYERS	SUSAN	431
NAPHEYS	NANCY	184
NELEN	RONALD	307
NELSON	SHARON	212
NIGGLI	KAY	112
OCHSENREITER	PEG	186
OFFICER	DANIEL	350
OFFICER	DANIEL	448
OFFUTT	TERESA	290
OGIER	JOHN	121
OSBORNE	SHIRLEY	141
OSBORNE	STEVE	116
OSTERHOUDT	WALTER	152
PADILLA	BECKY	033
PARK	MR.	382
PARK	MRS.	383
PARKER	CLAUDIA	027
PARKINSON	RUTH	467
PARSONS	RENEE	197
PAVLEK	MARSHA	076
PEARSON	LYNDIE	194
PEARSON	MARTIN	193
PEAVEY	PAM	346

Table 6.3 Alphabetic listing of commenters (Continued)

LAST NAME	FIRST NAME	INDEX NUMBER
PEEBLES	LILLIAN	013
PERKINS	JAMES	268
PERRYMAN	CHRIS	303
PETERSEN	DAWN	195
PETERSON	ARTHUR	086
PETERSON	ELISA	043
PETERSON	RICHARD	085
PETERSON	THOMAS	044
PETRUCKA	JOHN	399
PETRUCKA	SHELLY	398
PIETROPAULO	BONNIE	246
PORTER	DAVID	498
PORTER	JEANNE	499
POTEET	MARGARET	069
POWELL	DEBORAH	415
PRESBY	ADELE	016
PRESTON	HOWARD	558
PRESTON	KAREN	476
PRESTON	KAREN	526
PRESTON	KAREN	557
PRICE	ANNA	279
PULS	MARGARET	481
PUNKE	CHARLOTTE	367
PUNKE	WALTER	366
PURCELL	ETHEL	561
RANCH	STEWARD	452
RANDOLPH	CLAY	316
RANKIN	GENEVIEVE	102
RASMUSSEN	MAMIE	335
RAY	AARON	255
RAY	KELLY	148
REA	LOUIS	071
REESE	PATTI	313
REMPLE	LOIS	487
REPERT	VIRGINIA	159
RESNICK	GLORIA	114
REYNOLDS	LAURIS	081
RICE	DAVID	088
RICE	GRACE	167
RICE	JOHN	394
RICE	SHERMAN	155
RICE	WENDY	395
RICKARD	LAURA	135
RIDENOUR	JOHN	066
RIGHTER	JOE, JR.	330
ROBERGE	ERNIE	546
ROBERTSON	CAROL	174
ROBIN	FRED	247
ROCKELMANN	JIM	243
ROCKFORD	BECKY	087
ROGERS	TERESA	090
ROSEBERRY	JOYCE	074
ROSEBURY	JOYCE	354
ROSENBERG	RUTH	189
ROYCE	VIRGINIA	068

Table 6.3 Alphabetic listing of commenters (Continued)

LAST NAME	FIRST NAME	INDEX NUMBER
RUPP	RALPH	004
RUPP	TIERNEY	003
RUSSELL	PATRICIA	036
RUSTAD	PAT	397
RUSTAD	ROLAND	396
RUTNELD	MARION	442
RUTNELD	WILLIAM	441
RYAN	CHRISTOPHER	560
RYAN	JOHN	512
SAGESER	WILLIAM	180
SANDFORT	WAYNE	551
SANDLIN	PATRICIA	265
SANDLIN	RICHARD	264
SANFORD	SHERRY	104
SCHLAGETER	J. M.	262
SCHULZ	MARLO	424
SCHULZ	R. GAIL	425
SCHWARZ	ANDREW	381
SCHWARZ	ANN	166
SCHWARZ	ANN	380
SCHWARZ	ANN	528
SCHWARZ	ROBERT	445
SCOTT	R. T.	486
SCOTT	R. T.	543
SCRIVNER	KATHERINE	385
SCRIVNER	WHITLEY	384
SEAMAN	ANNE	032
SEBESTYEN	CAMILLE	261
SEMMLER	CHARLES	453
SEMMLER	CHARLES	521
SHADELL	KATHLEEN	259
SHERWOOD	BETH	179
SHINN	RON	275
SHIVERS	KEN	355
SHIVERS	LINDA	356
SHOLTEN	LAURA	001
SHRYKER	JERRY	405
SIDWELL	RICHARD	199
SILBERGLEIT	BETH	117
SIMPSON	MARTHA	337
SIMPSON	MARTHA	470
SINL	PATTY	039
SINTON	FRANK	327
SINTON	JAMES	187
SINTON	TOM	188
SMITH	ROBBYN	249
SMITH	RYKER	107
SMYLIE	M. T.	120
SNAIR	MARILYN	072
SNIDER	LINDA	057
SOIGNIER	D. BRIAN	258
SOUDER	KATHRYN	048
SPEELMAN	BECKY	432
SPENCER	GEORGIANA	455
SPRINGSTEAD	BILL & JENNIFER	351

Table 6.3 Alphabetic listing of commenters (Continued)

LAST NAME	FIRST NAME	INDEX NUMBER
SPROUL	STEPHEN	053
STEINHOFF	HAROLD	534
STOCKMAN	JOE	023
STONE	GREG	215
STRAIN	ELIZABETH	348
STUART	MICHAEL	413
STUMP	LINN	257
SULLIVAN CARNEY	JENNIFER	248
SUMRALL	RHONDA	131
SWISHER	STEPHEN	204
TAFOYA	CHRISTINE	314
TALLMADGE	JACKSON	407
TAYLOR	DUANE	524
TAYLOR	JOAN	270
TAYLOR	PHILIP	176
THOMPSON	CHRISTINE	192
THOMPSON	JEANNE	260
THOMPSON	MARY	158
THYS	KAREN	404
TIPOTSCH	JEAN	127
TODESCHI	GLADYS	030
TODESCHI	HERMAN	139
TODESCHI	MARGARET	031
TODESCHI	SANDRA	029
TORRES	GABRIELA	073
TRAIL	MARK	319
TRANTMANN	DAVID	153
TUBBS	TED	024
TURNER	BOBBY	435
TURNER	DAVID	113
VAGNEUR	JUDIE	263
VANDIVER	JEFFREY	315
VEBA	CHRISTINE	142
VEDDER	CLAYTON, JR.	254
VERCE	JIM	285
VERMEVLEN	NANCY	063
VOHS	NANCY	062
WALLS	OMA	157
WALSH	MARGARET	002
WANNAMAKER	JIM	183
WATTS	GAIL GREVE	207
WEISNEL	JAY	047
WELLS	BRETT	196
WELLS	JOHN	007
WHEELER-DOBBS	LESLIE	334
WHITE	AMANDA	510
WHITE	RICHARD	511
WHITNEY	CARLA	297
WIDDER	J. R.	363
WIDDER	L. C.	362
WIGGANS	TAMARA	518
WILES	BLAIR	149
WILLIAMS	E. ESTHER	203
WILLIAMS	LARRY	391
WILLIAMS	MARIANNE	390

Table 6.3 Alphabetic listing of commenters (Continued)

LAST NAME	FIRST NAME	INDEX NUMBER
WILLIS	C. J.	037
WINEGARDNER	J. E.	061
WINN	RICHARD, JR.	295
WINTERS	MARTHA	034
WOMBLE-KENNEY	M. LYNNE	513
WOODS	BRIAN	434
WOTHYNS	JAMES	208
YANEZ-THERNLEY	CLARISSA	058
ZACHARY	ZACHARY	171
ZELK	JUDITH	042
ZELLER	SKIP	136
ZICK	JIM	553

6.22 COPIES OF LETTERS

This section reproduces the written statements submitted on the draft environmental impact statement for remedial action at the inactive uranium processing site located in Durango, Colorado.

The substantive comments in each letter have been bracketed and numbered to indicate where they have been addressed within Section 6.0. Each letter or statement also has a number in the upper right corner which identifies the author. An alphabetical numerical cross index is provided in Section 6.21.

A number of form letters were received, a sample of each form letter is included. Form letters that were not reproduced are attributed to the following commenter numbers (see Table 6.2 for the names of commenters): 1-158, 160-176, 178-324, 328-365, 392-406, 420, and 494-503. As well, a number of individuals gave statements at the hearing, December 18, 1984 (comment numbers 521-548). These statements are not included in this document, although issues raised by the public are addressed. A copy of the hearings transcript is available in the reading rooms of the libraries listed in Appendix K, List of Agencies, Orgnaizations, and Persons Receiving Copies of this Statement, in this FEIS.

457

URGENT!

CITIZENS OF LA PLATA COUNTY

Please read, sign name and address and mail to the Department of Energy...*IMMEDIATELY!*

John D. Themelis
U. S. Dept. of Energy
UMTRA Project Office
Durango DEIS Comments
5301 Central Ave. N.E., Suite 1700
Albuquerque, NM 87108

Dear Mr. Themelis,

I am a resident of La Plata County, Colorado and wish to state my position on the Draft Environmental Impact Statement (DEIS) for the Uranium Mill Tailings Project.

6.20.1 I urge that the DOE extend the comment period for an additional 120 days since both the public meeting and public hearing were held during the Christmas holiday season. In addition, the DOE must provide additional essential information within 30 days so that we can complete our evaluation of the alternatives you presented.

6.17 •The DEIS contained no evaluation and analysis of the economic impacts related to our tourist industry, which is our primary source of income. We are entitled to a detailed analysis for each alternative that is presented in the DEIS and request a detailed model and technical analysis.

6.5.1 • Only one engineering design for Alternative 2, Stabilization in Place, was presented. DOE must develop and present at least 2 other engineering approaches since we are not certain that the one presented is the most technically sound recommendation.

It is within the DOE's jurisdiction to extend the comment period.

SIGNED Laura Sholten DATE 1/9/85

PRINT NAME Laura Sholten

ADDRESS 32221 Hwy 550 N #7
Durango, CO 81301

159

URGENT!

CITIZENS OF LA PLATA COUNTY

Please read, sign name and address and mail to the Department of Energy...*IMMEDIATELY!*

John D. Themelis
U. S. Dept. of Energy
UMTRA Project Office
Durango DEIS Comments
5301 Central Ave. N.E., Suite 1700
Albuquerque, NM 87103

Dear Mr. Themelis,

I am a resident of La Plata County, Colorado and wish to state my position on the Draft Environmental Impact Statement (DEIS) for the Uranium Mill Tailings Project.

I urge that the DOE extend the comment period for an additional 120 days since both the public meeting and public hearing were held during the Christmas holiday season. In addition, the DOE must provide additional essential information within 30 days so that we can complete our evaluation of the alternatives you presented.

•The DEIS contained no evaluation and analysis of the economic impacts related to our tourist industry, which is our primary source of income. We are entitled to a detailed analysis for each alternative that is presented in the DEIS and request a detailed model and technical analysis.

• Only one engineering design for Alternative 2, Stabilization in Place, was presented. DOE must develop and present at least 2 other engineering approaches since we are not certain that the one presented is the most technically sound recommendation.

It is within the DOE's jurisdiction to extend the comment period.

SIGNED Virginia L Repert DATE 1/6/85

PRINT NAME VIRGINIA L. REPERT

ADDRESS 2213 County Rd #250
Durango, Co. 81301

6.16 ! Present Site Historical National Monument

6.10 2. Cty incidence cancer comparison with Rural La Plata County?

B Incidence of Ca in workers VCA during closing.

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Mr. Shimelis,

I take exception to your recent comments in the paper, pertaining to eleventh hour comments.

Many of us were out of town for the holidays. Surely even you must admit your timing leaves much to be desired. One might even wonder if you had ulterior motives for such behavior.

I am the mother of a child in treatment for leukemia. I live less than a mile from the pile. I do not blame the pile for his disease, from what I can learn it seems unlikely that the pile influenced his condition. However, I am concerned about how much radon gas will be emitted once you dig into the pile, whether it is removed or re landscaped. I

6.20.3 strongly oppose removal to Long Hollow because (1) the time element - we know 7 years is a conservative ~~exp~~ estimate, to have that much dust + radon flying for so long would hurt us financially + economically all. (2) I've talked to people

6.10.3 ~~6.20.4~~ who worked at the mill when it was operational, they told of children residing at the south end of town who had lung problems, and a pink cloud over Durango. (3) What is really down in there - I've heard talk of yellow cake,

6.4.1 machinery even houses how do we dispose of these should we find them (4) How hot, how deep, I want

6.4.3 core samples. (5) What is our standing in so far as cancer statistics are concerned - I've heard alot of

6.10.~~X~~.3 differing opinions (6) We want something done but we want the SAFEST method and since we live here we want more information and the time to study it. You took over 2 years to compile information gathered by people who are paid as a job to do this. Most of whom the should think the pile should be left alone w/a retaining wall of some sort for the river. To ask us to drop everything learn + decide in 45 days is dirty pool. This situation

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affects our lives and livelyhoods, it may well even determine both. We are entitled to the time and access to information. (one on 1 DEIS copy for over 20,000 people - now, Provided there are only 20,000 people who want to read it, in 45 days we each have 1.94 minutes in which to read + understand the DEIS) You had 24 years surely we deserve at least 6 months and hearings at a more reasonable time.

I'm sure that once you realize how many of us feel you'll agree that perhaps we deserve this courtesy and perhaps not a dear price to show your concern and good will.

Most Sincerely,
Louise M. Henning

JAN 11 12 02 PM '85

URGENT!

CITIZENS OF LA PLATA COUNTY

Please read, sign name and address and mail to the Department of Energy...*IMMEDIATELY!*

John D. Themelis
U. S. Dept. of Energy
UMTRA Project Office
Durango DEIS Comments
5301 Central Ave. N.E., Suite 1700
Albuquerque, NM 87108

Dear Mr. Themelis,

I am a resident of La Plata County, Colorado and wish to state my position on the Draft Environmental Impact Statement (DEIS) for the Uranium Mill Tailings Project.

6.20.1 I urge that the DOE extend the comment period for an additional 120 days since both the public meeting and public hearing were held during the Christmas holiday season. In addition, the DOE must provide additional essential information within 30 days so that we can complete our evaluation of the alternatives you presented.

6.17
- The DEIS contained no evaluation and analysis of the economic impacts related to our tourist industry, which is our primary source of income. We are entitled to a detailed analysis for each alternative that is presented in the DEIS and request a detailed model and technical analysis.

6.5.1
- Only one engineering design for Alternative 2, Stabilization in Place, was presented. DOE must develop and present at least 2 other engineering approaches since we are not certain that the one presented is the most technically sound recommendation.

It is within the DOE's jurisdiction to extend the comment period.

SIGNED Jerry Carney DATE 1/10/85

PRINT NAME Robert Gerald Carney

ADDRESS P.O. Box 3235 OVER→
Durango, CO. 81302

I was convinced that alternative 2 was best for us in Durango. Then I started reading about "hot spots" of child deformatives in the Shiprock area. As there may be some connection between tailings & old mines to these epidemics of birth defects, I have decided 6.10.2 to request further study from your department. I still like #2 but, can it be done so that no further health hazards will occur and for centuries to come? If not, we may need some sort of pipeline to move the 6.3 pile; Trucking is out of the question as impact on us will be too great.

I suggest you consult with Dr. James Wilson c/o Center for Disease Control in Atlanta. Given the piles radiation out put, Dr. Wilson or other teratologists [since the radiation 6.10.2 is a teratogen, can pass thru the mothers body to the fetus] could determine if leaving it in place will give us a potential birth defect cluster.

I hate to see this project delayed any longer but I feel I must request additional comment time & more study on #2.

Sincerely
Jerry Carney

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Durango Herald 12-12-84

DOE opts for dangerous choice

TO THE EDITOR: 6.15

Of the five alternatives for dealing with the Smelter Mt. tailings pile, the U.S. Dept. of Energy has chosen the one that will prove to be the most disruptive and the most dangerous.

Removal will take at least 4½ years and cost at least $27.1 million. The D.O.E. recognizes many other costs, like site acquisition, right-of-way, legal and administrative, finance and interest costs, but hasn't yet estimated them. 6.20.1

6.17 The D.O.E. says disruption will be like building an earth dam or interstate highway.

I object to such disruption so close to the train station and downtown. 6.20.2

Tourists will stay away until the project is completed. The D.O.E. claims removal will be 51 months.

6.4. How about bad weather and other probable delays?

The pile might have to be moved on a conveyor down to the trucks. What is to prevent the prevailing southwestern winds from blowing the freshly disturbed, radioactive dust out over the train station, Durango and Ft. Lewis College?

To stabilize the pile in place will cost $16.1 million and take only one year, and stabilization will be effective for at least 200 years, as will the other three action alternatives.

Stabilization in place is the safest, most reasonable solution. The D.O.E. didn't choose stabilization because, simply, the D.O.E. favors the company that owns the pile. Hecla Mining should have the opportunity to reprocess it. So said the D.O.E. I say, their profit at our expense!

Citizens of Durango, in addition to our health and economic welfare, we must also protect the commuters, including bus loads of children, on C.R. 141, the rafters, the picnickers in our new Gateway Park, the bicyclists who "do the loop," the countless deer and elk in Bodo Canyon and the priceless tranquility of our community.

Citizens of Durango, this is it! The final decision is now being made. The D.O.E. said we can influence their choice. We must!

If you, too, are concerned about such massive disruption, be at the meeting at the Fairgrounds Dec. 18 at either 2 or 8 p.m.

Should you want to submit a letter, send it before Jan. 11 to:

U.S. Dept. of Energy
Umtra Project Office
Durango D.E.I.S. Comments
5301 Central Ave. NE
Suite 1700
Albuquerque, NM 87108

Jane E. Leonard
Durango

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URGENT!

CITIZENS OF LA PLATA COUNTY

Please read, sign name and address and mail to the Department of Energy...*IMMEDIATELY!*

John D. Themelis
U. S. Dept. of Energy
UMTRA Project Office
Durango DEIS Comments
5301 Central Ave. N.E., Suite 1700
Albuquerque, NM 87108

Dear Mr. Themelis,

6.17
Mr. Themelis - I am
extremely concerned what
this fiasco could do to
Durango's tourism. I've got
my entire life and finances
invested in Durango and I'd
hate for it to become worthless.
I beg you
to leave
the tailings
alone.
Stop useless
gov't waste. 6.20
Frank
Sinton

I am a resident of La Plata County, Colorado and wish to state my position on the Draft Environmental Impact Statement (DEIS) for the Uranium Mill Tailings Project.

I urge that the DOE extend the comment period for an additional 120 days since both the public meeting and public hearing were held during the Christmas holiday season. In addition, the DOE must provide additional essential information within 30 days so that we can complete our evaluation of the alternatives you presented.

- The DEIS contained no evaluation and analysis of the economic impacts related to our tourist industry, which is our primary source of income. We are entitled to a detailed analysis for each alternative that is presented in the DEIS and request a detailed model and technical analysis.
- Only one engineering design for Alternative 2, Stabilization in Place, was presented. DOE must develop and present at least 2 other engineering approaches since we are not certain that the one presented is the most technically sound recommendation.

It is within the DOE's jurisdiction to extend the comment period.

SIGNED Frank J Sinton DATE 1-8-85

PRINT NAME FRANK J SINTON

ADDRESS 31760 Hwy. 160E
Durango CO 81301

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367

December 6, 1984

Dear Mr. Themelis:

I/We wish to express concern over the use of Wilcat Canyon Road (County Road 141) from County Road 211 to the Long Hollow site for tailings material transport, should either Alternative 4 or 5 be used.

6.12 Many of us that live in the Rafter J Subdivision have school children travelling the above mentioned section of road on school buses three times a day to Ft. Lewis Mesa Elementary School in Kline, Colorado. We are worried about their health and safety. In addition, many of us use that road on a daily or weekly basis and are concerned over the large number of trucks that would use this two-mile stretch of road in the relocation of the uranium tailings, should the Long Hollow site be chosen.

We support the construction of a gravel road to run parallel with the section of road at issue so that no tailings truck traffic would be on any part of County Road 141.

Signed [illegible]

Signed [illegible]

Address 1032 CR 142

Durango, Co 81301

Other Comments:

6.20.1 There is no reason to run trucks at all!
Why not leave the pile where it is?
Feel for all in the overall analysis

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369

December 6, 1984

Dear Mr. Themelis:

I/We wish to express concern over the use of Wildcat Canyon Road (County Road 141) from County Road 211 to the Long Hollow site for tailings material transport, should either Alternative 4 or 5 be used.

6.12 Many of us that live in the Rafter J Subdivision have school children travelling the above mentioned section of road on school buses three times a day to Ft. Lewis Mesa Elementary School in Kline, Colorado. We are worried about their health and safety. In addition, many of us use that road on a daily or weekly basis and are concerned over the large number of trucks that would use this two-mile stretch of road in the relocation of the uranium tailings, should the Long Hollow site be chosen.

We support the construction of a gravel road to run parallel with the section of road at issue so that no tailings truck traffic would be on any part of County Road 141.

Signed Joyce M. Capp

Signed [illegible] Capp

Address 491 C.R. 142

Durango, Colo.

Other Comments:

6.20.1 We believe that the best overall solution to the problem of eliminating radiation from the Durango tailings pile is to stabalize and cover the pile in its present location, with the possibility of some redistributing of the pile as it now stands to provide for the best long-term holding properties in the event of flooding, earthquake, etc.

December 6, 1984

Dear Mr. Themelis:

I/We wish to express concern over the use of Wilcat Canyon Road (County Road 141) from County Road 211 to the Long Hollow site for tailings material transport, should either Alternative 4 or 5 be used.

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We support the construction of a gravel road to run parallel with the section of road at issue so that no tailings truck traffic would be on any part of County Road 141.

Signed [illegible]

Signed [illegible]

Address 59 North Elk [illegible]

Durango, Co 81301

Other Comments:

6.20.1 We favor option 2, i.e., leave in place and stabilize. We understand the possible continuing contamination of the Animas River under this option, but the relatively small frontage would indicate that a solution to this drawback could be found. If option 2 is not selected, we would be in favor of the above proposed parallel gravel road should the Long Hollow site be used. It is a logical proposal.

December 6, 1984

Dear Mr. Themelis:

I/We wish to express concern over the use of Wilcat Canyon Road (County Road 141) from County Road 211 to the Long Hollow site for tailings material transport, should either Alternative 4 or 5 be used.

6.12 Many of us that live in the Rafter J Subdivision have school children travelling the above mentioned section of road on school buses three times a day to Ft. Lewis Mesa Elementary School in Kline, Colorado. We are worried about their health and safety. In addition, many of us use that road on a daily or weekly basis and are concerned over the large number of trucks that would use this two-mile stretch of road in the relocation of the uranium tailings, should the Long Hollow site be chosen.

We support the construction of a gravel road to run parallel with the section of road at issue so that no tailings truck traffic would be on any part of County Road 141.

Signed Pamela Graves

(for) Signed Claude Graves

Address 150 Pine Rd - Rafter J

Durango, Co

Other Comments:

6.20.1 Would prefer removal site to be elsewhere - other than Long Hollow - [illegible]

1-4-85

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December 6, 1984

Dear Mr. Themelis:

I/We wish to express concern over the use of Wilcat Canyon Road (County Road 141) from County Road 211 to the Long Hollow site for tailings material transport, should either Alternative 4 or 5 be used.

6.12 Many of us that live in the Rafter J Subdivision have school children travelling the above mentioned section of road on school buses three times a day to Ft. Lewis Mesa Elementary School in Kline, Colorado. We are worried about their health and safety. In addition, many of us use that road on a daily or weekly basis and are concerned over the large number of trucks that would use this two-mile stretch of road in the relocation of the uranium tailings, should the Long Hollow site be chosen.

We support the construction of a gravel road to run parallel with the section of road at issue so that no tailings truck traffic would be on any part of County Road 141.

Signed Kal Gombart
Signed Edith Gombart
Address P.O. Box 1882
Durango Colo 81301

Other Comments:

6.20.1 Dear Mr. Themelis.
We strongly recommend to leave the Pile (Uranium tailings) in place and stabilize. We consider it an awful risk for Durango, and its population, Touristtrade, Their only source of work and income. To open up the pile and contaminate the whole area, whoever makes this decision should be responsible for the consequences.

K. G.

376
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December 6, 1984

Dear Mr. Themelis:

I/We wish to express concern over the use of Wilcat Canyon Road (County Road 141) from County Road 211 to the Long Hollow site for tailings material transport, should either Alternative 4 or 5 be used.

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We support the construction of a gravel road to run parallel with the section of road at issue so that no tailings truck traffic would be on any part of County Road 141.

Signed Irma M. Ellis
Signed Robert W. Ellis
Address 235 Oak Rd Forest Lakes
Durango, Co 81301

Other Comments:

6.20.1 We are against the use of the Long Hollow site for tailings relocation and stabilization, mainly because of the close proximity of a large number of people in the transportation process. Also the price tag seems to be excessive, especially when you consider that the price of uranium may go down since we have a surplus now, with little hope of the demand increasing 6.11 in the next few years. We also feel that the Long Hollow site would have a far greater negative effect on wildlife than has been estimated. And last, but not least, Hay Farmer and surrounding property owners don't want the tailings there.

We would prefer the Bodo Canyon site if precautions are taken so that the pile would not interfere with the proposed Animas - La Plata project. We feel that this alternative would be acceptable to the majority of Durango area residents who favor relocation of the pile.

December 6, 1984

Dear Mr. Themelis:

I/We wish to express concern over the use of Wilcat Canyon Road (County Road 141) from County Road 211 to the Long Hollow site for tailings material transport, should either Alternative 4 or 5 be used.

6.12 Many of us that live in the Rafter J Subdivision have school children travelling the above mentioned section of road on school buses three times a day to Ft. Lewis Mesa Elementary School in Kline, Colorado. We are worried about their health and safety. In addition, many of us use that road on a daily or weekly basis and are concerned over the large number of trucks that would use this two-mile stretch of road in the relocation of the uranium tailings, should the Long Hollow site be chosen.

We support the construction of a gravel road to run parallel with the section of road at issue so that no tailings truck traffic would be on any part of County Road 141.

Signed Joe Byrkit
Signed Deborah S. Byrkit
Address 308 Spring Rd
Durango, Co 81301

Other Comments:

6.20.1 We also support the idea of leaving Uranium tails pile in place and stablize, where it is now existing. We defintely do not support the proposal of 25-ton trucks traveling down Wild Cat Canyon Rd. (County Rd. 141) loaded with Radioactive tailings everyday. Especially since my husband, myself and my daughter travel Wild Cat Canyon Rd. at least twice daily. Thank you for your Consideration!

Mrs. Deborah S. Byrkit

December 6, 1984

Dear Mr. Themelis:

I/We wish to express concern over the use of Wilcat Canyon Road (County Road 141) from County Road 211 to the Long Hollow site for tailings material transport, should either Alternative 4 or 5 be used.

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We support the construction of a gravel road to run parallel with the section of road at issue so that no tailings truck traffic would be on any part of County Road 141.

Signed Ann Schwarz
Signed Andrew Schwarz
Address 255 Wildcat Rd
Durango CO 81301

Other Comments:

6.20.1 Strongly suggest the "do nothing" alternative; as a compromise, support "leave in place & stabilize" alternative.
No reprocessing!
No moving the tailings

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December 6, 1984

Dear Mr. Themelis:

I/We wish to express concern over the use of Wilcat Canyon Road (County Road 141) from County Road 211 to the Long Hollow site for tailings material transport, should either Alternative 4 or 5 be used.

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We support the construction of a gravel road to run parallel with the section of road at issue so that no tailings truck traffic would be on any part of County Road 141.

Signed [signature]

Signed Anna Parks

Address 143 Lowers Rd

Durango

Other Comments:

6.20.1 We have a concern over the pile even being moved! It seams much safer for everyone to leave the pile where it is and if necessary just stabilize it at its present location - To stir up the pile seams much more dangerous to everyone in the community! Not to mention the debris being blown all over for several years ~~and~~ while being transportated to new location. 6.20.1

It makes more sense to leave it and stabilize it where it is!

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I work with heavy equip. daily so I am aware of the enormity of cost involved in the proposal to move that tailings pile.

6.3 My suggestions are first that you leave the somewhat stable pile where it is & spend only a fraction of that money to stabilize it & beautify the appeal of the hill that exists. Rather than dig into a can of worms so to speak & find ~~that~~ God only knows what in the way of unforseen problems as the task of removing progressed.

6.12 My second suggestion is that the increase in ~~[illegible]~~ heavy load traffic - should you decide to follow through with this absurd idea, be delt over

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6.12 with before & attended to during the time you intend to use any part of the already questionably maintained County roads. I estimate that CR 141 along the stretch you intend to use would be no better than the road through the Bodo area is now in less than a week with the traffic you would be putting across it. It certainly would not be safe for the school bus route or private passenger travel & would be a tremendous imposition on those of us that have to use that road daily. Personally, I've already sustained 3 ~~broken~~ cracked windows from trucks throwing loose gravel on that road. It doesn't need to get any worse.

December 6, 1984

Dear Mr. Themelis:

I/We wish to express concern over the use of Wilcat Canyon Road (County Road 141) from County Road 211 to the Long Hollow site for tailings material transport, should either Alternative 4 or 5 be used.

6.12 Many of us that live in the Rafter J Subdivision have school children travelling the above mentioned section of road on school buses three times a day to Ft. Lewis Mesa Elementary School in Kline, Colorado. We are worried about their health and safety. In addition, many of us use that road on a daily or weekly basis and are concerned over the large number of trucks that would use this two-mile stretch of road in the relocation of the uranium tailings, should the Long Hollow site be chosen.

We support the construction of a gravel road to run parallel with the section of road at issue so that no tailings truck traffic would be on any part of County Road 141.

Signed Whitley C. Scrivner
Signed Katherine B. Scrivner
Address 900 C-R-142

Other Comments:

6.20.1 Our #1 Choice is to leave the tailings and stabalize in place!

December 6, 1984

Dear Mr. Themelis:

I/We wish to express concern over the use of Wilcat Canyon Road (County Road 141) from County Road 211 to the Long Hollow site for tailings material transport, should either Alternative 4 or 5 be used.

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We support the construction of a gravel road to run parallel with the section of road at issue so that no tailings truck traffic would be on any part of County Road 141.

Signed Vickie Fyfe
Signed Lloyd Fyfe
Address 190 Lower Rd, Rafter-J

Other Comments:

6.20.1 In no way do we want this pile moved. It will be safer and more economically feasible to stabilize the hill with concrete. If the pile is moved there will be many future law suits for peoples damaged health.

6.20.2 The rumor around Durango is that the removal is based on nothing less than the pressure of a special interest group who is waiting to grab the land. To take a chance with people's lives for the sake of political gain is absolutely unthinkable. Thank-you

We will do everything in our power legally to stop the removal.

December 6, 1984

Dear Mr. Themelis:

I/We wish to express concern over the use of Wilcat Canyon Road (County Road 141) from County Road 211 to the Long Hollow site for tailings material transport, should either Alternative 4 or 5 be used.

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We support the construction of a gravel road to run parallel with the section of road at issue so that no tailings truck traffic would be on any part of County Road 141.

Signed Brian Clark

Signed ______

Address 2691 CR-141

Durango, CO 81301

Other Comments:

6.20.1 There are many people around here who are seriously considering leaving Durango if the tailings pile is moved. Too many times, in the past, we have been told that this procedure or that toxic chemical or radioactive material is safe only to find out later that it is carcinogenic. Cover the tailings pile and stabilize it! The risk is not worth the $'S!

December 6, 1984

Dear Mr. Themelis:

I/We wish to express concern over the use of Wilcat Canyon Road (County Road 141) from County Road 211 to the Long Hollow site for tailings material transport, should either Alternative 4 or 5 be used.

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We support the construction of a gravel road to run parallel with the section of road at issue so that no tailings truck traffic would be on any part of County Road 141.

Signed ______

Signed Lois C. Bartig

Address 74 Summit Cir.

Durango, Colo.

Other Comments:

6.20.1 A better choice, rather than to move it to Long Hollow, would be to leave it where it is and stabilize.

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December 6, 1984

Dear Mr. Themelis:

6.12 I/We wish to express concern over the use of Wilcat Canyon Road (County Road 141) from County Road 211 to the Long Hollow site for tailings material transport, should either Alternative 4 or 5 be used.

Many of us that live in the Rafter J Subdivision have school children travelling the above mentioned section of road on school buses three times a day to Ft. Lewis Mesa Elementary School in Kline, Colorado. We are worried about their health and safety. In addition, many of us use that road on a daily or weekly basis and are concerned over the large number of trucks that would use this two-mile stretch of road in the relocation of the uranium tailings, should the Long Hollow site be chosen.

We support the construction of a gravel road to run parallel with the section of road at issue so that no tailings truck traffic would be on any part of County Road 141.

Signed Marianne L. Williams
Signed Larry H. Williams
Address 300 S. Elk Run
Durango, Co 81301

Other Comments:

6.20.1 We strongly feel that the Department of Energy should adopt Proposal # 2 regarding the tailings pile — leave it in place and stabilize it.

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RE: DURANGO TAILINGS PILE

JACKSON TALLMADGE FEB. 3, 1985
32 CANYON CREEK TRAIL
DURANGO CO 81301

JOHN DEANTONIO, PROJECT MANAGER
URANIUM MILL TAILINGS PROJECT OFFICE
U.S. DEPARTMENT of ENERGY
5301 CENTRAL AVE. NE SUITE 1700
ALBUQUERQUE, N.M. 87108

DEAR MR. DEANTONIO,

FOR MANY YEARS PEOPLE HAVE BEEN WORRIED ABOUT HAVING A URANIUM MILL TAILINGS PILE LOCATED SO CLOSE TO OUR TOWN AND LOCATED ABOVE THE RIVER. 6.20.1 IT IS MY OPINION THAT IT SHOULD BE MOVED, MOVED DAMP TO PREVENT CONTAMINATED DUST FROM BLOWING.

6.4 I FEAR THAT, AS OFTEN HAPPENS IN MOUNTAIN SPRINGTIMES, THE WHOLE PILE WILL SLUMP IN A MOST DANGEROUS MUD SLIDE RIGHT INTO THE RIVER. WHAT IF IT WERE COVERED WITH A VENEER OF CONCRETE?... I DON'T SEE HOW YOU CAN PERMANENTLY STABILIZE SUCH A HILL IN A WAY THAT COULD GUARANTEE THAT THE PILE WOULD NOT SOMEDAY (OR BE SUBJECT TO TERRORISM?) COLLAPSE AND CAUSE A WORSE PROBLEM DOWNSTREAM.

YOU MUST CONSIDER MUCH, I KNOW. GOOD LUCK REMOVING THE PILE.

SINCERELY,
Jackson Tallmadge

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Kara Bertholf
3780 C.R. 129
Hesperus, CO 81326

January 9, 1985

Dear D.O.E.:

I am writing to express my views on the uranium mill tailings remedial action project at the uranium millsite in Durango, La Plata county, Colorado. I attended the December 18, 1984 public hearings in Durango and was relieved to see a good turn out of concerned Durango area residents. I was impressed by the fact that most people favor stabilizing the tailings on site or no action at all while the least popular alternative is the Long Hollow site.

6.20.1 I feel that the D.O.E.'s preferred alternative (the Long Hollow site) would be an unwise choice for political, environmental, health, and economic reasons. The alternative that best meets the needs of the Durango community is stabilization on site: this alternative is not only the choice of the majority of the hearing goers, but also poses the least impact on the environment and on the lives of the Durango area population.

6.5 The following two stabilization in place alternatives were not considered in the draft EIS, but should be studied: 1) capping the existing tailings piles without digging into them; and 2) redesigning the piles and capping them in such a way to exceed the EPA requirement of 200 years by as much as is possible to engineer.

Thank you,

Kara Bertholf

Kara Bertholf

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411

U.S. Department of Energy
Umtra Project Office
Durango D.E.I.S. Comments

5301 Central Ave. N.E.
Suite 1700
Albuquerque, N.M. 87108

Sirs:

6.20.1 This is the citizen input you have requested. Everything in my whole being says stabilise the mill tailings pile in Durango, in place. The idea of trucking, or belting all that radio-active dust is appalling. Please put me and my husband and daughter down as being vehemently opposed to carting away the pile to either re-process or bury.

Most sincerely,

Joanna G. Joiner

Joanna G. Joiner

Halford W. Joiner

Halford W. Joiner

Lisa S. Joiner

Lisa S. Joiner
750 Pioneer Circle
Durango, Colorado 81301

(303) 247 - 5380

January 25,1985
1647 W. 2nd St.
Durango, Co.
81301

Project Manager
Uranium Mill Tailings Projects Office
U.S. Dept. of Energy
5301 Central Ave. NW
Suite 1700
Albuquerque, N.M.87108

Dear Madame or Sir:

After careful consideration on the subject of proposals to remediate the mill tailings in the Durango, Colo. area, I have come to the conclusion that the efforts to "clean" up the Uranium Mill Tailings must be based on the following factors:

6.20.1

1) A significant increase in public health and safety.
From information released it appears that the health hazard from the pile is less of a risk than to a smoky office every day (which I do). No matter what form of expensive precaution is taken, removal of the pile will have to disperse parts of the pile either through accident, dust, or wash into the river during low flows. This is an Unacceptable health risk to myself and also to my family. It is obvious that the pile has moved very little over the past decades so at this time the danger of it entering the river appears to be minimal. Only during very high water flows could one reasonably expect to have any of the pile enter the stream and in this case dilution would certainly minimalize tho the point of non-detection the effect of the radiation.

6.4.4

2) Security of the proposed placement site.
We do not know positively that the location for removal will be a stable site for the next 10 or 20 thousand years. More than likely shifts in the earth will cause some form of fracturing in the rock bowl containing the tailings. The important factor is that we will not know what is happening to the pile because we cannot effectively monitor or watch it.

6.20.1

The best solution is to leave the pile highly visible to the naked eye and observe any changes in it so that corrections or remedial action can be taken atthe current site directly.

6.20.3

3)Efficient use of government funds.
From what I understand about the federal budget, practically any money received for this cleanup would have to from borrowed funds anyway. Therefore there is no money-just the promise of a loan. There is no reason to pick an expensive alternative just because Uncle Sam is going to pay for it. The choice is clear. The most efficient alternative is to leave the pile where it is-as it is. The best possible counter-alternative would be to stabilize it in place.

I presently live in Durango fairly close to the tailings pile. However I feel no threat from it or discomfort by living around it. It maybe somewhat of an eyesore but then the Smelter Mt. natural terrain is not exactly pleasing to the naked eye! Moneys,if spent, should be used to clean up fill on private properties or some on-site bank stabilization for the pile. I urge you strongly to consider these thoughts before making a decision about the pile removal.

Sincerely Yours,
Kenneth A. Beegles
Kenneth A. Beegles

Michael B. Stuart
2524 Delwood
Durango, Co. 81301

Project Manager
Uranium Mill Tailings Project Office
U.S. Dept. of Energy
5301 Central Ave. N.E.
Suite 1700
Albuquerque, N.M.

I am writing concerning the proposed alternatives of the removal of the uranium mill tailings at the Durango, Co. site. It is obvious to the citizens of Durango that the proposed alternatives 4&5 , to move the tailings to Long Hollow, are the worst scenerios for economic and health reasons. The population of Durango has doubled in the last 15 to 20 yrs. solely due to the major advent of the tourist industry. It is the only industry that we have. To extend the tailings cleanup for any more than one year wouldcripple the tourist industry due to the psycological factor of the visibility of the work going on in full view of the most heavily touristed part of town, Rio Grande Land. Without the tourists,even for a short time, a large part of the population would risk displacement. We do not have a great amount of good road around Durango. The Long Hollow Alternatives would require heavy truck travel down a road that is already a heavily used artery of transportation. The amount of radioactive dust put into the air by Alternatives 4&5 would be 6 to 8 times that of Alternative 2 and 2 to 3 times that of Alternative 3. Clearly Alternatives 4&5 are unacceptable.

6.17

6.20.1

Alternative 2 seems to be favored by people I have talked to and the most vocally favored Alternative at the Durango Task Force meetings. It is the least expensive, requires the least time, and releases the least amount of radioactive dust into the air. Engineering studies have not been provided to ascertain whether Alternative 2 is really feasible due to the possibilities of flood and earthquake. If it is possible and the formation of the stabilization can be done so that it is not an eyesore when viewed, then I am in favor of Alternative 2.

6.6.1

6.20.1

If Alternative 2 does not prove feasible due to the factors stated above then the Bodo Canyon site is the only viable Alternative. The similarities of time frame, release of radioactive dust, and non-use of major transpotation lanes make it so.

Please accept that Alternatives 4&5, which were originally favored by the DOE, will have major detrimental impact on the economics and health of the citizens of Durango.

1-24-84 414
476 E 7th Ave
Durango CO 81301

Dept of Energy
Albaquerque NM

To the Project Manager, Uranium Mill Tailings office

The decision on what to do with the Smelter Mtn. Uranium tailings should be made to satisfy both the D.O.E. and the Durango residents. After years and years of saying something should be done, it would seem that all of a sudden the decision needs to be made right away.

I think before any decisions are made, some more facts should be uncovered:

1) What is the amount of radiation now being released and to what degree does this threaten the residents?

6.10 2.) Could the amount of radiation being released be reduced with the pile kept in place?

3.) How much radiation would likely be released if the pile were moved?

6.12 4.) What is the potential for accidents involved in moving the tailings?

6.3 5.) Could the tailings be returned to their original spot inside smelter Mtn.?

I'm sure there are many more questions that could be raised. The bottom line is, are the tailings really that harmful? I think that

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the coal dust from the rail yard to pose a much greater threat to our health than the tailings, but no one seem's to be making much noise about that.

6.16 I think it would be appropriate that the tailings pile be made into an historical monument — it was uranium from this site that made the atomic bomb that destroyed Hiroshima. It should be made safe as possible for the area residents, but if we get more radiation from being out in the sun than from the piles, it doesn't make sense to mess with them.

I hope the D.O.E. carefully considers All the issues before anything is done.

Thank You

René Larrieg

René Larrieg

JAN 29 3 02 PM '85

Commissioners Office — January 22, 1985
Courthouse
Durango, Colorado

To the La Plata County Commissioners;

I am writing in response to the recent debate concerning the tailings pile removal. I have read several of the recent viewpoints and options which have discussed the ways in which the tailings may be dealt with.

6.20.3 It appears that removing the tailings will create a more dangerous environment for the residents of Durango, than by not removing these hazardous wastes.

6.3 The most reasonable option that I have encountered is the idea of placing a clay base, several feet thick, directly over the tailings. Much of the radioactive tailings are spread by the wind blowing the particles through the air. The clay covering would serve to prevent this from occuring.

This may not be the complete answer to the problem, but it is certainly better than the dangerous levels of radioactivity that would be created by removing the tailings pile by the truckload.

The issue of the homes and buildings constructed of tailings should also be addressed by this community. This also may directly affect the health

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and welfare of the residents of this community.

The entire tailings issue is one which requires careful research and consideration in order that the safety of the residents of La Plata County is preserved.

Thank you.

Respectfully Submitted,

Deborah Powell
La Plata Youth Home Comp.
1013 E. 3rd Ave
Durango, CO 81301

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Uranium Mill Tailings
Feb 4, 1985

John DeAntonio
Project Manager

I am writing to express my views on above subject as they relate to us in La Plata County. I am a retired chemist with 40 years past experience, so I understood much of what your group presented here last week. I also have obtained from our library the two Drafts on EIS. Your presentations enabled me to realize that the radiations are modest around here, and that you know how to move tailings in a reasonable and safe manner. Inasmuch as DOE has dictated remedial action on these tailings around the country, I have focused on whats best for us, and my views is as follows

6.20.1

I consider it an opportunity to get rid of some scars left over from careless early mining. Therefore, I believe the tailings pile should be moved to Bodo Canyon employing the detailed and excellent plan laid out in the EIS Draft. I feel everything should be cleared from the present site, including the smokestack that some might like as a momento to the region. The basic theme of "out of sight - out of mind" seems best to get rid of a bad deal.

For all the detail presented in the EIS drafts, one can almost judge that the Bodo Canyon site is far the most effective site and lowest cost way to dispose of this problem.

Since the State of Colorado will acquire the Durango Tailings site, and if they are hauled off, the cleared site would be wonderful for a state rest stop which is needed at that very point by our Tourists.

Very truly yours.
C.W. Mertz
649 CR 301
Durango, Co 81301

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243 Pine Ridge Loop
Durango, Colorado
81301
February 5, 1985

Mr. John DeAntonio
Project Manager
Uranium Mill Tailings
Project Office
U. S. Dept. of Energy
5301 Central Av. NE
Suite 1700
Albuquerque, NM 87108

Dear Mr. DeAntonio:

6.20.1 We wish to communicate to you our considered opinions and feelings concerning actions as to the disposal of the Durango Tailings Piles and vicinity properties. In brief, we support their transfer to Bodo Canyon and their stabilization for long term personal safety and esthetic and property improvement.

We are in agreement with the opinions of Mr. and Mrs. C. W. Mertz of County Road 301, Florida Mesa. We were much impressed by the technical competence and reasoned discussion exhibited and carried on at the January 31st meeting, and in the DOE/EIS-0111D.

6.4.1 Having had some contact with uranium milling in the mid 1950's at Phillips' installations near Grants, New Mexico, I should like to see the recovery of more uranium and possibly radium from these moderately rich tailings, but am aware of the low price of yellowcake and the nuclear energy controversy. I should like to suggest that, from brief research in the Durango Public Library's chemical references, use might be made of the solubility of radon, thoron, etc. in water and of its adsorbability in activated carbon (charcoal) at least in emergency situations and possibly in long term remedial actions.

While we feel we are not immediately concerned, living in Durango West, we are interested in the future safety, appearance and property values of our chosen retirement community, and much appreciate the efforts of the many persons and the Federal Government to these ends.

Yours very truly,

Donald E. Berger

Lynn and Don Berger

J. CRAWFORD
58 FOLSOM PL
DURANGO CO 81301

1 Jan 1985

Mr. John G. Themelis
Project Manager UMTRAP
U.S. Dept. of Energy
5301 Central Ave. NE
Suite 1700
Albuquerque NM 87108

Dear Mr. Themelis,

This letter is to express my opinions regarding the five alternatives that have been proposed for dealing with the VCA Uranium mill tailings pile in Durango, and to offer a suggestion which I believe is new, or at least, hasn't been discussed much.

6.20.1 Stabilization in place is, in my opinion, shortsighted and unacceptable. Even though that option would probably have the least impact on the tourist industry which is the mainstay of our local economy, "sweeping it under the rug" in this way does not solve the problem. It would only postpone it for a future generation to deal with. There has already been too much of that kind of thinking in this country. The tailings pile itself is a monument to that kind of attitude.

Of the five alternatives proposed in the Draft Environmental Impact Statement, I favor the plan that includes reprocessing the tailings to recover residual Uranium.

6.14 I would also like to see the Radium and other radioactive elements removed at the same time. Even though the demand for these materials is low at present, it seems very likely that within the next few decades that will change. If so, then to not reprocess the tailings now will practically insure that they will be dug up again in the future when the population density of this area is higher and the consequent health risks to the society are greater.

Considering the fact that there isn't enough experimental data to adequately predict the health risks from breathing dust enriched with radium and other radioactive elements, I believe that it is important to consider the problem from a "worst case" standpoint. Every precaution must be taken to insure that the release of dust into the atmosphere is minimized. Three of the alternatives discussed in the Draft Environmental Impact Statement include the proposal that the tailings pile be transported by means of a fleet of 25 ton trucks. It is inevitable that large amounts of tailings will be spread by such an operation.

6.2 This material could be moved much more cleanly by using a slurry pipeline. If the diversion and use of water for this purpose is a problem, then why not use carbon dioxide? There is a gigantic carbon dioxide production unit operated by Shell Western E&P Inc. about 10 miles away, and the techniques for slurrying with it have already been developed. Arthur D. Little, Inc. has made a study of the use of carbon dioxide as the slurrying agent for use in a coal pipeline extending from Wyoming to Arkansas. Adapting that technique to moving a couple of million tons of material from Durango to Long Hollow shouldn't be all that difficult.

Sincerely,

Jesse Crawford

Jesse Crawford

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1/7/85

ATTENTION
U.M.T.P.O.

6.20.1 As a resident of Durango Colorado I do not wish to See the uranium tailings pile moved. STABLIZE IT!

6.16 Further I would like to see the stablized pile as a ~~War~~ Memorial & a reminder of what the "Manhatten Project" signifies.

The benifit of a memorial could be an added point of interst for the ~~town~~ in the world tourist ~~market~~. this could help amorize cost in the long run.

Bill Boland
Durango, Co.

12 02 P 85

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Jack and Jean Graham
1121 Camino Del Rio
Durango, CO 81301

January 8, 1985

Uranium Mill Tailings Project Office
Albuquerque Operations Office
U. S. Department of Energy

To Whom It May Concern:

As business owners in downtown Durango and residents of La Plata County, whose home is only a few miles from the Longhollow site, we have two concerns in the proposed mill tailings disposal alternatives.

6.20.1 As business owners we are forced to spend a certain amount of time downtown approximately one mile from the present site. An 82 month exposure as outlined is proposal 5, the reclamation and relocation to Longhollow, seems excessive and dangerous. A seven year exposure to the dust and contaminants raised by such a project is unacceptable. Proposal 2, on-site disposal, is estimated at a one year completion which trims almost six years from our time of exposure. The quickest, cleanest way of disposal should be considered as best for the people of Durango.

6.2 If the tailings are relocated to the Longhollow site, with or without reclamation, we have these three concerns: pollution of the groundwater which has not been adequately studied; the use of
6.12 county road 141 which is a busy, narrow, dangerous road and would not be improved by heavy truck traffic; and the extra time and contamination that is bound to occur by loading and transporting the tailings.

None of these problems seem to have safe solutions as covered in the existing proposals.

The residents of Durango deserve that the utmost care be taken to minimize their exposure to all the hazards raised in any manner of disposal of the mill tailings. They should not have to face escalated health risks by being exposed to a dusty contaminated downtown area for six or seven years. We hope the Department of Energy will pick a clean and expeditious plan to stabilize the uranium tailings and not expose Durango to the danger of radioactive contamination for longer than is absolutely necessary.

Jack Graham
Jack Graham
Jean Graham
Jean Graham

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5403 Angel Place
Farmington, New Mexico 87401
January 2, 1985

Mr. John G. Themelis
Project Manager
Uranium Mill Tailings Project Office
U. S. Dept. of Energy
5301 Central Ave NE Suite 1700
Albuquerque, N. M. 87108

Subject: DOE/EIS-0111D, Remedial Actions at the Former Vanadium Corporation of America Uranium Mill Site, Durango, LaPlata County, Colorado, Comments on

Mr. Themelis:

Our Identity: Mr. Marlo W. Schulz, presently an Electrical Engineer at Four Corners Power Plant, Thirteen years experience in the nuclear energy field through jobs at Knolls Atomic Power Laboratory, Schenectady, NY, Idaho National Engineering Laboratory, Idaho Falls, ID, and DOE Idaho Operations Office, Idaho Falls, ID.

Mrs. R. Gail Schulz, presently a Claims Representative for the Social Security Administration, Durango, CO, twelve years tenure in Federal Civil Service.

Residence: 5403 Angel Place, Farmington, NM 87401

Reason for making comments: Ownership of a thirty-five acre lot in section 8, T34N R10W and section 1U, T34N, R11W which is approximately 1.25 air miles northeast of the Long Hollow Site discussed in the subject EIS. We plan to establish a residence on this lot in 1985. We obtained a Colorado State well permit in April, 1984, and will drill the well this summer. Last year we surveyed our boundaries, determined our building sites and built an access road. We procured a copy of the subject EIS and attended the December 18, 1984, public hearing on the draft EIS, the 7:00 pm session.

Comments:

6.20.1 1. We wish to voice our strong opposition to alternatives 4 and 5 for disposal of the Durango uranium mill tailings in Long Hollow. We believe we would be among the most adversely affected because of the lot we own about 1.25 miles northeast of the Long Hollow site. As stated above, we are in the process of developing it into our personal residence. In regard to this we fear for the following:

6.17 a. Decrease in the value of our lot to the point where it would be unsaleable and potentially undesirable to be inhabited. We have invested a great deal in our land with the hope of building it into our permanent residence. We could not afford to have it rendered worthless.

6.7.2 b. Potential contamination or water level drop in our domestic well since we will be the closest domestic well to the site. We fear for the contamination of whichever aquifer upon which we draw whether it be shallow or deep due to the ambiguity of the way the aquifers interrelate. We have seen first-hand the rapid erosion possible as a result of summer rain storms.

6.7.1 In the process of building our access road last year, a 4 foot diameter culvert was washed out twice in the small branch of the creek across which we built our road. We question if the Study has adequately considered the effects of rainstorms in this area and whether drainages may change direction (from Long Hollow to Basin Creek) in the time over which the site is to last.

6.7.2 2. Those of us who believe in the future and healthy growth of Durango and the surrounding area believe the Animas-LaPlata Project is a necessity. When the project is built, the Ridges Basin Reservoir will cover much of County Road 211 to a point not far from its junction with County Road 141. Basin Creek which drains from the edge of Long Hollow flows directly into the area to be covered by the reservoir. We fear that the water could potentially be contaminated which would go into the reservoir.

6.17 The land surrounding Ridges Basin Reservoir would be of great value for development. Placement of the tailings at the Long Hollow site so close to the reservoir could potentially condemn this prime development land and make it worthless. This would deprive LaPlata County of a considerable amount of revenue and adversely affect recreational and residential development around the reservoir.

6.13 3. We do not believe the draft EIS considered the extent to which land has been subdivided and sold in the close vicinity of the Long Hollow site. The lot which we purchased is one of seven lots laid out by the former owner. The remaining six lots plus all of the immediately surrounding land which was part of lands owned by J. J. Kikel has been purchased by a Texas-based development firm. We speculate that that firm is planning to plot out more low-density residential lots. Land value and water quality considerations should be more heavily weighed in light of this.

6.20.1 4. According to the draft EIS, alternatives 4 and 5 involve the highest cancer risks. We do not believe this can be tolerated. Alternative 5 involves the longest period of time at the greatest expense to complete. We do not believe this is acceptable in view of the increased cancer risk from radon emissions from the pile and during transportation. I, Mrs. R. Gail Schulz, work in the Federal Building on Camino del Rio in Durango which is one of the closest business offices to the tailings piles. I am against prolonging my exposure which would be the case in alternative 5.

6.12 5. The draft EIS states that use of County Road 141 is "light". We believe, to the contrary, that it is among the most heavily traveled roads in the county. County Commissioner R. T. Scott supports this belief. We believe the additional impact of 570 trips per day by 25 ton trucks would produce hazardous results far above the ones given in the EIS. The road is narrow, winding and already prone to frequent accidents. The chance for loss of lives and spilling of contaminated materials onto the roadway, into ditches or stream beds is too high to risk. We are personally concerned about the high exposure rate to radon emissions to which we and our animals would be subjected since we are bounded by County Road 211 on the north and County Road 141 on the west. We fear contamination from blowing dust as well as radon gas.

6.12 6. We are against the transportation of the tailings in 25 ton trucks with only canvas covers or no covers at all even if the tailings have been wet down. We do not believe this is adequate to contain the material against being blown off and to stop possible enhancement of radon emission during transport.

6.10.2 7. We ask that the lung cancer death rates given in the EIS be put in layman's terms. What does "4.4 lung cancer deaths per 1000 years" translate to in terms of deaths in Durango in 10 years given the present population and projected growth? We also ask that the death rate projections by other authors and recognized experts in the field of radon gas toxicity be included so that the public may see the range of projections.

6.3 8. We ask that the reasons for rejecting the other six disposal sites be given. Assuming that the reasons are as valid as the reasons for rejecting the transport to Montrose County, they will be accepted on their own merit.

6.6.3 9. We request that Appendix C include studies or information on the Ridges Basin fault which apparently goes through the Bodo Canyon site. Whatever projections can be made on the extent of movement of this fault from the maximum projected quakes in this area or possibly from lubrication from the Ridges Basin resevoir should be included.

6.5.1 10. In regard to alternative 2, we ask whether there may be some more aesthetically appealing access barrier for this site than the 3 foot concrete posts, steel cable, etc.?

6.8.2 11. We ask that alternatives 3 through 5 be clarified in regard to how much water is required at the relocation site and how that water will be supplied. Assuming that the water at the sites would come from wells at the site, what are the projected impacts on the water tables. This is of particular concern to us in the case of reprocessing at the Long Hollow site.

6.16 12. We ask that further information be included on the archaeological, historical or cultural sites which may be impacted by any of the alternatives and ask whether consideration has been given to the potential damage due to vibrations from the 25 ton trucks?

6.8.1 13. In regard to alternate 5, we ask what problems may have been experienced at Naturita in the operation of their leach ponds, assuming that leach ponds were in use there? What problems were encountered in cleaning up that site assuming that it has been cleaned up? Would the reprocessing buildings and equipment be moved off the site upon completion of the project and was that included in the cost estimate?

6.15 14. We request that page 85 section 4.3.4 of Volume I in regard to atmospheric stability be put in layman's terms.

6.20.1 15. If alternative 2 is chosen we believe a method should be devised to severely limit the amount of disturbance and moving of the tailings to minimize radon gas emissions and dust to the greatest extent possible. Stabilization in-place to the greatest degree possible should be accomplished.

Page 5 of 5

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6.3 16. If alternative 3, removal to the Bodo site is chosen, we believe reconsideration should be given to using a tunnel or a slurry pipeline system to transfer the tailings from the present site to Bodo Canyon. This would elimate the expense and hazard of a fleet of 25 ton trucks and would to the greatest extent possible protect the people of Durango from airborne particles. It would also greatly reduce the hazard of highway accidents and it would be far less disruptive to the wild life inhabitants and eliminate road kills.

3.2.5 17. If alternative 4 is chosen despite the rejection by the majority of the people contributing comments, we believe that it should include a synthetic liner to further reduce the possiblity of leaching into the aquifers.

Thank you for your serious consideration of our comments and concerns for this hazardous, sensitive issue.

Sincerely yours,

Marlo W. Schulz
R. Gail Schulz

Marlo W. Schulz
R. Gail Schulz

cc: Chairman Harold Steinhoff
Durango Uranium Mill Tailings Task Force
Senator Pete Dominici
Representative Bill Richardson

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CHARLES R. BUTLER
GEOLOGIST
WEST BUILDING
P O BOX 435
DURANGO COLORADO 81301
PHONE 24[illegible]

January 2, 1985

Manager, Uranium Mill Tailings Project Office
Department of Energy
5301 Central Avenue, NE, Suite 1700
Albuquerque, New Mexico 87108

Re: Draft EIS
Durango Site

Dear Mr. Themelis,

6.20.1 I would like to comment on your Draft Environmental Impact Statement for remedial actions at the Durango uranium mill site. I concur with your conclusion that Alternative 5 is the best one. However, in view of present uranium prices I suggest that the plan be modified so that the reprocessing
6.14 could be delayed for a period of at least 10 years. If such a modification is not possible I would favor Alternative No. 4. My third choice is Alternative No. 3.

As I analyse the comments made at the public hearings in December I must conclude that the majority of the testifiers were speaking from the point of view of their personal short term interests. While I agree that everyone has a right to an opinion I would admonish you to reach your final decisions on a basis of sound engineering data and on your perception of the best long term interests of the nation.

6.20.1 I think the stabilization in place option - from a geological point of view - would be a grave mistake. No one here has witnessed a 1000 year flood, and I doubt if a system of rip rap erosion barriers would survive such an event.

Very truly yours,

Charles Butler

Charles R. Butler
Consulting Geologist

CRB:jd

Edward E. Moses
9575 C.R. 141
Hesperus, Colo. 81326

Manager
Uranium Mill Tailing Project Office
U.S. Department of Energy

I Edward Moses am very concerned about the D.O.E. plan to move the Durango mill tailings out of town to either the Bodo Canyon area or the Long Hollow site. It is my understanding that these areas are either on or very near the site for the Animas La-Plata Project. Why I ask would anyone in their right mind even think of putting uranium tailings where such a large reservoir of water would be kept. What about downstream from the reservoir where irrigation water would be running through Long Hollow!

6.13 The only answer I can come up with is that the D.O.E. thinks that if they put the uranium tailings there first then the Animas La Plata Project would not be built.

The problem is the Long Hollow and La Plata ~~and the La Plata~~ river drainage areas are labeled water-critical districts by the Colorado Division of Water Resources. This means that no more well permits are being given out. The large ranches out here, like everywhere, are starting to split off pieces of their land just to afford to keep going, and people like my wife and I are going to buy this land and improve it and

build on it. We have lived out here on 10 acres of land now since March 1980. Since that

6.13 time we have been denied a well permit. Our only hope like others in this area is for the Animas La Plata Project to be built.

6.20.1 I hoped I have explained why the tailings pile can not be moved out to this area and hope you will take the Bodo Canyon and Long Hollow areas off of your list of alternatives.

6.17 If this is not done and the tailings pile is moved to either area then I feel that the D.O.E. should purchase our land from us plus pay damages from such action.

DEC 31 12 02 PM '84

signed Edward E. Moses
9575 C.R. 141
Hesperus Colo. 81326
12/21/84

908 Leyden Street
Durango, CO 81301
January 3, 1985

U. S. Department of Energy
UMTRCA Project Office
5301 Central Avenue N. E.
Suite 1700
Albuquerque, New Mexico 87108

Subject: Durango Mill Tailings DEIS comments.

6.20.1 My strong choice is Alernative 1; "No action". Your DOENEWS fact sheet states that Alternative 1 cannot be selected. If this is legally true, which I doubt, then the only other reasonable alternative is number 2; "Stabilization of all contaminated materials on the Durango site".

The vicinity properties, off-site from the tailings piles, should be made safe. Where homes, businesses, or public places conclusively show dangerous levels of radon gas emissions or radiation, the contaminated materials should be removed and disposed. Covering these materials at the Durango tailings pile site is logical and reasonable.

6.10.4 I am opposed to disturbing the already stabilized Durango tailings piles. No evidence has been presented by DOE or any other group that conclusively shows that a health hazard exists that is any greater than from many naturally-occurring geologic formations. There is no evidence of off-site dangerous contamination of water, air, flora, fauna or soil. The piles are well covered by vegetation. It appears that it may be reasonable to consider covering the raffinate-ponds area and riprap the banks of Lightner Creek and the Animas River.

The disturbance and health risk during remedial action would be greater than suggested by the DEIS. Although precautions are taken and actions monitored, projects of this size always have unforeseen problems caused by "acts of God", human failures, carelessness and inefficiencies.

6.9 You estimate project costs of 16.1 to 28.1 million dollars, NOT including land acquistion and other substantial costs. Not including these costs is a serious shortcoming of the DEIS.

6.20.3 With the national budget deficit exceeding 200 billion dollars, it is not prudent to spend millions on a project with minimal, if any, benefit. As a taxpayer, and thinking of the legacy of debt we are leaving our children, I say this is a foolish expenditure.

My family has lived in Durango for eleven years. Mrs. Cooley and I plan to spend the rest of our lives here. We know the risks we accept daily from accidents in our car and home are much greater than those posed by the Durango tailings pile. My observation is that the vast majority of the local population wants as little disturbance of the piles as is reasonably possible. You should also be well aware of this feeling following the public hearings in Durango. The only speaker I heard favoring moving the

6.4.5 piles was a legal advocate from Boulder, Colorado. He did not speak for my family. We want any remedial action, if deemed necesary, to be as short a duration as possible. Transportation from the tailings pile site is almost universally seen as causing more problems than it will solve.

6.5.1 I believe DOE should develop another alternative describing the movement and covering of materials from the vicinity sites at the tailings pile, covering the raffinate-ponds area, further vegetative covering of the tailings piles, and riprapping Lightner Creek and the Animas River.

6.9 Also, all costs should be calculated for all alternatives.

6.20.1 I also believe the public comment period should be extended.

Sincerely,

John R. Cooley

John R. Cooley

cc: Durango mill tailings study committee
Congressman Mike Strang
Senator William Armstrong
Senator Gary Hart
Governor Lamm

908 Leyden Street
Durango, CO. 81301
January 2, 1985

U. S. Department of Energy
UMTRA Project Office
5301 Central Avenue N.E.
Suite 1700
Albuquerque, New Mexico 87108

Gentlemen:

6.20.1 In July 1981 I spoke at your public meeting in Durango concerning the Durango Tailings Pile. I was opposed to any movement of the pile at that time, and still encourage stabilization on site as the most sensible, economical and least harmful alternative.

6.10.4 In the twenty years or so the pile has been at the edge of Durango, no loss of life can be traced directly to its existence--either by radon in the air, or traces in the water of the Animas River.

Statistics presented to citizens on December 18, 1984 have shown stabilization in place to be the least costly (except for no action whatsoever) in actual dollars, injury or possible deaths of any of the alternative remedial actions.

6.9 When our Federal government is charged with a responsibility for action on a project, it must comply. However, that does not necessarily dictate the most expensive mode must be undertaken. A decision of least consequence to the public can be a viable solution. Why must an action be one wherein people could be injured in their line of work; where the employees would be exposed to extremely high rates of radon (even though protective clothing is used); where the high use of an already dangerous road could result in a number of traffic accidents producing serious injury or death; where the use of this same road by school buses and trucks hauling polluted ore could endanger those young lungs? In addition, by admission of the Department of Energy, four lives could be lost during a proposed move of the pile. This is more than four times the projected loss of life from radon gas if the pile remains where it is.

6.4.1 Each year more natural grass and shrubs can be seen growing on the piles. Why disturb this covering? Presentors at our local meetings state precautionary measures will be
6.4.1 taken to keep dust from the air. Just what kind of measures can guarantee this? One method suggested was to spray with

6.4.2 water. Colorado water is limited. Where will all this water come from, and more importantly where will all the runoff water go--into the Animas River? One of the main concerns of the pile now is contaminated seepage into the river. Would not this runoff be more potent?

6.20.3 And, the money issue. Millions of dollars have already been spent, and all we have is reams of reports. Millions more will be spent before any action is taken, and then millions more to review, report again, with a possible conclusion in fifty years things were better off before any action was taken.

Please, save Durango from needless air pollution, save its residents from needless accidents, save its scenery from disturbance, and save all U. S. taxpayers millions of dollars.

Yours truly,

Kathleen M. Cooley

Kathleen M. Cooley

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January 3, 1984

Mr. John G. Themelis, Project Manager
Dept. of Energy - Uranium Mill Tailings Project Office
5301 Central Ave., N.E., Suite 1700
Albuquerque, New Mexico 87108

Dear Sir:

As a resident of La Plata County, I am very concerned about the D.O.E. proposal to move Durango's uranium mill tailings to another site, and possibly reprocessing.

Durango is a sparsely populated community surrounded by wilderness of diverse type; desert, mountain, forest, tundra, etc., which is of fragile ecology. To relocate and reprocess over a period of years thousands of truck-loads of radioactive material through this area would cause irreversible harm to the environment. Also, additional harm might be done to the population breathing the increased dust stirred up by this activity, and there is the economic consideration of building roads, and the detraction of tourism as well.

6.20.1 In my opinion, it is far more favorable both ecologically and economically to stabilize the tailings in place, and in discussing this issue with friends and neighbors, I find that most of them feel as I do.

I sincerely hope that our opinions will be given the serious consideration they deserve.

Yours truly,

Caryl K. Helmin
Caryl K. Helmin
240 Sawmill Rd.
Durango, CO 81301

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12-14-84

Dear Sir:

6.20.1 I would like to express my deep opposition to the DOE's stated preference of reprocessing Durango's tailings pile in Long Hollow. I feel that both Long Hollow options are very inappropriate. If the DOE pursues either of these alternatives then I would join any legal actions against the department in an effort to stop an irreversible mistake from being made.

6.20.1 Please make a record that I am in strong support of recontouring & stabilizing the tailings piles in place.

Thanks,

Susan Myers

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19 Newland Circle
Durango, CO 81301
December 14, 1984

U.S. Dept. of Energy
UMTRA Project Office
Durango DEIS Comments
5301 Central Ave. NE
Suite 1700
Albuquerque, NM 87108

Dear Sirs;

6.20.1 We, being citizens of Durango, wish to express our opinions on the issue of the mill tailings. We feel that the risk taken with stabilizing the tailings pile would be more hazardous than doing nothing with it. The lives that are estimated to be taken from the radon are less than the estimated lives to be injured or taken while trying to stabilize the pile. Another reason for leaving the pile as it is would be the amount of money involved. This money could be used more wisely for several other life saving projects.

6.20.3 As for the DOE's choice of reprocessing the pile in Long Hollow, it would be the wrong decision because of the hazards to health and the money could be used for many other more important life saving projects. We urge you now to reconsider your proposed plan.

With all due concern,

Becky Speelman and Cathy Mueller

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To whom it may concern: 12/14/84

6.20.1 We believe that the tailings pile should be stabilized in place because if they move it to Bodo or Long Hollow they are not accomplishing anything. After the long hard working days, and they finally get it moved, it will still give off radioactivity unless they bury it in place and stabilize it. In conclusion we feel that the Durango tailings pile should be stabilized in place.

Brian Woods
Bobby Turner

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Dear, Sirs,

My name is Matt Evans. I am a Student attending Durango Senior High School. I am greatly concerned about the Tailings pile next to Smelter mountain. I have seen yours proposals and I would prefer stabilizing the pile in place rather than move it to Long Hollow and Reprocessing it.

6.20.1

The reason why is: the cost of moving it and reprocessing it is far more than just leaving it in place and stabilizing it. Another reason is contamination would be over a larger distance and greater area if it was to be moved. And besides, the estimated truck accidents for the project is higher moving it to Long Hollow than leaving it were it is.

6.20.3

I hope you understand what I am saying to you and I hope you'll also agree with me.

Thank you for your time.

a concerned Student

Matt Evans.

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Dear Sirs:

We citizens of Durango, Colorado would like to express to you our opinions.

We are deeply concerned about our environment. As you know, located in the southern portion of town there is a radio active, tailings pile. We know you have plans to clean up the pile. Also, we know you would like to reprocess the Uranium, we feel this is a bad choice. Moving the tailings pile over this rough mountain road would cause many more problems than would be appreciated by the people of Durango.

6.20.1

We feel a better choice would be to stabilize the ~~pile~~ pile where it is. The reasons being that it would cost less, cause less chance of accidents, and take less time.

6.20.1

We feel the job should be done in the most economical, and safest way possible. We thank you for your time, and hope you will reconsider your choices in this matter.

6.20.3

Sincerely,

John Dunsmore

437

120 E. 36th St., Durango.

18 December, 1984.

I, William M. Browse, a voter and resident in Durango, Colorado, do hereby request that the tailings pile at the south edge of town be left at its present site and stabilized.

6.20.1

440 1[illegible]-[illegible]-84

Al and Debra Kleemeyer
10512 C.R. 120
Hesperus, CO 81326
(303) 385-4317.

Mr. John G. Themelis:

6.20.1 We favor option 1, 2 or 3 (in that order) and reject options 4 & 5, concerning the tailings pile in Durango, Colorado.

6.13 The ground in long hollow is boggy and unstable and is a source for drinking water, etc. It will also border the Animas-La Plata project. Once the Animas La Plata is completed it will become a highly populated area and a recreation area.

6.12 The 141 road is now heavily traveled and unsafe for current traffic conditions. It is our primary route to Durango. It cannot stand any truck traffic. You would have to build a separate road and not allow any trucks on 141. It is a major site of cars sliding off the road, trucks jack-knifing etc.

6.13 Use of private land when public land is available is also wrong!

6.20.1 Please leave the pile as is or cover where it is. If this is not possible, please use a Bodo site. We would also prefer a slurry pipeline to truck hauling. This is a windy area. It is also a dangerous area

6.3 for hauling due to winding roads, steep grades, and long winters. All of these factors indicate that moving by truck (80,000 loads) is unthinkable.

6.20.3 More lives could be lost to accidents, exposure during moving the tailings, etc than to leave as is and take the risk of being exposed at present levels.

6.17 Also, the company who has the property where the tailings now are should pay for moving the tailings. The value of reclaimed property at that particular location will be very, very high. They will have extremely prime real estate.

Sincerely,

Al & Debra Kleemeyer
B[illegible]

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12/13/84

Dear Sir,

6.20.1 Living in Durango since 1956, we are in favor of grooming & stabilization of the Uranium Tailings pile in its present location, rather than trucking it & contaminating another piece of beautiful ground, which we feel would result in greater problems than they already have. DON'T MOVE IT!

Sincerely,

[illegible]

[illegible]

#41 CR 227
Durango Co. 81301

1/7/85 443

ATTENTION MANAGER
U.T.R.A U.S. Dept. Energy

6.20.1 As a resident of Durango, Colorado I do NOT wish to see the uranium tailings pile moved, but rather see it STABLIZED!

6.16 Further I would like to see the stablized pile as a WAR Memorial & a reminder of what the "Manhattan Project" signifies.

The benefit of a memorial could be an added point of interest for the town in the world tourist market. This could help amorize any cost in the long run. Do it artisticly!

Bill Boland
Durango Co.

488

1347 County Road 316
Bayfield, CO. 81122

7 January 1985

Mr. [illegible]elis
Uranium Mill Tailings Project Office
U.S. Department of Energy
5301 Central Ave. NE
Albuquerque, N.M. 87108

Dear Mr. Themelis,

6.20.1 As a concerned citizen I would like to state my preference regarding the tailings pile at Durango, CO. It should be stabilized in place for the following reas[illegible]

6.10.4 1. There has been no conclusive evidence of an increase in cancer in the area - even from the people who worked there during the milling.

2. Any disturbance of the pilings will result in added exposure from the dirt spillage and dust for the entire area.

3. The dust and dirt used to cover it in place will not have the added threat of radiation because it will be ordinary soil.

4. It is by far the cheaper of the options, and is the preferred choice of all citizens with whom I have talked.

Very truly yours,

L. Brissette

Leslie C. Brissette

Jan 3, 1985

Dear people

Please make this letter part of your public record regarding the Durango uranium mill tailings pile.

The debate over what to do with the uranium tailings has been going on for some time now and promises to come to a close in the near future.

6.20.2 But the people of Durango have never had any realistic, viable alternatives presented to them about what to do with the tailings. Instead they have been offered five "alternatives" of which all five are weak, biased and sorely limited in vision; hardly the material to base an intelligent decisision on.

The People of Durango need some strong alternatives to make a decision with. We also need more time to allow the local public to develope a meaningful dialogue with people in your office in Albuquerque and our representatives in congress.

6.20.1 I attended the public hearing, here at the La Plata Co. fairgrounds, shortly before Christmas. I didn't speak, I listened, and it seemed that the public was generally apposed to moving the pile to another location. I too am apposed to moving the pile. I think that the radon gas emissions are the least of our worries, when faced with loading the tailings into trucks and hauling them to another sight. To begin with you create two contaminated sights out of one.

6.20.2 Secondly, and most importantly, I think the effects of radioactive dust are of far greater danger to people than the radon gas. This point has been poorly represented in the material I have read and I would venture to guess down played in it's signifficance, by those who would like to see the pile moved. I Seriously doubt the efforts to keep down the dust will be as effective as promised.

I, as head of one family in Durango, simply won't keep my family here, if the tailings are moved to another sight. And I think many others will follow in the exodus. The economy would suffer greatly for this, as well as the loss of turist trade, due to bad publicity.

The "Stabalize In Place" solution should be looked at in greater depth, and the people of Durango given five sound alternatives of stabalizing in place, (not one pathetic pseudo solution).

If we people of Durango seem to be dragging our feet, now that help is knocking on our door it is because we want to see the right thing done with the pile, not be bullnosed into a mediocre solution to a complex problem. Please listen to our input and let us help make the decision a good one.

Sincerely,

Robert Schwarz
2403 C.R. 203 # 10
Durango Co. 81301

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The Earthen Vessel elegant simplicity in stoneware

Jan. 8, 1985

John D. Themelis
U.S. Dept. of Energy
5301 Central Ave NE #1700
Albuquerque, NM 87108

Re: Durango:

Many business people like myself were not able to be present at hearings here in Durango because of schedule conflicts, so I am submitting my comments for you.

6.20.1 I favor stabilization of uranium tailings - that option is least cost method, plus it will not create serious air/noise pollution problems that would inevitably result if tailings were removed. Importantly our economy in

6.17 Durango is delicately balanced on tourism and the option to remove tailings would be detrimental to a continuation of tourist traffic and visitor growth. Moreover an increased measure of safety to one's health is of major concern from dust and re-emergence of radiation if removal is undertaken.

Stabilization is the only logical course to follow.

Sincerely, Daniel G. O'[illegible], owner

835 Main Ave. • Shop 223 • Durango, Colorado 81301 • Phone: (303) 247-1281

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January 7, 1985

John D. Themelis
U. S. Dept. of Energy
UMTRA Project Office
Durango DEIS Comments
5301 Central Ave. N.E., Suite 1700
Albuquerque, NM 87108

Dear Mr. Themelis,

6.20.1 I am a resident of western LaPlata County, Colorado, an area known locally as the dryside. Because of my proximity to the uranium mill tailings in Durango and the various proposals dealing with their disposition, I must make my feelings known. To begin with, I sharply disagree with the published preference of the U.S. Dept. of Energy. The transportation and reclaimation of the tailings in Long Hollow imperils my health, safety, and welfare. I offer these reasons:

6.12 1) The increased likelihood of my having a vehicular accident with the hauling trucks on my twice daily, daylight, commutes to and from work.

6.72 2) In an area nicknamed for its lack of water the Long Hollow alternative creates the possibility of groundwater contamination in the watershed of what little water we do have.

6.17 3) The traffic and stygma attached to this hazardous waste, compounded by the length of the project obstensibly places the real estate value of my property in jeopardy and potentially robs me of profitable subdivision or [illegible].

These are only a few of the most important reasons I believe the U.S. DOE must reconsider its alternative preference. I can only hope my statements will suggest either the stabilization in place or the move to Bodo Canyon as the only competing alternatives in consideration of the health, safety, and welfare of the LaPlata County community.

Sincerely,

Craig N. Larson

Craig N. Larson
144 Trail Road
Hesperus, CO 81326

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2007 Crestview Drive
Durango, Colo. 81301

January 7, 1985

James A. Morley, Project Mgr.
UMTRA
U. S. Dept. of Energy
Albuquerque Operations Office
5301 Central Ave., NE
Suite 1700
Albuquerque, N. M. 87108

Dear Mr. Morley:

The President of the United States has asked us all to stop relying on the Federal Government for all our needs. The government has enough to do just providing the services that are essential to public welfare and cannot be handled by the States or the private sector.

As an affected, long-term resident of Durango, Colorado, we wish to express our thoughts and feelings regarding the "problem" of the uranium-vanadium tailings piles on the south end of Durango. Our family has strong feelings in this regard since this is our home and our lifelong investments and personal health are of prime interest to us. We hope that some well-meaning outsiders will not put their philosophies and hypothetical, statistical extrapolations above our personal concerns and wishes. We certainly would not foist our beliefs and actions on their personal living situations. We are of sound mind and have a moderate degree of intelligence so that we do not have to depend on some higher authority to conduct our lives.

6.10.4 Thousands of us have reared our children in this small community of our choice with no empirical evidence showing ill-effects attributable to the tailings piles. To our knowledge, we haven't even found a rat with a cancer around the piles! We have relatives who worked at the site for years and they feel the same way we do. We "survived" the years of tailing dust storms and are more than pleased with the present condition of the piles.

The inferred, anticipated health hazard potential is miniscule even if the assumptions of the experts are accepted as being valid. A one-day auto driving moratorium in the U. S. would save more lives and injuries than thousands of years of effect of the tailing piles.

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We also feel strongly that the economic value of the recovery process of the tailings piles should not be of any consideration in comparison to the populace's right to continue their lives without disruption of the tailings piles.

0.3 Please give utmost and serious consideration to the majority of people living here whose personal lives are at issue. We don't wish to tell anyone else how to live their lives and trust that other Americans would feel the same. There are more important and constructive ways to spend tax dollars, e.g., housing for street people, down on their luck and dying in the cities, food for Americans who are starving and can't feed themselves or their families, etc.

0.1 Please leave the pile where it is. We are proud Americans who are not asking for government assistance and just wish to be left alone. If there persists to be a need on someone's part to do something to "protect" us in our ignorance, just cover up the piles!

Thanks for giving us consideration for deciding our own destinies. We promise not to interfere with yours.

Sincerely,

Nicholas J. Heidy

Nicholas J. Heidy

Helen R. Heidy

cc: Mr. Ronald W. Reagan
President of the United States
The White House
Washington, D. C. 20500

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June 8, 1985

John G. Themelis, Project Manager
Uranium Mill Tailings Project Office
U.S. Department of Energy
Albuquerque, N. Mex. 87108

Dear Mr. Themelis:

Comments on DEIS - Uranium Mill Tailings Remedial Action, Durango, Colorado - La Plata County.

6.10.4 For 25 to 40 years La Plata County residents have lived with the tailings piles without much concern or adverse effects. Now we are told we are endangered by radioactive elements in air, water & soil.

The piles have settled and should be left alone. They are not as dangerous now as they will be if they are excavated and relocated to another area to contaminate it. All the gouging and uprooting of the mountain will release tons and tons of dust and gases. The trucks carrying the material will distribute more.

6.20.4 Truck drivers and machine operators on the job will work and breathe this dust and be far more endangered than residents of Durango would be leaving the piles in place. This contamination would go on for from 12 months to 82 months depending on which alternative is selected.

By trucking this material to another location a different land and people will be contaminated. No one wants these tailings on their land.

6.1 In Alternative 3 - Bodo Wildlife Area - a wildlife mitigation plan would have to be implemented to mitigate the impacts on the area. This means

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that some rancher will probably be threatened with land condemnation - unless there is some protection made that any land be gotten only from willing sellers. Another plan would be to get land from people who plan to benefit from moving the piles.

My recommendation would be to leave the piles where they are - or stabilize them and do something to keep them from leaching into the Animas River.

Alternatives 2, 3, 4, & 5 are costly, our government cannot afford this expense!

Sincerely,

Violet L. Gwaltney
Steward Ranch
4385 County Rd. 207
Durango, Colo. 81301

Mr. John G. Themelis
Project Manager
Uranium Mill Tailings Project Office
U.S. Department of Energy
5301 Central Avenue, NE
Albuquerque, New Mexico

Mr. Themelis:

I spoke my opposition to your selection of the Long Hollow disposal site at the public hearings in Durango, Colorado on December 18, 1984. I am writing to once again voice my opposition to the Department of Energy's proposed plan. I would like to address a number of issues I did not have time to express at the public meeting.

My first concern is that my family and I live about 3,500 feet west
6.19 of the Long Hollow site - not 5,000 feet as the DEIS incorrectly states in
a number of places. My wife runs a day care center at our home, and
10.3 the disposal at Long Hollow would have a large negative effect on the business and create new, unwanted health hazards to the children that stay there. The traffic on County Road 141 would be intolerable. The increased deaths and injuries from traffic related accidents would exceed the cancer deaths expected if the tailings piles were left as they are.
6.12 The noise at our place would be near the equivalent of living back in town. We moved where we did to get away from the noise, traffic, and pollution that you are now proposing to force upon us. Your DEIS is quick to mention the large real estate value increases at the Durango site if the piles are removed. But there is no analysis of the decreased property values at the Long Hollow site, along the disposal route, and for the surrounding
6.17 properties. It would appear a few landowners in the Long Hollow area are expected to not only accept the unpleasant health hazards from moving the piles - they are also expected to pay for this new hazard in decreased property values. That is hardly fair - not even in Russia.

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I think it is premature to evaluate the different alternatives when the exact location at Long Hollow is still in question. In addition, without the right of way costs, and administrative and legal costs included in the analysis, a fair cost comparison cannot be made. The legal complications and costs of acquiring right of way from an unwilling seller at Long Hollow could have a significant impact on the economic
6.9 and scheduling criteria for moving the piles. Also, the engineering and overhead costs for the Long Hollow site are extremely low. Bringing these to a realistic level would increase substantially this already most expensive site. The price of the reprocessed uranium has also been over estimated. This makes the reprocessing plan much more attractive than it would be in reality. The Long Hollow site also needs to include the cost of a new road to the site so that County Road 141 was not used at all. The intersection of County Road 141 and 211 is dangerous under existing conditions. With the huge increase in truck traffic, disaster is
6.12 eminent. The use of 141 by school buses and residents in the Red Mesa area makes it an unacceptable route for the number and size of trucks proposed. In addition, the road is a very popular route for bicyclists. Use of the road for transporting the piles would virtually eliminate its use by bicyclists.

The selection of Long Hollow was initially selected by the Department of Energy on the basis of things such as vegetation, wildlife, soils, hydrology, meteorology, air quality, and other such factors. When dealing with the removal of hazardous wastes the most important consideration should be health hazards from moving and restabilizing the wastes and the deaths and injuries from actually moving the wastes. When the four
6.3 alternatives in the DEIS are evaluated on increased lung cancer rates, increased cancer rates, traffic deaths, and disabling injuries the preferred site or alternative becomes stabilizing the piles in place, with disposal at Bodo Canyon the next best. The Long Hollow site is by far the worst plan. When the truck traffic, time span for moving, energy used, and fuel used is included; the relative ranking of alternatives is the same, with stabilizing in place the preferred plan.

[illegible] evaluated and mitigated, but they should never [illegible] actually select the best site for disposal.

Other factors also seem to be inadequately addressed in the DEIS. What effect
6.13 does the dust stirred up by removal and transporting really have? What effect does using the Long Hollow site have on the sheep operation that exists there? What
6.72 effect is there by removing the 2 stock ponds at Long Hollow? What about the irrigation ditch that presently provides water to the Long Hollow area? What potential
6.17 effects of people living in Long Hollow below the site? Your DEIS says background radiation levels are met by predicted results - not actual monitored results. This is hardly an acceptable method. How about the traffic increases past the Division of
6.12 Wildlife house in Ridges B[illegible]?

6.17 The DEIS states that all concerns from the scoping meetings were addressed in the DEIS. That may be true, but real answers to the questions and concerns are nowhere to be found. There are a lot of facts and figures presented. Even your own numbers (right or wrong) dictate either leaving the piles in place or moving them [illegible] Bodo Canyon. No sound engineering judgement could select the Long Hollow [illegible] preferred alternative. And with all the facts and figures, no real [illegible] effects to the most involved citizens (those of us *living* in the area you [illegible] to destroy) is given. I believe the DOE should completely re-evaluate their plans and alternatives and I believe either stabilizing in place, moving to Bodo Canyon, or doing nothing will come out as the preferred alternative. I hope your final EIS treats the Long Hollow area citizens more fairly. Thank you for your time.

Sincerely,
Charles D Semmler (Charles D. Semmler)
8587 County Road 141
Hesperus, Colorado 81326
01/07/85

3077 E. 4th Ave.
Durango, CO 81301
23 FEB 85

Project Manager
Uranium Mill Tailings Project Office
U.S. Department of Energy
5301 Central Ave. N.E., Suite 1700
Albuquerque, NM 87108

Dear Sir,

6.20.1 The Durango radioactive mill tailings, which are a danger to peoples safety should be left in their present place. The best plans are either "Alternative one," to leave them as they are, or "Alternative two," to add to them what radioactive material is practical to gather from vicinity sites and stabilize in the present tailings pile site. Moving the material to a clean site may not accomplish the result of a clean Durango site. The Bodo Canyon site is geologically much more active than their present place ~~and~~ would result in a sooner release of the material to the area below.
6.12 To put the material in the Long Hollow site would probably require the use of heavily loaded trucks along a public road, also a danger to peoples safety.
6.20.1 So leave it where it is; perhaps put a tall piling fence to divert a large flood from the place.

Sincerely, Georgiana Spencer

February 10, 1985
P.O. Box 325
La Plata, NM 87418

Project Manager
Uranium Mill Tailings Project Office
U.S. Department of Energy
5301 Central Ave. NE
Suite 1700
Albuquerque, NM 87108

Dear DOE,

These are my comments on the Draft Environmental Impact Statement (DEIS) for Remedial Action at the former Vanadium Corporation of America Uranium Mill Stie at Durango, Colorado. I presented verbal comments at the public hearing on December 18, 1984 and I am now sending technical comments to supplement the ones I made at the hearing.

6.15 1) In several places, the DEIS states that information is not known about the Long Hollow (LH) site. The Durango site and the Bodo Canyon site have been described separately even though they are only about a mile apart. The LH site, although it is eight miles away, has been ASSUMED to be like Bodo. No information from the LH site is presented. This assumption was made with regard to wind distributions on page 85, with regard to atmospheric stability on page 85, with regard to probable maximum precipitation on page 97, with regard to surface water quality on page 97, with regard to soil radionuclides on page 111, with regard to vegitation radionuclides on page 111, with regard to ambient total suspended particulate (TSP) concentration on page D33, with regard to computer model inputs to predict changes in TSP on page D33, and with regard to vegetation on page G20. In addition, the section on radiological field study results (H.1.3) presents no data for Long Hollow on airborn particulate radionuclides, ambient radon-222 concentrations, or sediment radionuclide concentration. Any one of these indicates a serious gap in our knowledge. Taken together they indicate a total ignorance of the affected enviroment at Long Hollow. The final EIS must include a complete description of all the above items based on studies taken at the Long Hollow site.

6.10.2 2) Page 145 states that the carcinogenicity of radiation was taken to be 120 excess cancer deaths per 1,000,000 person-rads of whole body exposure and 20 deaths per 1,000,000 person-rad of exposure to the bronchial epithelium. This represents only one choice of values from the range of scientific uncertainty. The DEIS must make clear that the carcinogenicity is not known with any accuracy and should include a range of values representing the diversity of scientific opinion. This range varies from the quadratic model, which predicts essentially no risk at these exposure levels, to the results of Goffman (John W. Goffman, Radiation and Human Health, Pantheon Books, New York), which gives values up to 6000 excess deaths per 1,000,000 whole-body person rads (p. 184) and 1560 deaths per 1,000,000 person-rads to the bronchi (Table 14). The DEIS should use this range for all descriptions of cancer risk, including but not limited to Table 1.3, Table 5.1, Table 5.2, and section 5.18. I, for one, hope that radiation is safer than Goffman's results, but being concerned about public health, I must assume it is hazardous until scientifically proven otherwise.

.10.2 3) Pages H72-H75 estimate the radiation dose to workers from inhaled particulates. The soil to air transfer factor is calculated using the approximation that dust is suspended uniformly over the entire site area. The legal area of the site, however, is irrelevant as far as dust suspension and dispersal is concerned. The dust is actually suspended in a few small areas where equipment is operating and the people exposed are also in those same areas. To get a more realistic estimate, I calculated the transfer factor, following page H73 using these values:

suspension rate = 32 #/hr (scraper, sec. D.2.6),
area = 4 meters wide by 50 meters long,
all other factors taken from page H73.

The resulting transfer factor is 3.6E-8 (in contrast to the given factor of 4.1E-10), and would be the same regardless of which site the scraper is operating on. One would hope that particulate concentrations at the cab of heavy equipment have been measured experimentally, so we don't have to use this type of crude calculation. But if a calculation is to be used, it must be based on realistic values which reflect the fact that the operator is very close to the dust source. (My calculation does not include the fact that one operator may be exposed to dust from other equipment besides his own, an effect which can only increase the exposure.)

The combined effect of items 2 and 3 indicate that the DEIS may have underestimated the lung cancer risk to workers from inhaled particulates by as much as a factor of 6760.

.10.2 4) The estimates of radon sources for the alternatives (section H.3.1.2) neglect several contributions. First, for alternative 3, 4, and 5 the pile is not going to be moved at a uniform rate of so many acres per month. Rather, section A.5.3.1 indicates the pile would be moved from the top down and the exposed area would remain nearly constant until the very end of the project. The radon source terms must be increased to include this effect. Second, for alternatives 3, 4, and 5 there is no estimate of the radon released during burial at Bodo or Long Hollow. Although in 2 weeks the radon may not reach full secular equilibrium, the radon levels are 92% of equilibrium (since the 3.8 day half life is also the time required for the level to build to half of equilibrium). Over the two weeks, the average release rate is 64% of equilibrium, not zero as is stated. The release during his time must be included as a radon source term. Third, the DOE has indicated that work for alternative 5, and perhaps others as well, would be conducted only during the summer months, May through October. Radon releases during the non-working winter months have not been included and must be added. Finally, one term which is overestimated, the long term release from alternative 2 is computed as 20 picocuries per square meter per second over 135 acres. However, the pile after completion is only 38 acres and the estimate must be reduced correspondingly. If these errors had occured consistently or randomly one might believe they were the result of carelessness or ignorance. But since all these errors minimize the hazards of moving the pile (especially of the preferred alternative 5) and accentuate the hazards of stabilization in place.

6.15 crushing the tailings. This obviously creates a great potential for dust release which appears not to have been included in appendix D where other dust releases are estimated.

12) Section 3.3 "Environmental Impacts" and Chapter 5 "Environmental Consequences" are not the appropriate places to discuss the dollar value of land under the Durango site (p.71, 175ff). These, along with many other factors, should be treated in a section on economic impacts. Such a discussion must include the loss in value at and near the Bodo and Long Hollow sites as well as how the nearby landowners will be compensated for this involuntary loss. The statement on page 176 that "development
6.17 (near the Durango site) seems to indicate that nearby landowners' decisions are not affected by any health-related or other fears of any danger related to the presence of tailings and radioactivity" is patently false. A better explanation is that those people who base their decisions on the health effects have moved elsewhere, some of them to the Long Hollow area, to stay away from the tailings pile. The losses these people suffer and the process by which they will be compensated need to be adressed.

13) The sections on potential future developement at Long Hollow (I.4.5.4 on page I28) and impacts on land use for alternatives 4 and 5 (I.6.1.4 and I.6.1.5 on pages I39-40) make no mention of the Animas - La Plata water project. When this project is built, the
6.13 Long Hollow area will become prime recreational developement land. This is especially true since much of the land around the Ridges Basin Reservoir is publicly held land and will not be available for developement. The land use impacts need to be reassesed and the radiological impacts on population influx need to be included in the final EIS.

14) In several places (eg. pp. 47, 49, 58, A28-30, A50-53, and A73) it is stated that all contaminated water will be evaporated rather than released to the environment. However, on page 212, it is stated that "the use of water would not be a permanent
6.4.2 commitment of the resource since it will be released to the environment following treatement." In the southwest, evaporated water is no more useful than burned engine fuel. In both cases the atoms still exist in the environment, but they have been lost as far as any beneficial use is concerned.

15) Page 214 states that handling of contaminated materials would stop during periods of heavy wind. What criteria are used to
6.4.1 define "heavy wind?" Who decides when to stop work? How quickly can work be stopped and exposed surfaces protected? Can this be accomplished in the short warning time before summer thunderstorms? These questions must be answered in the final EIS.

16) Section 5.21.8.2 states that there will be extensive
6.10.1 monitoring of radiological exposure to the workers and the community. Will full and complete records be available to the public on a timely basis?

17) Finally, I am enclosing a copy of the results of the CCAMP
6.20.1 public opinion survey on the tailing pile issue. There are many comments and concerns raised by the people surveyed which need to be addressed. The results show that there is strong local

the overall effect appears to be deliberate.

5) Section A.4.2.2 describes the radon diffusion through an earth cover for only one moisture content. Table A.3 indicates that only the "optimal" clay miosture content was considered. The final EIS
6.4.1 must include a range of flux estimates based on different conditions, including the extreme case of a bone-dry cover. The DEIS presents partial results only for alternative 2, the possible range of fluxes must be given for all other alternatives as well.

6) Page H37 states "areal food production, and forage uptake by animals was assumed to be zero according to data presented in section H.1.1.3." However, the section referred to makes no mention
6.10.2 of food production or forage uptake. Since food is potentially an important pathway for radiation exposure, especially for elements like radium which can be concentrated in milk, this pathway must be studied, not ignored.

7) The EPA standards (40 CFR 192, section II.A.1.b) conclude that radon exposure in vicinity properties is as great as any other health hazard the tailings present. At $7.8 million (p. B4) it is also a major contribution to the cost of remedial action. It is therefore completely inappropriate that the vicinity properties be relegated to a mere 16 pages buried in the appendices. The vicinity properties must be treated in the main body of the final
6.18 EIS in as much detail as the pile itself. This must include, in detail, how many properties might be involved, the extent and location of contamination, the current radon and gamma levels, the alternatives for remedial action at each site, the time required (for individual sites and collectively), the health and environmental impacts each of these alternatives would have, and the mitigation measures to be used. Without this information it is impossible to asses the environmental impacts of the project.

8) Since Long Hollow is in a shallow ground water region, the protection of ground water is entirely dependent on artificial barriers. It is stated repeatedly (eg. p. 71, 170) that the longevity of these bariers is questionable and that "degredation
6.7.2 of water quality ... would be possible" (p.70). We all know that plastic sheets are vulnerable to damage from roots, sharp rocks, and burrowing animals. The final EIS must include an analysis of the potential contamination if the artificial barriers fail and, for whatever reason, are not repaired.

9) Page 163 indicates that the water requirements at Long Hollow would be significant, 10,000 to 35,000 gallons per day. The actual
6.8.2 source of the water needs to be identified and shown not to conflict with existing water rights. The means for transporting this amount of water to the site needs to be discussed.

10) The description of reprocessing (pp. 64, A87-88) must include the nature of the tailings after processing is complete. This'
6.8.2 should cover factors like: moisture content, pH, and concentration and solubility of radionuclides and toxic heavy metals. It should also address the possibility of dissolved hazardous materials being drawn to the surface by capillary action and evaporation.

11) Page A87 indicates that reprocessing would include drying and

opposition to moving the pile anywhere; people feel that too much radioactive dust would be generated at the Durango site. Any decision to move the pile is therefore likely to lead to lengthy court cases and other efforts to prevent the move. SIP does not seem to have this opposition. Although some people feel it is not the best alternative (10% want less done, 15% want more done), very few people felt it would be a serious mistake. As part of a government responsible to the people, the DOE should change its preferred alternative to stabilization in place.

In summary, I feel there are many serious problems with this DEIS. I expect these problems will be corrected in the final EIS. When it is available, please send me a copy of the final EIS, and other documents regarding his project, at the above address.

Hoping for a safe future,

Paul Bendt

Dr. Paul Bendt, Ph.D.

January 6, 1985

Thomas Lepisto
670 C.R. 207 #3D
Durango, CO 81301

John G. Themelis, Project Manager
Durango D 13
Uranium Mill Tailings Project Office
U.S. Dept. of Energy
5301 Central Avenue, NE, Suite 1700
Albuquerque, NM 87108

Dear Mr. Themelis:

I am writing as a concerned citizen to register my views on the disposition of the Durango uranium tailings pile.

6.20.1 First, I oppose any action which would in any way affect the Bodo Canyon wildlife area. I totally oppose option 3, moving the tailings to Bodo Canyon. I also oppose the use of soil from the Bodo Canyon area for covering the tailings in the course of stabilizing them in place (option 2). As a resident of La Plata County concerned with maintaining wildlife habitat, I believe that either of the above actions would add to the county-wide problem of damage to wildlife. This county is experiencing rapid real estate development which almost certainly will reduce areas available for wildlife, especially north of Durango. We cannot afford to lose what little conservation land we have.

6.11 I would also question whether it is legal for any other use of Bodo Canyon land to take place, since the Nature Conservancy deeded the land to the Colorado Division of Wildlife on the condition that it be used solely for maintaining wildlife habitat.

6.11 Second, I oppose any action which would require widening of La Plata County Road 211 to transport tailings. Activity on this road would have an adverse impact on wildlife and contribute to degradation of the natural environment in an area which I and many other local residents value for its natural beauty.

6.12 I feel also that transporting hazardous wastes along the winding, dangerous routes provided by county road 211 and Wildcat Canyon Road would be fraught with problems, quite likely including cost overruns and environmental damage and risk to the lives of the drivers. Fatal accidents on Wildcat Canyon Road have occurred.

6.51 Finally, it is clear that local residents oppose moving the tailings. Since reprocessing is not economically viable at the present time, option 5, the Long Hollow site, appears questionable. Since option 1, no action, is not allowed by current law, I would favor stabilizing the tailings in place with soil, gravel, etc. obtained from some site not in Bodo Canyon. This would be a modified option 2.

Sincerely,

Thomas Lepisto

Thomas Lepisto

Sunflower
Complete Plant Service
Wendy Bryant 545 6th Ave · Durango, Colo. 81301 · 247-5671

1-8-85

Dear Mr. Themelis,

You can imagine **Durango** at the peak of the **Holiday** Season – we're what these skiers are dreaming – hoping their hard-earned vacation will be! the whole town pulls hard to keep the smiles on the faces of the skiers. My point is ...

Why Mr. Themelis were both public meetings concering Durango's tailings pile scheduled during this time – when the very people most concerned were at their
6.20.1 busiest time of the year?

The citizens of Durango are not inert lumps of protoplasm but concerned and aware Americans. We love our town – we have hopes for our children and our businesses. Please – give us more time to consider this problem. The Tailings pile can wait a few days longer and we All want to do the right thing.

Sincerely...
with trust in your good will and good judgement,
Wendy Bryant

I was convinced that alternative 2 was best for us in Durango. Then I started reading about "hot spots" of child deformatives in the Shiprock area.
6.10.2 As there may be some connection between tailings & old mines to these epidemics of birth defects, I have decided to request further study from your department. I still like #2 but, can it be done so that no further
6.20.1 health hazards will occur and for centuries to come? If not, we may need some sort of pipeline to move the
6.3 pile; Trucking is out of the question as impact on us will be too great.

I suggest you consult with Dr. James Wilson c/o Center for Disease Control in Atlanta. Given the piles radiation out put, Dr. Wilson or other teratologists [since this radiation
6.10.2 is a teratogen, can pass thru the mothers body to the fetus] could determine if leaving it in place will give us a potential birth defect cluster.

I hate to see this project delayed any longer but
6.20.1 I feel I must request additional comment time & more study on #2.

Sincerely
Jerry Carney

460

Jan. 8. 1985

Dear Mr. Themelis,

6.20.1 I object to moving the tailings pile to Long Hollow or Bodo. The pile should be stabilized in place because it's the best of the five alternatives.

Moving the pile would be dangerous to the residents of this community and disastrous to the tourist industry.

6.10.2 The information related to the hazard incurred of breathing the contaminated dust is too inconclusive to provide us with any sense of comfort.

I do not believe there is sufficient water nor enough human motivation to properly dampen the hundreds of trucks or the pile during the 5 - 7 years required for removal.

If you are listening carefully, you can do nothing but conclude that the majority of Durango residents do not want the pile moved off site.

Please consider your decision carefully and respond to the protests against removal.

Sincerely,

Joe E. Zerrand

1033 C.R. 142

Durango Co

81301

cap allen • registered professional engineer

Mr. James A. Morley
Project Manager
Uranium Mill Tailings Remedial Action Project
US DOE
Albuquerque Operations Office
5301 Central Avenue N.E. Suite 1700
Albuquerque, New Mexico 87108

Ref: Durango Draft EIS

6.20.2 The citizens of La Plata County have had the opportunity to view the results of the near $1,000,000 the Department of Energy has seen fit to spend in "study" of our local "problem", the tailings pile. This Draft Environmental Impact Statement represents the input of a number of well paid contract "experts" whose actual facts it might well take a similar amount of money to argue with. As with most EIS tomes, the document takes on the flavor of chosen alternative justification rather than a fair evaluation of the impacts to the environment.

500

Any but the most expert is left in the posture of examining the conclusions of the DEIS, rather than their validity. This document is unusual in that it puts a human life value on the consequences of non-compliance with EPA regulations. This is quite unusual as government regulations go. We need to build sewer plants to comply with EPA regulations without the knowledge of possible death or injury resulting from non-compliance. We put scrubbers on power plant stacks without exact death results. Since most of us understand nothing of radiation, it seems as if the idea of deaths per time is a stab at justifying the danger of radiation. If so, the unit of measure shows just how un-needed the DEIS effort was.

6.10.4 The DEIS tells us that 4.4 lives will be lost over 1000 years if the citizens of Durango are so pitifully remiss as to allow the piles to remain in place. In 100 years, this would be 0.44 additional deaths. In the same period, assuming a 3% growth rate, and a 0.6% death rate, 110,000 people will die anyway most likely from all causes, in La Plata County. How cost effective is it to spend from $16 million to $58 million for half a death in 100 years?

Other cases of "life cost management" can be found. The Colorado Department of Highways is going to spend $6 million dollars to prevent recurrence of 5 deaths in 20 years that have occurred on Riverside Slide near Ouray. This 25 deaths in 100 years number is a 150 times to 550 more cost effective outlay of funds than the tailings movement alternatives.

The act of moving and processing the tailings will create additional dangers to

6.10.4 human life. Big trailer dump truck running on dirt roads, busy paved roads, steep roads, snowy roads, icy roads- up to 450 trips per day! The DEIS estimates that this activity will cause 0.014 worker deaths in the case of Alternative Two, with the other Alternatives higher. That wild statistic, even if we beleive it, represents 3 times the chance of death in the same period than from the untouched tailings. How can we possibly move the tailings if we are justifying it in human life terms?

6.10.4 It is typical of any draft EIS process that the required responses to public input are always found by the consultants within the prepared document- whether the answers are there or not. (Please see page 125 where Mr. Jones questions are answered, etc.) This is generally an end run technique in the interests of time and republication costs. This technique is undoubtedly going to occur again. The best end run of all is to state that Alternative 1 is unacceptable because it does not meet EPA standards. It is always distasteful to hear the bureaucratic mind blindly cite a regulation as justification for any action. In this case I think the tailings issue deserves a full airing of cost effectiveness and "honest" cost-benefit analysis. If the denominator must be in terms of human life, then let us use that.

In no case should we accept such a long disruption of life in Durango just because some regulation is being exceeded and one person in 227 years may die. No one should move any tailings until substantially more proof is presented that such activity is needed at all.

Unfrotunately, it may cost us another $1 million of Deficity money to give us such an answer.

1/7/85

462

913 N. Hidden Valley
Durango, CO 81301
January 6, 1985

Ben McCarty
DOE
Box 5400
Albuquerque, NM 87115

Dear Mr. McCarty:

6.20.1 I am in favor of disturbing the Durango uranium mill tailings pile as little as possible. I therefore support your second alternative, "Stabilization of all material at the Durango site."

Yours truly,
Cheryle Brandsma

463

PURGATORY

DURANGO SKI CORPORATION · P.O. BOX 666 · DURANGO, COLORADO 81301 · (303)247-9000

January 12, 1984

John D. Themelis
U. S. Department of Energy
UMTRA Project Office
Durango DEIS Comments
5301 Central Ave. N.E., Suite 1700
Albuquerque, New Mexico 87108

Dear Mr. Themelis:

I am a resident of La Plata County, Colorado and wish to state my position on the Draft Environmental Impact Statement (DEIS) for the Uranium Mill Tailings Project.

6.20.1 I urge that the DOE extend the comment period for an additional 120 days since both the public meeting and public hearing were held during the Christmas holiday season. In addition, the DOE must provide additional essential information within 30 days so that we can complete our evaluation of the alternatives you presented.

6.17 The DEIS contained no evaluation and analysis of the economic impacts related to our tourist industry, which is our primary source of income. We are entitled to a detailed analysis for each alternative that is presented in the DEIS and request a detailed model and technical analysis.

5.1 Only one engineering design for Alternative 2, Stabilization in Place, was presented. DOE must develop and present at least two other engineering approaches since we are not certain that the one presented is the most technically sound recommendation.

It is within the DOE's jurisdiction to extend the comment period.

Sincerely,

Timothy A. Buzzard
Vice-President, Resort Development

TAB/jac

473

Conclusion:

In conclusion the Southern Ute Indian Tribal Council is opposed to Alternatives 3, 4, and 5. The complexity of the Durango Uranium Mill Tailings issue makes it extremely difficult to resolve. However, based on the available information the Tribal Council and their representatives feel that Alternative 2 - Stabilizing of the Durango site, would provide the most long and short term benefits for the people and ths surrounding natural resources. This preference is conditioned upon the acquisition of sufficient information that demonstrates a reasonable necessity for taking any action.

Robert Jefferson
Environmental Specialist

Chris A Baker
Tribal Chairman

464, 465, 466, 467, 468, 469, 470, 471, 472

Durango, Colorado
November 30, 1984

U. S. Department of Energy
Uranium Mill Tailings Project Office
5301 Central Ave., N.E.
Suite 1700
Albuquerque, New Mexico 87103

RE: Durango Mill Tailings Pile

Dear Sirs:

We, the undersigned, have lived in Durango for a number of years and feel that Salt Lake City had the best solution - LEAVE the uranium mill tailings pile where it is!

Stabilization of the tailings pile on site seems the most feasible and economical solution.

We would appreciate your taking our views into consideration when making the final decision.

Sincerely,

464 Nanna Alford, 1807 W 3rd Ave
465 Ethel Dyer 127 Riverview
466 Velene Eggleston 135 Riverview Dr.
467 Ruth Pankman 356 E [illegible]
468 Evelyn Bugg. 191 Riverview Dr.
469 Wilma DeNier - 2707 Colorado Ave.
470 Marda Simpson 196 Riverview Drive
471 Margaret Nunn 27 Bacus Ave.
472 S. Y. Alford 1807 W 3rd Ave.

SOUTHERN UTE INDIAN TRIBE
Tribal Affairs Building
P.O. Box 737
Ignacio, Colorado 81137
303-563-4525

January 4, 1985

Mr. James A. Morley, Project Mananger,
Uranium Mill Tailings Remedial Action Project
U. S. Department of Energy
Albuquerque Operations Office
5301 Central Avenue, NE
Suite 1700
Albuquerque, NM 87108

Dear Mr. Morley:

The Southern Ute Tribal Council and it's representatives wish to express their opinions and concerns about the proposed alternatives of the Durango Uranium Mill Tailings Remedial Action Program. The listed comments are based on information provided by the U. S. Department of Energy's Draft Environmental Impact Statement, Remedial Actions at the Former Vanadium Corporation of America Uranium Mill Site, Durango, La Plata County Colorado, Volumes I and II, and based on, the Southern Ute Tribal Council's concern for the health and welfare of persons affected by the mill tailings and for the proection and preservation of the subject lands and natural resources.

Alternative 1 - No Action

Alternative 1 does not provide for any changes of the existing conditions at the Durango Mill Tailings site. Contaminants will continue to be released into the air, land and water at the same levels which occur today. In essence this is not a feasible alternative if the health and welfare of the people in the surrounding area, and, the value of our natural resources are to be protected from a dangerous condition. It should be noted, however, that the data currently
.2 available does not clearly indicate what the health hazards are with exposure to long term low dose radiation.

Alternative 2 _ Onsite Stabilization

.1 Alternative 2 is considered the most practical and preferred alternative for the Southern Ute Indian Tribe.

Alternative 2 would utilize a 38 acre parcel at the north end of the Durango site.

The amount of contaminated materials which must be moved is substantially less than that required in Alternatives 3, 4 and 5, thus reducing the amount of contaminated dust and chemical pollutants released into the air.

The number of expected accidental deaths and disabling injuries is lower than alternatives 3, 4, and 5. The total cost and the project duration is also less than the other alternatives.

6.5.1 A major concern pertaining to Alternative 2 is: Could surface water runoff seeping beneath the overlain layer of sand and gravel cause piping and erosion of the sand and clay layers above the tailings?

Alternative 3 - Stabilization at Bodo Canyon

Alternative 3 is not the preferred choice, but should be considered if Alternative 2 is not used.

The use of Bodo Canyon would be exposed to pollutants from dust emissions and have adverse effects on the wildlife migration in the area.

6.4.1 The long term intergrity of the disposal system would be endangered by the high velocity surface water runoff.

The total cost, project duration, and estimated deaths and disabling injuries exceeds that projected for Alternative 2 but is less than that for Alternatives 4 and 5.

6.13 A major concern of Alternative 3 relates to problems that may be created with the relocation of the tailings in the close proximity of the proposed La Plata Animas Water Project.

Alternative 4 and Alternative 5

Alternatives 4 and 5 would utilize private lands within the original Southern Ute Tribal boundaries for stabilizing and reprocessing (Alternative 5) the uranium tailings.

The Long Hollow Canyon and adjacent to tribal lands would be exposed to pollutants from dust emissions and from leachate contaminants in the ground water and surface runoff.

It is estimated taht Alternatives 4 and 5 would take approximately 2 plus years and 7 years respectively to complete. The cost for either proposal is calculated to exceed 27 million dollars.

For the duration of either project, the Long Hollow-Durango corridor would be subjected to excessive noise, dust, and traffic. Accidental deaths and disabling injuries would increase.

6.10.2 The mathematical data used to generate health statistics as related to the effects of long term low dosage radiation is highly debatable. Because of this factor the question must be asked whether the number of deaths and disabling injuries resulting from Alternative 4 or Alternative 5 would exceed the benefits of stabilizing and reprocessing (Alternative 5) the tailings at Long Hollow.

It is the opinion of the Southern Ute Tribal Council and its representatives that Alternatives 4 and 5 are not acceptable methods for addressing the Durango mill tailings issue. The short and long term effects on the people and natural resources in this geographical setting negate the questionable benefits of Alternatives 4 and 5.

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Conclusion:

In conclusion the Southern Ute Indian Tribal Council is opposed to Alternatives 3, 4, and 5. The complexity of the Durango Uranium Mill Tailings issue makes it extremely difficult to resolve. However, based on the available information the Tribal Council and their representatives feel that Alternative 2 - Stabilizing of the Durango site, would provide the most long and short term benefits for the people and ths surrounding natural resources. This preference is conditioned upon the acquisition of sufficient information that demonstrates a reasonable necessity for taking any action.

Robert Jefferson
Robert Jefferson
Environmental Specialist

Chris A. Baker
Chris A Baker
Tribal Chairman

469, 470, 471, 472

Durango, Colorado
November 30, 1984

U. S. Department of Energy
Uranium Mill Tailings Project Office
5301 Central Ave., N.E.
Suite 1200
Albuquerque, New Mexico 87103

RE: Durango Mill Tailings Pile

Dear Sirs:

We, the undersigned, have lived in Durango for a number of years and feel that Salt Lake City had the best solution - **LEAVE** the uranium mill tailings pile where it is!

Stabilization of the tailings pile on site seems the most feasible and economical solution.

We would appreciate your taking our views into consideration when making the final decision.

Sincerely,

464 Nanna Alford, 1807 W. 3rd Ave
465 Ethel Dyer 127 Riverview
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470 Mac Sturgeon 196 Riverview Drive
471 Margaret Dunn 27 Bacus Ave.
472 S. T. Alford 1807 W 3rd Ave.

505

SOUTHERN UTE INDIAN TRIBE

Tribal Affairs Building

P.O. Box 737

Ignacio, Colorado 81137

303-563-4525

January 4, 1985

Mr. James A. Morley, Project Mananger,
Uranium Mill Tailings Remedial Action Project
U. S. Department of Energy
Albuquerque Operations Office
5301 Central Avenue, NE
Suite 1700
Albuquerque, NM 87108

Dear Mr. Morley:

The Southern Ute Tribal Council and it's representatives wish to express their opinions and concerns about the proposed alternatives of the Durango Uranium Mill Tailings Remedial Action Program. The listed comments are based on information provided by the U. S. Department of Energy's Draft Environmental Impact Statement, Remedial Actions at the <u>Former Vanadium Corporation of America Uranium Mill Site, Durango, La Plata County Colorado, Volumes I and II,</u> and based on, the Southern Ute Tribal Council's concern for the health and welfare of persons affected by the mill tailings and for the pro-ection and preservation of the subject lands and natural resources.

Alternative 1 - No Action

Alternative 1 does not provide for any changes of the existing conditions at the Durango Mill Tailings site. Contaminants will continue to be released into the air, land and water at the same levels which occur today. In essence this is not a feasible alternative if the health and welfare of the people in the surrounding area, and, the value of our natural resources are to be protected from a dangerous condition. It should be noted, however, that the data currently available does not clearly indicate what the health hazards are with exposure to long term low dose radiation.

Alternative 2 _ Onsite Stabilization

Alternative 2 is considered the most practical and preferred alternative for the Southern Ute Indian Tribe.

Alternative 2 would utilize a 38 acre parcel at the north end of the Durango site.

The amount of contaminated materials which must be moved is substantially less than that required in Alternatives 3, 4 and 5, thus reducing the amount of contaminated dust and chemical pollutants released into the air.

The number of expected accidental deaths and disabling injuries is lower than alternatives 3, 4, and 5. The total cost and the project duration is also less than the other alternatives.

6.5.1 A major concern pertaining to Alternative 2 is: Could surface water runoff seeping beneath the overlain layer of sand and gravel cause piping and erosion of the sand and clay layers above the tailings?

Alternative 3 - Stabilization at Bodo Canyon

Alternative 3 is not the preferred choice, but should be considered if Alternative 2 is not used.

The use of Bodo Canyon would be exposed to pollutants from dust emissions and have adverse effects on the wildlife migration in the area.

6.4.1 The long term intergrity of the disposal system would be endangered by the high velocity surface water runoff.

The total cost, project duration, and estimated deaths and disabling injuries exceeds that projected for Alternative 2 but is less than that for Alternatives 4 and 5.

6.13 A major concern of Alternative 3 relates to problems that may be created with the relocation of the tailings in the close proximity of the proposed La Plata Animas Water Project.

Alternative 4 and Alternative 5

Alternatives 4 and 5 would utilize private lands within the original Southern Ute Tribal boundaries for stabilizing and reprocessing (Alternative 5) the uranium tailings.

The Long Hollow Canyon and adjacent to tribal lands would be exposed to pollutants from dust emissions and from leachate contaminants in the ground water and surface runoff.

It is estimated taht Alternatives 4 and 5 would take approximately 2 plus years and 7 years respectively to complete. The cost for either proposal is calculated to exceed 27 million dollars.

For the duration of either project, the Long Hollow-Durango corridor would be subjected to excessive noise, dust, and traffic. Accidental deaths and disabling injuries would increase.

6.10.2 The mathematical data used to generate health statistics as related to the effects of long term low dosage radiation is highly debatable. Because of this factor the question must be asked whether the number of deaths and disabling injuries resulting from Alternative 4 or Alternative 5 would exceed the benefits of stabilizing and reprocessing (Alternative 5) the tailings at Long Hollow.

It is the opinion of the Southern Ute Tribal Council and its representatives that Alternatives 4 and 5 are not acceptable methods for addressing the Durango mill tailings issue. The short and long term effects on the people and natural resources in this geographical setting negate the questionable benefits of Alternatives 4 and 5.

The Nature Conservancy

Colorado Field Office
1244 Pine Street
Boulder, Colorado 80302
(303) 444-2950

January 10, 1985

Mr. John G. Themelis
Project Manager
Uranium Mill Tailings Project Office
U.S. Department of Energy
5301 Central Avenue, N.E.
Suite 1700
Albuquerque, NM 87108

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Dear Mr. Themelis:

The Nature Conservancy remains extremely concerned about the various proposals to relocate uranium tailings on the Bodo Wildlife Area, and/or to transport such tailings through the Bodo Wildlife Area. I am aware that the Division of Wildlife has expressed concern regarding the DEIS and its inadequacy in terms of addressing wildlife needs and mitigation. The Conservancy considers itself to be a partner with the Division in regard to concerns about wildlife and the adverse impact to wildlife if the relocation and transport of uranium tailings does take place. We share those concerns.

6.11 I feel that the Division of Wildlife and The Nature Conservancy have been extremely cooperative throughout the long process of coming up with the DEIS. We have been clear all along that our concern remains with the wildlife, and have repeatedly asked for a Wildlife Mitigation Plan. Like the Division, we feel strongly that all alternatives, with the exception of "no action", will affect Bodo and that a mitigation plan must address all alternatives.

The Nature Conservancy has the legal right and obligation to preserve the wildlife values at Bodo. I think it is fair to say that unless a thorough mitigation plan is prepared and agreed to by the Conservancy and the Division of Wildlife, we may very well have to enforce our interests in the property. Relocation and transportation of uranium tailings through an area as special as Bodo is certainly not consistent with preserving wildlife values.

The Conservancy remains ready and willing to work with the Department of Energy on this issue. However, it is very hard for us to comment on your proposals or on the DEIS in any detail, without a comprehensive mitigation plan accompanying it. We consider completion of such a plan to be of utmost importance.

Thank you for the opportunity to comment on the DEIS, and we look forward to receipt of the mitigation plan in the very near future.

Sincerely,

Sydney S. Macy

Sydney S. Macy
Director
Colorado Field Office

SSM:djb

cc: Mr. Donald Duprey, Regional Attorney
The Nature Conservancy

Mr. James B. Ruch, Director
Colorado Division of Wildlife

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Colorado Chapter of The Wildlife Society

07 January 1985

Mr. John G. Themelis, Project Manager
Uranium Mill Tailings Project Office
U.S. Department of Energy
5301 Central Avenue, N.E., Suite 1700
Albuquerque, New Mexico 87108

Dear Mr. Themelis:

The Wildlife Society, founded in 1937, is a professional, nonprofit organization dedicated to the wise management and conservation of the wildlife resources of the world. Principle objectives of The Society are to (1) develop and promote sound stewardship of wildlife resources and environments upon which wildlife and humans depend, (2) undertake an active role in preventing human induced environmental degradation, and (3) seek the highest standards in all activities of the wildlife profession. In Colorado, the Wildlife Society has had an active Chapter since 1971 and represents a broad spectrum of over 500 professionals in private, federal, and state positions. Further, the Chapter continues to look towards the future by addressing issues of concern: remedial actions at the former Vanadium Corporation of America Site near Durango, Colorado is one such issue.

The Chapter's Conservation Review Committee has completed its evaluation of the DEIS. I am relaying their comments to you. Before proceeding, we wish to thank you for the opportunity to provide input and hope that our comments will be considered in the final decision making process.

Since the DOE is mandated to remedy the present situation, option 1 is
not really viable (or desirable). Of the remaining four alternatives, we have
serious reservations about 3, 4, and 5. The Bodo Canyon site appears to be
6.11 the most valuable area from a wildlife perspective. Since it is deeded to the
State of Colorado by the Nature Conservancy for deer and elk range, mitigation
measures would no doubt be quite involved. The State of Colorado has a history
of coming out on the short end of the stick in such mitigations. Furthermore,
6.11 Nature Conservancy will in all likelihood initiate legal proceedings to halt
alternative 3, since the deed states that any land use other than for wildlife
will cause the property ownership to revert back to the Conservancy. We are
6.11 also concerned about the precedent that will be set by depositing hazardous
materials in wildlife areas, as well as the loss of non-wildlife values such
6.16 as the many prehistoric and artifact sites present at Bodo Canyon.

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The potential also exists for creating a serious environmental problem
at the Long Hollow site. In the report, Volume I on p. 16, it states "the
interrelations between the shallow ground-water system and the deeper bed-
6.11 rock system at the Long Hollow site have not been fully characterized," and
in Volume II (Appendices), p. C-9, is the comment that there is a "potential
for deteriorating the quality of water to downstream areas and users." Moreover, I also feel, after reading the report through again, that the potential impacts upon wildlife in this area are inadequately addressed in some ways.

Alternatives 3, 4, and 5 seem unreasonable. Why create a new contami-
ↄ.20.1 nated site where none presently exists? In our opinion, Alternative 2
(stabilize the materials in place, at the Durango site) seems the most
reasonable of the 5 alternatives proposed in the report. Even more preferable,
however, is an alternative essentially rejected by the O.O.E. early in its
6.3 deliberations, and this involves transport of the contaminated materials to
a dump in Montrose County near Naturita.

We feel all the alternatives proposed in the report (with the possible exception of Alternative 2) are an attempt at a short-term, inexpensive solution, and none of these really solve the problem. With so many of these contaminated dumps needing remedy in various parts of western Colorado, it underscores now more than ever the need for a central dump area, such as that proposed near Naturita, which would afford a final, long-term solution. Thus, we would urge reconsideration of the option to remove the contaminated materials at Durango to the Naturita area. Yes, it would be more expensive, but is seems a more satisfactory solution to this problem.

Sincerely,

Richard W. Hoffman

Richard W. Hoffman, President
Colorado Chapter of The Wildlife Society

RWH/jeb

December 4, 1984

Mr. John G. Themelis
U.S. Department of Energy
UMTRA Project Office
Durango DEIS Comments
5301 Central Ave. N.E.
Suite 1700
Albuquerque, New Mexico 87108

Dear Mr. Themelis:

The remedial action that needs to be taken on the Durango Uranium Mill Tailings Pile is of great concern to the people of Durango and its outlying areas. We are grateful to have the opportunity to publicly air our views on this matter.

The Rafter J Landowners Association is requesting an opportunity to communicate our position at the Public Hearing scheduled on December 18, 1984. I am available to speak at any time on that date.

Enclosed is a copy of the statement we will be making at the hearing. Also enclosed is a copy of the Editorial page of the Durango Herald from December 3, 1984. You may find it of some interest.

Please feel free to contact me at (303) 247-8590 on any matter concerning the Public Hearing.

Sincerely,

Karen Preston
President
Rafter J Landowners
Association

KP/te
Enc.

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Durango Uranium Mill Tailings
Public Hearing
December 18, 1984

We the residents of the Rafter J Subdivision wish to take this opportunity to thank the Department of Energy for listening to our concerns of a few years ago when there was a possibility of using County Road 141 (Wildcat Canyon Road) past our subdivision to the Long Hollow site for the duration of the cleanup operation. We are very grateful that a few private citizens can make a difference to an agency of the United States government.

6.12 At this time, we would like to voice our concern over the possible use of County Road 141 for the 2 miles from County Road 211 to the Long Hollow Site, should the decision be made to use either of the last two alternatives. We are disturbed because our children travel this route on school buses to Ft. Lewis Mesa Elementary School, located in Kline , Colorado, three times a day. In addition, many of us use this road for travel to and from that school and for commuting to work on a daily or weekly basis.

We would support the construction of a gravel road running parallel to County Road 141 from the intersection of County Roads 211 and 141 to the Long Hollow Site, if it is chosen. This action would leave County Road 141 completely free from tailings truck traffic.

Thank you very much for allowing me the time to communicate the concerns of the people of the Rafter J Subdivision to you this evening.

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Sierra Club
Rocky Mountain Chapter
2239 E. Colfax Ave.
Denver, Co, 80206
Dec. 19, 1984
"...TO EXPLORE, ENJOY AND PRESERVE THE NATION'S FORESTS, WATERS, WILDLIFE AND WILDERNESS..."

Mr. James A. Morley
Project Manager
UMTRAP
U.S.D.O.E
5301 Central Ave. N.E.
Suite 1700
Albuquerque, NM. 87108

Dear Sir;

I have just a comment or two on the Draft plan and EIS for Uranium Mill Tailings Remedial Action Project, on behalf of the Rocky Mountain Chapter. We have more than 100 members in SW Colorado and have had a fair level of activity as a Chapter on the issue of mill tailing disposal in Colorado.

The plan in the aforementioned document appears to be a reasonable one first because it removes an eyesore and health hazard from a growing community which bases most of its present prosperity on tourism, and second, because it has avoided placing the tailings in rural location with a great number of obvious conflicts. There are a couple questions remaining, however, which my reading of the document did not answer. Perhaps they should be spelled out more clearly in the Final. First, it is not clear exactly why the Long Hollow site was chosen. It seems to have acceptable or better physical and biological conditions, but has the owner of the property expressed a willingness
6.3 to sell? The fact that some tests could not be carried out because of the landowners objections would appear to bode ill for anything short of condemnation. The EIS did not make clear whether the acceptability to the land owner was a factor in the siting decision. Secondly, it is not clear just how much the final cost of the Preferred Alternative will depend on the market for the recovered metals; a discussion of possible extreme scenarios might have been helpful. I worry in particular
6.9 about any costs that have to be borne by the State, given the parsimony of our Legislature. Would they balk at the increased cost and cause DOE to adppt the less environmentally desirable site at Bodo Canyon? I also worry a bit about the possibility of tailings from other places in SW Colorado being treated and disposed of at Long Hollow. Is it possible that the site could evolve into a regional treatment site for
6.20.3 the regions substantial mill waste problems? If such comes to pass, then I predict that local people may find the "temporary inconvenience, permanent improvement" rationale to be increasingly tiresome. Finally, the projected yearly dose for ore-truck drivers of 2.3 rem is troubling
6.10.3 to me because of its size. Is there any way to give truck drivers better shielding in their cabs?

Thank you for your consideration of these remarks.

Kirk Cunningham, Conservation Chair

ENVIRONMENTAL DEFENSE FUND

STATEMENT OF

JAMES B. MARTIN

STAFF ATTORNEY
ENVIRONMENTAL DEFENSE FUND

ON

REMEDIAL ACTIONS AT THE
FORMER VANADIUM CORPORATION
OF AMERICA URANIUM MILL SITE
IN DURANGO, COLORADO

December 18, 1984

1405 Arapahoe Avenue Boulder, Colorado 80302 (303) 440-4901
OFFICES IN: NEW YORK, NY (National Headquarters); WASHINGTON, DC; BERKELEY, CA; RICHMOND, VA; BOULDER, CO

The Environmental Defense Fund is grateful for the opportunity to present a statement today at this public hearing concerning remedial actions for the inactive mill site at Durango, Colorado. The Environmental Defense Fund is a national, non-profit environmental organization of 55,000 members, more than 1,000 of whom reside in this state. Since EDF was founded in 1967, one of its major program goals has been to prevent or reduce unnecessary human exposure to carcinogens and other hazardous substances. Therefore, we are pleased that three of the four action alternatives, and the Department's preferred alternative, involve transportation of contaminated materials to a remote site for final disposal. Removing these materials from the mill site will significantly reduce health risks to residents of this community from the radiological and nonradiological hazards associated with mill tailings.

EDF is preparing extensive written comments for submission to the Department of Energy by January 11. EDF's comments today fall into two general categories. First, we address some of the more serious flaws we have identified in the environmental impact statement's assessment and evaluation of radiological impacts to human health. Second, we have several concerns about the adequacy of the earthen cover designs to attenuate radon exhalation over the long term.

A. Radiation Risk Assessment

The central purpose of the Uranium Mill Tailings Radiation Control Act is to ensure that uranium mill tailings are managed and disposed of in a manner that protects human health, safety, and the environment from hazards posed by these materials. At the same time, the National Environmental Policy Act--NEPA--mandates preparation of an environmental impact statement for all major federal actions significantly affecting the quality of the human environment. An EIS serves several broad purposes. First, it ensures that the agency has before it all of the information necessary to make an informed and reasoned decision. Second, it provides evidence that the agency has indeed weighed all relevant factors, while also fully apprising the public of what the important factors were and how they were considered. In a very real sense, NEPA is an environmental full disclosure law.

6.10.3 In spite of that clear mandate, we find that a critical component of the decisionmaking process is entirely absent from the Durango EIS. The Department has estimated the radiation dose equivalent to the bronchial epithelium for a representative set of individual receptors, under current conditions and under each of the action alternatives. The Department also included in the EIS its estimate of the total population impacts attributable to those exposures. However, the Department did <u>not</u> estimate risk for either the maximally exposed individual or for the representative set of individual receptors, even though the data necessary to do such an assessment are available.

This approach has several serious deficiencies. First, it diffuses risk to exposed individuals by aggregating health effects to the population as a whole. As such, a population risk assessment neither describes distribution of risk among the population nor quantitates the magnitude of risk to an exposed individual.

Second, by aggregating risks to a population, the EIS makes it difficult or impossible for the people in the community, and probably for the decisionmakers as well, to identify and consider the critical element of risk to individuals.

The purpose of a quantitative risk assessment is to give the decisionmaker and the public an estimate of the severity of health problems associated with exposure to a carcinogen. The Environmental Protection Agency has stated that in developing such an estimate, <u>two</u> measures are of particular interest: "maximum individual risk," and "total population impact":

> The two estimates taken together provide a better description of risk in a community than either number taken alone. "Maximum individual risk" tells us the worst risk, but not how many people bear that risk. "Total population impact" describes the overall health impact to the entire exposed population but not how much risk the most exposed persons bear. Two chemicals or regulations could have similar population impacts, but very different maximum individual risks, or vice versa. Consequently, <u>any sensible "risk management" system cannot rely on either measure alone; both are important</u>.

6.10.3 Even though EDF may sharply disagree with the agency's weighing of risks or with its choice of a regulatory response, we strongly agree that, at a minimum, the agencies must identify, consider, and disclose risks to individuals from carcinogenic agents.

Similarly, the Nuclear Regulatory Commission's regulatory guides for assessing compliance by uranium mills with NRC's and EPA's radiation protection standards clearly mandate calculation of doses for both individuals and populations. And a document prepared by the Los Alamos National Laboratory for DOE, to guide its development of radiation risk assessments as part of EISs, clearly emphasizes the importance of estimating risk to

<u>individuals</u>, including the maximally exposed individual.

A key principle underlying the federal regulatory regime for radiation protection is the identification and minimization of risk to individuals as well as populations. As long ago as 1960, the Federal Radiation Council made clear that federal agencies must devote their attention to minimizing exposure to individuals in the population. As recently as 1977, the International Commission
6.10.3 on Radiological Protection reaffirmed that principle. (<u>Radiation Protection</u>, ICRP Publication 26, January 1977).

The Department's effort to disguise risks to individuals by aggregating risks to the population at large is not acceptable. In the final EIS, the Department should clearly and explicitly quantitate the health risks to individuals due to radon exposure.

Beyond the Department's failure to assess individual health effects, the draft EIS's treatment of radiation risks is deficient in several other respects. First, apparently the Department has used a risk estimator developed by Messrs. Evans <u>et al</u>., even though its usefulness has been called into serious question. In comments to EPA on the agency's active site standards, Dr. Martell of the National Center for Atmospheric Research explained
6.10.2 that Dr. Evans's work seriously underestimates the risk of radon induced lung cancer. A copy of those comments is attached to this statement. More to the point, in promulgating its inactive site standards, EPA reviewed Dr. Evans's risk estimate and concluded that it was "not convincing." Indeed, EPA devoted several pages of Volume II of the final EIS to a description of the flaws it had identified in Dr. Evans's calculation of a risk estimator.

For these reasons, the Department's use of Evans's health risk model clearly is not appropriate. The agency either should use the results of EPA's work, or should use the risk estimator developed by the BEIR III committee, or the comparable results of other scientists in the field of radiation biology.

EDF's work in this field makes abundantly clear that the risks of fatal lung cancer attributable to radon exposure are significant. Attached to this statement is a report prepared by Dr. Julie Overbaugh for EDF. In that report, Dr. Overbaugh examined the scientific information available on radon induced carcinogenesis, as well as recently published estimates of risk. Using the estimators developed by the BEIR III committee and by Drs. Radford and Renard, Dr. Overbaugh concluded that **at ambient**
6.10.3 **radon concentrations of 1 pCi/l, the excess risk of lung cancer for lifetime exposure ranges from a high of 1-in-56 persons exposed to a low of 1-in-120. At 3 pCi/l, the risk ranges from 1-in-19 to 1-in-39.**

The Engineering Assessment prepared by Ford, Bacon & Davis shows that radon traceable to the tailings piles was detected up to 0.7 mile from the Durango tailings piles. The Engineering Assessment also shows that within that radius, ambient radon concentrations as high as 1.7 pCi/l were measured. These data, and their implications for human health, reinforce the importance of developing a risk assessment for a range of individuals using EPA's risk estimator or another, comparable estimator. This information is crucial to an informed evaluation of the health risks associted with the status quo, as well as to selecting a remedial action plan that prevents or minimizes risk of cancer from the radionuclides generated by the tailings piles.

EDF has identified a second flaw in the Department's radiological assessment. The Department apparently decided <u>not</u> to incorporate into total doses the dose commitments received via the ingestion of contaminated food products and water, despite evidence that these pathways may be significant, at least for some individual receptors. Ford, Bacon & Davis reported that windblown tailings have been observed on the inhabited bluff northwest of the site and across the river in Durango. The Engineering Assessment also contains data showing significant soil contamination, and states that elevated levels of radium were detected in the Animas River downstream of the piles.

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NRC regulatory guides state unequivocally that <u>all</u> individual exposure pathways of significance must be evaluated for locations where the exposure pathway and a dose receptor actually exist. The preamble to EPA's final standards include, in the list of potential exposure pathways traceable to abandoned piles, exposure due to windblown erosion of tailings, and ingestion of contaminated food products and water.

In light of the evidence in the record of offsite contamination, the Department may not simply assume away these exposure pathways. It must either establish that these pathways do not exist, or it must estimate dose commitments from these pathways.

B. <u>Cover Design</u>

EDF's written comments will address in greater detail the

adequacy of the Department's proposed earthen covers to attenuate radon exhalation over the long term. However, several concerns are noted in this statement because of their importance to compliance with the EPA standards.

6.4.1

Each of the action alternatives calls for a single-layer earthen cover, five to six feet thick, to control radon flux from the piles and percolation of water to the tailings. We have not yet reached a conclusion on whether that cover is adequate to achieve compliance with EPA's design standard of 20 pCi per square meter-second. However, several factors appear not to have been considered in the cover design calculations. For example, while the clay covers will be moisture sensitive, the remedial action alternatives do not take into account the eventual moisture loss and cracking that will occur, resulting in a significant reduction in effectiveness. In its generic impact statement on uranium milling the Nuclear Regulatory Commission recognized that cover designs should factor in features to protect clay covers from the effects of cracking, as well as differential settlement. For these reasons, we strongly urge that the Department <u>add</u> to its cover designs a gravel and sand layer that is not moisture sensitive and which is sufficient to maintain the effectiveness of the cover over the long term.

6.4.1

Second, the NRC's generic EIS also recognized that penetration of the clay cover by plant roots (or burrowing animals) appears to lead to an increase in radon flux. The draft EIS does not discuss these impacts and the remedial action alternatives do not appear to take this factor into account.

Third, recent EPA studies estimate that the uncertainty in

predicting actual cover performance can be as high as a factor of three. As a result, EPA recommended that design calculations take into account the uncertainty in measured values of specific materials to be used, the tailings to be covered, and predicted
6.4.1 long-term values of equilibrium moisture content. We urge that the Department build into its cover design calculations an uncertainty factor to ensure that EPA's radon exhalation standard will be met over the long term.

DEC 27 12 02 PM '84

January 4, 1985

La Plata County Farm Bureau
P.O. Box 122
Ignacio, CO 81137

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Mr. John G. Themelis, Project Manager
Uranium Mill Tailings Project office, U.S. Department of Energy
5301 Central Avenue NE Suite 1700
Albuquerque, New Mexico 87108

Comments on DEIS—Uranium Mill Tailings Remedial Action, Durango, La Plata County, Colorado.

The La Plata County Farm Bureau consists of over 300 farm families. Our members have observed these tailings for 20 years and have never been overly concerned about any hazards from them.

Then proposals were made for their stabilization in place, or removal to another site or removal and reprocessing — all proposals to be followed by actions to stabilize and cover to bring radiation emissions to within established standards. Farm Bureau members have continued surveillance of these proposals.

6.10.4 However, the dangers to health and living of residents has not been enough of a compelling argument for Farm Bureau members to insist upon any action proposed. The dangers to health and living are admittedly small compared to such prevailing dangers as the uses of tobacco, alcohol before driving, drugs while driving and consumption of inappropriate foods.

6.20.3 All actions proposed, except alternative 1, no action would cost millions. These expenditures when considered along with other possible expenditures do not seem justifiable to the County Farm Bureau members.

Accordingly, the County Farm Bureau Board of Directors have directed me to recommend that of the alternatives considered that:

6.20.1 a. Alternative 1 — No Action — is most appropriate at this time. This recommendation would not prohibit some actions found to be more appropriate at a later date.

6.5.1 b. Alternative 2 — stabilization on the present site — is the second best choice. However, even this action, if chosen, should be modified to absolute minimum

Page 2 — La Plata County Farm Bureau — Comments on DEIS—Uranium Mill Tailings Remedial Action
Jan. 14, 1985

6.5.1 necessary movement of tailings and the providing of minimum or no cover.

c. No other alternatives seem to be justifiable to the County Farm Bureau Board of Directors.

Respectfully,
MR. LAVERNE GWALTNEY
Laverne Gwaltney, Chairman, Local Affairs Committee
La Plata County Farm Bureau
4385 County Road 207
Durango, CO 81301

FUTURE
P. O. Box 2625
Denver, CO 80201
January 8, 1985

Mr. John G. Themelis
Project Manager
Uranium Mill Tailings Project Office
U.S. Department of Energy
5301 Central Avenue N.E., Suite 1700
Albuquerque, NM 87108

CERTIFIED MAIL -
Return Receipt Requested

Re: Durango, Colorado, UMTRAP Site

Dear Mr. Themelis:

FUTURE is a nonprofit Colorado corporation with both statewide and national participation. Since we began in 1978, we have focused on uranium mining and milling and in particular on problems associated with active and inactive tailings disposal sites. We have been a party to a major lawsuit (Sunflower Coalition v. Nuclear Regulatory Commission, et al.) and a number of other legal proceedings involving uranium issues over the past seven years and have represented at their request residents of areas impacted by the uranium industry.

We have received and reviewed the Draft Environmental Impact Statement, "Remedial Actions at the Former Vanadium Corporation of America Uranium Mill Site, Durango, La Plata County, Colorado", October 1984, U.S. Department of Energy, and would like to make some brief comments on its five proposed alternative courses of action:

6.20.1 (1) "No action." This is clearly unacceptable because of the toxic and radioactive nature of the tailings and the location of the piles in the floodplain of, and immediately adjacent to, a major river. This waste material has constituted a significant threat to health and the environment for over forty years, and its presence contradicts numerous state and federal regulations, policies and standards governing such sites. It should be dealt with as soon as possible.

6.20.1 (2) "Stabilization of the contaminated materials on the Durango site." This alternative is also totally unacceptable to us because the tailings are located on the bank of a river and thereby pose a serious threat to both ground and surface water, especially during periods of high runoff and flooding. Water from the river is used by many persons downstream and several communities for drinking and for other domestic and agricultural purposes.

6.20.1 (3) "Transportation of the contaminated materials to the Bodo Canyon site for disposal, and decontamination of the Durango site." Of the five alternatives presented, we find this one to be the least objectionable, at least in theory. However, from a technical standpoint we believe Bodo Canyon will require considerably greater

6.11 engineering analysis and planning before it can be accepted as a solution. In addition, we are basically opposed to using a state-owned elk range and wildlife refuge for a tailings dump, and believe that this option should be taken only if extensive further study indicates there is no other viable alternative.

6.20.1 (4) "Transportation of the contaminated materials to the Long Hollow site for disposal and decontamination of the Durango site." We have strong objections to the Long Hollow site because of its location and geologic characteristics and feel that it deserves no further consideration.

6.20.1 (5) "Transportation of the contaminated materials to the Long Hollow site for reprocessing and stabilization, and decontamination of the Durango site." We also strongly oppose any reprocessing of the tailings. Reprocessing, quite simply, leads to an even bigger mess than the one with which we started, necessitating the expenditure of even more tax dollars for adequate clean-up. Reprocessing uranium tailings is not economically sound and should not be considered in any remedial action program undertaken by government agencies.

6.3 Please understand that FUTURE recognizes there are no easy solutions to the Durango tailings problem. However, we think that efforts to deal with this problem have been totally inadequate to date, and that it is now time to review what won't work and start over again, considering other alternatives. It is very difficult for us to believe that the only options available are the five listed above.

In conclusion, we recommend relocation of the tailings to a technically and politically acceptable site, using the best state-of-the-art technology available to control radon and radioactive dust during their removal and to stabilize, contain and reclaim them at the new location. We also recommend thorough decontamination of the old site and the employment of as many local people as possible to implement the project. And we urge full involvement by state agencies, including the Colorado Department of Health and the Colorado Geological Survey, in this undertaking.

We greatly appreciate having received a copy of the DEIS and being allowed to comment on it. Please keep us on your mailing list and keep us fully advised of new developments. Thank you.

Sincerely,

Margaret Puls

Margaret Puls
Secretary and Member,
Board of Directors

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LEAGUE OF WOMEN VOTERS OF DURANGO

22 Cutler Drive, Durango, Colorado 81301

December 18, 1984

Mr. John G. Thelmeliš, Project Manager
Uranium Mine Tailings Remedial Action Project
U. S. Department of Energy
Albuquerque Operations Office
5301 Central Avenue, NE, Suite 1700
Albuquerque, New Mexico 87108

Dear Mr. Thelmelis:

In 1979, the League of Women Voters in Colorado undertook a two-year study of hazardous materials in the State, with special emphasis on nuclear material and the impact of low-level radiation. As a result of the study, the Colorado League has published its position to give "support for adequate safeguards in the production, transportation, use, treatment, disposal and storage of hazardous and radioactive materials...with consideration for population density...and an emphasis on recycling, reuse and reduction."

6.20.1 The Durango League of Women Voters has compared the State position and supporting guidelines with the five alternatives presented for remedial actions at the Durango uranium mill site. Based on our review and discussions, we acknowledge that hazards exist and they must be dealt with. And, as we look at the five choices, we conclude that the Preferred Alternative 5 -- to move, reprocess and stabilize the contaminated materials at the Long Hollow site,-- best meets the intent of the Colorado League's position statement in terms of the ultimate results that will be achieved.

However, members of the Durango League are very concerned about the processes involved to accomplish Alternative 5, as well as the other alternatives that call for transporting the mine tailings. Our concerns or questions are presented here as "drawbacks" that warrant continued attention and further consideration:

6.17
- o The economy of Durango is tourist-based. The tailings piles are immediately evident from the downtown area. How many people will decide not to visit Durango or come here to live during the six-plus years required to complete Alternative 5? What will be the loss to the local economy? The removal activity will be a black eye for Durango for months and years to come.

6.20.3
- o Future technology might allow for other more environmentally-safe means of moving the contaminated materials; and the economic benefits might be greater. What would be the real harm in saving expenditures of energy now and keeping entropy low until new and better techniques are developed?

6.20.3
- o There are increased hazards inherent in all the alternatives to move the tailings, including the possibilities of increasing the release of radon gases, radiological illnesses or deaths, occupational injuries, and transportation hazards. Considered cumulatively, are these hazards worth the disruption, public anxiety and adverse economic effects of moving the piles?

6.20.1
- o Radiation and its effects are poorly understood and are generally a source of alarm. There is a continual need for quantifiable means of measuring real effects, describing the issue and educating the public about what's real. Facts are needed to counteract emotional public reaction and rumors and to better explain an environmentally-sound decision.

6.17
- o Psychological effects on the local residents and visitors must be taken into account. Anxiety, uncertainty, and nagging concern over the long term will accompany whatever moving process is used. These issues should be addressed through a continuing flow of public information and education about such things as mitigation measures taken, work status reports, benefits and other news of interest about the project.

The League of Women Voters strongly urges that all possible measures be undertaken to protect water quality, in line with its National position to promote "actions for improvement of quality and for planning and management of water resources to meet regional needs and the national interest."

6.16 In addition, local League members have expressed concerns about weather patterns and effects on neighbors to the south, as well as the desire that the mill stack should remain if possible as an historic feature at the old millsite. These and other questions may result in further comments, which will be forwarded before the January 11 deadline.

We sincerely appreciate this opportunity to comment.

Sincerely yours,

Kay Rogers Peg Langworthy / KR

Peg Langworthy & Kay Rogers
Co-Presidents, Durango League
of Women Voters

cc: Gretchen Nicholoff,
State Vice-President, Natural
Resource Issues

JL

Durango Uranium Mill Tailings Task Froce
P.O. Box 2587
Durango, Colorado 81301

January 7, 1985

Mr. John Themelis, Manager
Uranium Mill Tailings Project Office
U.S. Department of Energy
5301 Central Avenue NE, Suite 1700
Albuquerque, New Mexico 87108

Subject: Draft Environmental Impact Statement, Remedial Action, Durango Uranium Tailings

Dear Mr. Themelis:

Following are questions and comments of the Durango Uranium Mill Tailings Task Force in addition to those we presented orally at the Durango hearing of December 17, 1984.

In the Task Force meeting of December 18, 1984, the Task Force eliminated Alternatives 1 (no action), 4 (Long Hollow) and 5 (Long Hollow with reprocessing) from further consideration as preferred alternatives. Alternative 1 was eliminated because of real or perceived danger from radiation, danger of contamination of the Animas River by a catastrophic flood, and because it does not meet either federal or state radiation health standards. Alternatives 4 and 5 are no longer considered because of overwhelming public opinion against them, their greater highway traffic hazard, the length of project duration, ground water problems, and their much greater cost.
6.4.4 It is the feeling of the Task Force that the tailings should not be reprocessed. . . ever. This is especially the case for the stabilization in place alternative. What steps will DOE take to insure that reprocessing will never occur?

We are still considering the relative costs, both short-term and long-term, of Alternatives 2 (stabilization in place) and 3 (Bodo). Currently our judgement of the factors which are least costly for each alternative are as follows:

Rankings:

1 - Highest importance
2 - Moderate importance
3 - Little or no importance

Comparing Only Alternatives 2 and 3

Least Costly For Alternative 2 Stabilization in Place		Least Costly For Alternative 3 Bodo		Equally Costly For Each Alternative	
Rank	Cost Factor	Rank	Cost Factor	Rank	Cost Factor
1	Truck Miles	1	Durango reputation	1	Cancer
1	Project duration	2	Maintenance	1	Ground water
1	Risk to workers	2	Scenic value	2	Treatment cost
		2	Future reprocessing	2	Wildlife impact
		2	Site acquisition		
		3	Safety from catastrophy		
		3	Property tax loss		
		3	Land value loss		
		3	Employment		
		3	Acres of land lost		

We note that all of the cost factors which favor Alternative 2 are short-term (i.e. only for the duration of the project). Almost all of the cost factors which favor Alternative 3 are long-term--potentially forever. However, we should like you to consider issues which might change any of the cost factors from one of the above categories to another category. Additional comments and questions for these two alternatives follow.

STABILIZATION IN PLACE - ALTERNATIVE 2

6.5.1 1. Design Alternatives. With regard to Alternative 2 (the stabilization in place alternative), can DOE and its contractors make the stabilized pile aesthetically pleasing in appearance by utilizing terracing or other contouring designs which will support flowers, trees, and other landscaping. The Task Force requests that the final EIS include (for the stabilization in place alternative) at least three alternative engineering designs which meet the 200 year standard and involve landscaping and beautifying the pile. At least one alternative design should involve a design which prevents or minimizes leaching from watering of the landscaped surface. Another alternative design should be the covering of the present pile with clay and topsoil with no recontouring or a very minimal disruption to the present pile. With respect to all alternative designs, please include an assessment of cost factors, health factors, maintenance factors, leaching factors, and compliance with the 200 year standard. Please keep in mind that a "concrete tomb" is not consistent with the scenic beauty of the Durango area, Durango's reliance upon tourism, and Durango's reputation. 6.3

6.20.1 The local Task Force would like to have the opportunity of reviewing alternative designs and engineering details before remedial actions are undertaken. Perhaps this can be done in conjunction with state review of these alternative designs.

6.4.4 2. Maintenance. What specifically will be involved in maintaining (a) the rip-rap, and (b) any landscaping? What agency or entity will be responsible for maintenance? Will this responsible agency sub-contract the work? What will be the funding source for on-going maintenance costs?

6.17 3. Socioeconomic Impact. How will the DOE address the negative publicity that might ensue when it is publicized that "radioactive dust is blowing around Durango?" What will the press releases say about what the remedial action is, what its impacts, health effects, etc. will be, and so forth? What is the expected amount of lost revenue to businesses in the City of Durango and La Plata County during the remedial action stage and the following five years?

6.4.1 4. Road/Access Issues. What will be the level of access improvements from County Road 211 to the piles? Will road profiles and cross sections be prepared for inclusion in the final EIS? What maintenance measures will be necessary to prevent deterioration of the gravelled roadbeds?

6.4.5 5. Project Duration and Timing. Are time estimates (i.e. 12 months for Alternative 2, 18 months for Alternative 3) based upon consecutive months of work (e.g. April to April) and do they take into account anticipated "down time" due to adverse weather conditions? Or have anticipated stoppages in work due to bad weather not been included in the time estimates? Will one tourist season (May through September) or two be affected by the remedial action?

6.4.1 6. Windblown Tailings Control. What methods are proposed for controlling windblown tailings at the pile itself during excavation or stabilization activities? What will prevent disturbed tailings from blowing around during the night or in periods of high winds, adverse weather conditions, on weekends, or during worker strikes?

6.5.1 7. Flood Protection. Will the stabilized pile be guaranteed against the probable maximum flood? How much encroachment in the Animas River and in the floodway will take place under each of the alternatives for stabilization in place?

REMOVAL TO BODO CANYON - ALTERNATIVE 3

6.4.1 1. Road Issues. Have road profiles and cross sections been prepared to determine the feasibility of putting in access roads to the tailings piles

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Uranium Mill Tailings Project Office
U.S. Department of Energy
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6.4.1 along the sides of Smelter Mountain at 30 foot intervals? Will these roads be able to be constructed at the required 35 foot width? What alternative means of excavation/disposal are available if construction of the access roads prove unfeasible?

6.3 2. The Smelter Tunnel. With respect to the Bodo Canyon alternative, for several years the Department of Energy and its contractors have been advised by local officials that they should investigate an existing mining tunnel in Smelter Mountain. This tunnel could conceivably be used in a conveyor system for transporting the tailings to the Bodo Canyon site. This would save substantially on truck miles, dust, and disturbance to the pile. The old mining tunnel reportedly has an entrance on the north side of Smelter Mountain and it may have an opening on the back side of Smelter Mountain not far from the Bodo Canyon site. Because this alternative has the potential of moving many of the adverse impacts of the transport "to the other side of the mountain" and away from the population, it should be reviewed and addressed in the Final EIS.

6.4.1 3. Decontamination. Another set of questions relates to whether or not the present site can be decontaminated if the pile is moved. Do we know how deeply into the natural soil and rock the contaminated material, or contaminated water from it, have moved? Will contaminated material underneath the pile be removed down to a point where radiation levels drop to EPA standards? How deep will this be? Is removal even possible? Could this add significantly to the cost?

GENERAL HEALTH CONCERNS

6.10.2 Concerning the health aspects of the Durango Uranium Mill Tailings Pile, the Task Force is concerned about the discrepancies in cancer death danger as listed in the following reports:

A. The DEIS where lung cancer deaths are estimated at 4/1000 years;

B. Colorado Department of Health figures (personal communication by Al Hazle to Task Force) estimate of 24 lung cancer deaths/1000 years;

C. Ford, Bacon & Davis study estimates of 4 excess lung cancer deaths/25 years (160/1000 years);

D. Environmental Defense Fund statement of DEIS public hearing estimating lung cancer rates of maximal individual exposure to 1pCi/1 of radon gas (less than Durango's pile) at 1 person in 120 to 1 person in 56.

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Uranium Mill Tailings Project Office
U.S. Department of Energy
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6.10.2 Because of these widely varied reports, because of general unknowns (such as genetic risk) about radon gas exposure, and because there are no controlled long-term studies of exact health risks associated with low-level radon gas exposure, the Task Force recommends that the Final EIS admit that these uncertainties exist. Furthermore, we feel the Final EIS should clearly enunciate the belief the tailings must be stabilized not only because they exceed EPA standards, but also because of these unknown health risks associated with the piles.

6.20.1 Finally, as we have previously discussed by telephone, the Task Force respectfully requests that the comment period be extended from 30 to 60 days beyond the January 11, 1985 deadline because of reported problems of citizens in the community in obtaining access to copies of the DEIS.

We shall appreciate discussing these questions with you at a meeting in Durango at your earliest convenience.

Sincerely yours for the Task Force

Tim LaFrance

ACTING Chairman
Tailings Task Force

Task Force Members:

Harold Steinhoff - Chamber of Commerce
Tim LaFrance - Southwest Colorado Bar Association
R. T. Scott - La Plata County Commissioners
Bill Thompson - Durango City Councilman
Dr. Randall Jernigan - La Plata Medical Society
Greg Hoch - City Planner, City of Durango
Bob Likes - Fort Lewis College
Dan Judkins - Citizens for Safe Tailings Management

Citizens Concerned About
Moving the Pile (CCAMP)
P.O. Box 1484
Durango, CO 81302

Mr. John D. Themelis
U.S. Dept. of Energy
UMTRA Project Office
Durango DEIS Comments
5301 Central Ave., N.E. Suite 1700
Albuquerque, NM 87108

Dear Mr. Themelis,

I am writing to confirm the meeting with you and your staff scheduled for Wednesday January 30, 1985, which Mr. La France set up with you on behalf of the Citizens Concerned About Moving the Pile (CCAMP). The meeting will be held at the La Plata County Fairgrounds Extension Building at 7:00 pm.

I have enclosed, for your information, a copy of the Press Release announcing the meeting. I'd like to request that you bring some copies of the Draft Environmental Impact Statement and the Appendices with you as many citizens, such as myself, have officially requested copies and have still not received them.

We look forward to an enlightening evening of questions, answers and positive dialogue on this most complex issue.

Sincerely,

Andrea G. Maynard
for the Citizens Concerned About
Moving the Pile (CCAMP)

enclosure

cc: Mr. Tim La France

FOR RELEASE January 14, 1985

Citizens Concerned About
Moving the Pile (CCAMP)
Steering Committee:

Andrea Maynard 247-9276
Renee Parsons
Rick Lane
Jane Leonard

The Department of Energy (DOE) has agreed to participate in a Public Information Meeting being sponsored by the Citizens Concerned About Moving the Pile (CCAMP) on Wednesday January 30th at 7:00 pm at the LaPlata County Fairground Extension Building, according to Tim LaFrance of the Tailings Task Force , who set up the meeting. The primary purpose of this meeting is to give the public the opportunity to ask questions and obtain clarification on the many complex heath, technical , environmental and economic issues surround the Draft Environmental Impact Statement (DEIS). Representatives of the Tailings Task Force will also participate.

Citizens who don't already have a DEIS are urged to contact the DOE immediately to obtain copies: #505-844-3941. There are also now eleven copies in the Public Library.

In response to requests for a 120 day extension of the comment period which ended on January 11, 1985, the DOE has agreed to at least a 30 day extension and is contemplating the possibility of extending the period an additional 60 days.

CCAMP spokesperson Andrea Maynard said that the group formed because it became apparent from reading the Department of Energy's Draft Environmental Impact Statement that more information is needed: particularly regarding the health and safety of our citizens, the economic consequences on tourism in Durango if the piles should be moved, and additional engineering alternatives on stabilizing the piles in place.

CCAMP's next meeting will be held Thursday, January 17th at 7:00 pm in KDGO's meeting room. Concerned citizens of Durango and La Plata County are urged to attend.

HEALTH ENVIRONMENT department

STATE OF NEW MEXICO

ENVIRONMENTAL IMPROVEMENT DIVISION
P.O. Box 968, Santa Fe, New Mexico 87504-0968
(505) 984-0020

TONEY ANAYA
GOVERNOR

DENISE D. FORT
DIRECTOR

January 14, 1985

Mr. John G. Themelis, Project Manager
UMTRA Project Office
Department of Energy
Albuquerque Operations Office
P.O. Box 5400
Albuquerque, New Mexico 87115

Dear Mr. Themelis:

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This letter summarizes comments provided by staff of the NMEID on the "Remedial Actions at the Former Vanadium Corporation of America Uranium Mill Site, Durango, Colorado". These comments are submitted to DOE in order to provide an assessment that will demonstrate the benefits of remedial actions at inactive uranium processing sites which the State of New Mexico supports. Listed below are the major concerns expressed by the reviewing staff as not having been adequately addressed, or for which sufficient data were not presented to determine how DOE arrived at its findings.

6.20.1 Because of the Animas River flows into New Mexico, the New Mexico EID is especially concerned over the proposed alternative 2 (and, needless to say, alternative 1). Any disturbance of the pile by the Animas River would result in contamination entering New Mexico, over which this State would have no control. On-site stabilization would most probably not result in long-term stability of the tailings without periodic maintenance or repair of the stabilized pile or embankments under Title I of UMTRA. Thus, from the technical perspective, alternatives 1 and 2 would be of direct concern to the State of New Mexico and should not be considered as viable alternatives. Other concerns, of less direct concern to New Mexico are:

6.7.2 1. The siting of alternatives 4 and 5 (Long Hollow site) in an area of ground water discharge presents great potential for leaching and transport of contaminants from tailings. A site without this potential would be preferable also from the standpoint of expense and complexity of design and would avoid long-term reliance on a ground water interception or isolation system.

6.4.1 2. No studies of the potential for biological intrusion (by plant roots or by burrowing animals) were made for any of the proposed sites. Plant uptake and consumption by grazing animals is a potential pathway for radionuclides or metals to humans. The action of burrowing animals can result in wind dispersion of tailings and increased radon emissions. (See report "Long-term Biobarriers to Plant and Animal Intrusions of Uranium

6.4.1 Tailings" by Cline et al., DOE/UMT-0209, 1982). Fencing around the area would not prevent animal entry for any long period of time, and would not prevent small animal entry for <u>any</u> period of time.

6.4.1 3. No mention is made of any studies of potential gulleying at any of the sites, which could easily result in breaching of embankments. (NUREG PCR-3397, 1983). This is an important potential source of disruption that must be considered, especially in western states where livestock grazing is common. See, "Design Considerations for Long-Term Stabilization of Uranium Mill Tailings Impoundments" by Nelson et al.

6.4.1 4. The potential for aggradation (or filling-in) of the diversion channels around the Long Hollow site should also be considered, as well as the potential for erosion of the stabilized site if the channels do become filled.

6.7.2 5. The interceptor trench mentioned in Section A.7.2.2. (page A-80) may not have a significant effect on the peizometric surface under the disposal (pond) area. Excavating below the water table may cause significant problems, especially with liner placement. Would synthetic liners be installed as per the guidance provided in NRC documents on the issue? "Design, installation, and operation of natural and synthetic liners at uranium recovery facilities" (#WM-8101). See also the new report, "Technology for Uranium Mill Ponds using geomembrances" (NUREG/CR-3890, December, 1984).

6.8.1 6. No mention is made of the type of synthetic liner proposed (i.e., will it resist the acid leachate?). If the liner fails several years after final stabilization, how will the leak detection and recovery system be used to safely handle the leaking solutions?

6.8.1 7. Only a brief mention is made of the leachate underdrains for the heap leach piles (second paragraph, p. A-88) and <u>no</u> figures show their design or location. How would leachate be recovered (location and depth of pumps, etc.), and would this underdrain system be used to later remove the accumulated seepage from the pile?

6.8.1 8. In conjunction with the above concerns, there is no discussion of the time required for the tailings to drain for alternative 5 (as there is for the Bodo Canyon site and the Long Hollow site without reprocessing). It was left out, presumably, because the synthetic liners are considered impermeable. This should not be assumed for the long term. Some provision should be made for removing the accumulated tailings drainage (from both moisture redistribution and infiltration) over the many years required for it to accumulate (preferably using the leachate collection system above the first synthetic liner). This is important under alternative 5 since the tailings will have been saturated during the leaching process. The leak detection and recovery system (between the two synthetic liners) should be used for its named purpose, though, again, no discussion is present concerning handling its potential discharge.

9. On page F-137, third paragraph, last sentence, mention is made of the total discharge from the drainage blanket (in cubic feet per second), but

Mr. John G. Themelis
January 14, 1985
Page 3

6.7.1 it is not clear how these figures (especially the lower range) were obtained. A table showing the flow into the blanket from both sources (ground water and tailings) over time would be more informative. In conjunction with this, it is not clear how the dilution factors were obtained that are cited in the last paragraph on page F-137. The concentrations of U, Zn, sulfate, and Fe cited are for the long-term (best) case (water standards for sulfate and iron are exceeded); what will be the concentrations during the first several years? The initial discharge of 2.5 cfs is equivalent to 1,122 gallons per minute, which is not a small flow! The 0.18 cfs (long term) equals 80.8 gpm. This could result in surface flow for a long distance downstream that would certainly be used by cattle and sheep. This human pathway has also not been considered in the report.

Other relatively minor corrections or clarifications:

6.19 Page F-132, 1st paragraph, last sentence should read (for clarification): "...through liner is greater than the maximum net infiltration rate (i.e., 1.0 in/yr. infiltration..... over the 38 acres)." (Changes or additions underlined here.)

Page F-133 and F-136, Figures F-17 and F-20: Titles should have appended "...for different infiltration rates."

Page F-135, Figure F-19: Title is incorrect. It is listed correctly in the List of Figures.

We would like to thank you for the opportunity to review the DEIS and hope that the comments will be of benefit in preparation of the final EIS.

Sincerely,

Terrance R. Morgan
for
Felix R. Miera
Program Manager
Uranium Licensing Section

FRM/cvg

cc: Ken Hargis
Terry Morgan

LA PLATA COUNTY

1060 EAST SECOND AVENUE, DURANGO, COLORADO 81301 - PHONE 303-259-4000

BOARD OF COUNTY COMMISSIONERS
1060 EAST SECOND AVENUE

AIRPORT - DURANGO-LA PLATA COUNTY
POST OFFICE BOX 2677
303-247-8143

ASSESSOR
POST OFFICE BOX 3339

ATTORNEY
1060 EAST SECOND AVENUE

BUILDING DEPARTMENT
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26616 HIGHWAY 160

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POST OFFICE BOX 2220

SOCIAL SERVICES
1060 EAST SECOND AVENUE

TREASURER
POST OFFICE BOX 99

January 11, 1985

Manager, Uranium Mill Tailings Project Office
U.S. Department of Energy
5301 Central Avenue NE, Suite 1700
Albuquerque, New Mexico 87108

Subject: Draft Environmental Impact Statement, Remedial Action, Durango Uranium Tailings

Dear Sir,

6.20.1 Based on the draft EIS, both options 4 and 5 should have no farther considerations for the following reasons:

#1 - length of time involved;

#2 - An additional exposure creates additional health hazards to the general public;

#3 - The DEIS does not reflect accurate figures, at least options 4 and 5.
On accidents and deaths created during the remedial action according to National figures;

#4 - Therefore, accidents and deaths will be much higher than reflected in the DEIS;

#5 - Cost of both options much greater than other options;

#6 - Both options generally unacceptable to citizens in the community;

#7 - Ground water issue has not been resolved; therefore, will create both a health hazard and probable costs:

#8 - Condemnation of private property;

Option 1 - to do nothing - not acceptable;

Option 2 - As presented, it does not appear to be acceptable both from our standpoint and yours. This option would probably be most acceptable if the engineering was of a different quality.

Manager, Uranium Mill Tailings
Project Office
January 11, 1985
Page two

Option 2 (con't)

There is entirely too much exposure of tailings on present design, too much maintenance, too short a life, and too expensive and too many unknown factors.

6.5.1

Request: redesign and re-engineer option 2.

#1 - move less amount of tailings;

#2 - Longer life;

#3 - Less maintenance;

#4 - Less cost;

#5 - No unknown.

We do not believe this option has had a fair shake or design and engineering.

Option 3 - is an acceptable solution if Option 2, after redesign is still unworkable.

Option 3 - would not involve any public road other than a short distance on C.R. 211 which can be barricaded from public use during remedial action.

6.4.4

Not enough emphasis is applied on the reason for remedial action. The only reason is the health hazard the tailings create for people of this community. With this in mind, whatever action needs to be taken should be by the Federal Government to make sure that the tailings are not removed for re-processing at any time in the future.

Manager, Uraniym Mill Tailings
Project Office
January 11, 1985
Page three

This is vitally important to the resident of this community that once the tailings are covered they will never be removed.

Again, you are reminded of the schedule you have committed on this project and it is very important to stay on track.

Sincerely yours,

LA PLATA COUNTY

R. T. Scott,
County Commissioner

RTS:mw
cc: Mill Tailings Task Force

30 January 1985

Project Manager
Uranium Mill Tailings Project Office
U.S. Department of Energy
5301 Central Avenue N.E., Suite 1700
Albuquerque, NM 87108

Dear Sir:

Durango, Colorado, Uranium Mill Tailings Cleanup

Citizens for Safe Energy has been concerned about environmental matters, especially uranium mining and milling, since 1978. We have testified at hearings, have offered written comments.

We have considered the five proposed alternative methods of dealing with the Durango mill site (former Vanadium Corporation of America site) and would like to make some brief comments.

6.20.1 We do not believe that any of the five proposed courses of action is acceptable. Certainly some action must be taken, and the other four alternatives (other than "No Action") pose hazards to water or are unsound because of geologic characteristics or because of inadequate analysis and planning. Reprocessing is not a good solution.

6.3 We urge you to consider other alternatives. The tailings must be moved to a technically adequate location and the old site must be thoroughly decontaminated. The Colorado Geological Survey should be consulted. The location chosen and the technology employed in moving, reclaiming and containing the tailings must be chosen with such care that the problem is not simply moved nor exacerbated.

Thank you for keeping us informed.

Sincerely,

CITIZENS FOR SAFE ENERGY

Lois Remple

Lois Remple
419 Van Buren
Pueblo, CO 81004

Law Office of
James C. Anesi
A Professional Corporation
2023 Main Avenue
Durango, Colorado 81301
(303) 247-8720

December 20, 1984

U.S. Department of Energy
UMTRCA Project Office
Durango DEIS Comments
5301 Central Avenue N.W., Suite 1700
Albuquerque, New Mexico 87108

RE: Durango Uranium Mill Tailings

Gentlemen:

Pursuant to the information disseminated at the public hearing on December 18, 1984, I wish to make the following written comment concerning the alternatives for disposal of the uranium mill tailings project on behalf of my client, Mr. Gary Farmer, the owner of the proposed Long Hollow site.

6.20.1 Mr. Farmer is opposed to alternatives 4 and 5, and believes that the Department of Energy has overlooked or ignored many of the concerns Mr. Farmer has. 6.20.1 In addition, no one from the Department of Energy has ever sat down with Mr. Farmer to listen to his concerns, other than the statements I have made on his behalf in public meetings.

6.20.2 In reviewing the documentation supplied by the Department of Energy and their summary which was prepared and delivered at the November 29, 1984, meeting, there are various recommendations as to why one alternative should be used over another. I am referring to alternative 3; the Department of Energy put heavy reliance on the effect of the wildlife in the Bodo area as well as migration patterns for prefering alternatives 4 and 5 over 3.

6.11 The Department of Energy was informed that it is our belief that there is a more significant wildlife habitat, including deer and elk, that live year-round on Mr. Farmer's land, including the Long Hollow site. There has been no investigation by the Department of Energy as to the wildlife migration plan and effects of wildlife on the Long Hollow site. If the Department of Energy were truly concerned about the migration pattern and effect on wildlife, I believe they would have checked into this on the Long Hollow site. It is only a short distance from the Bodo site and the wildlife is not confined to the Bodo site.

In response to questions by me at the November 29, 1984, meeting, your representatives indicated that they had not looked into effects of wildlife at the Long Hollow site, and in addition they were invited by Mr. Farmer and myself to go out and view the wildlife which we feel is significant in this area. They made no response to our invitation, and it is my belief that they have no intention of making a determination of the effects of wildlife on Mr. Farmer's land.

6.11 I believe that the Department of Energy is attempting to favor alternatives 4 and 5 and use the wildlife as an excuse to not use the Bodo site. If, in fact, the Department of Energy were truly interested in the wildlife, one would assume that they would have had the same concerns in the Long Hollow site as it is well known to people in the area that there is a substantial deer and elk population that inhabits the Long Hollow site year round.

The Department of Energy, in the November 29, 1984, meeting, in response to questioning me as to the effect on Mr. Farmer's sheep operation stated that they do not feel this was an important factor in determining the site. Mr. Farmer and I strongly disagree with this, and if there is consideration given to the migration patterns of the wildlife and the effect on the wildlife of the proposed site, there should be equal if not more consideration given the effect of the significant sheep population that inhabits the Long Hollow site and effects of its historic migration, and what effect it will have on the sheep population as well as Mr. Farmer's livelihood.

6.17 The traffic flows proposed would virtually shut down Mr. Farmer's sheep operation. He uses the main highway to move his sheep from one side of his property to the other and the truck traffic proposed would virtually shut down his operation. In addition, there has been no consideration given on the effect on Mr. Farmer's livelihood for the duration of the project, whether alternative 4 or alternative 5 is chosen, nor the effect of the noise and air pollution that would be caused by the dust of the trucks moving on and off Mr. Farmer's property.

6.13 It appears obvious to Mr. Farmer and to me that the Department of Energy has chosen to ignore the effect on Mr. Farmer and his animal habitat. There should be equal, if not more, consideration given to the effects of this project on the sheep population in the area as well as Mr. Farmer's livelihood. The Department of Energy has, I believe, intentionally chosen not to comment on these effects and has given a preference to the wildlife habitat over that of domestic habitat.

In the November 29 meeting, Mr. D'Antonio, the project engineer was questioned by me why he had given a preference to the concerns of the Bodo site over that of the Long Hollow site as it affected migration patterns of wildlife and why he chose to ignore the obvious effects on Mr. Farmer, and he stated "it was his prerogative".

6.20.3 The Department of Energy also in that meeting, I believe misled the public as it concerned availability of land at the Bodo site. Mr. D'Antonio informed the audience that because the Nature Conservancy was involved, and they had a restriction on the land, that they were having a difficult time and could not get more than the 41 acres, and that was another reason for choosing the Long Hollow over the Bodo site. I find this highly offensive as whatever powers of condemnation the governmental agencies would have in this would also apply to Nature Conservancy which is a private, non-profit organization in the State of Colorado. If the federal government would decide that the Bodo site is the site where the tailings would be deposited, I am confident that they would, or Congress could create the necessary authority to allow them to condemn whatever area. Statements by the Department of Energy that they are limited to 41 acres in the Bodo site is misleading and again shows a deliberate attempt to mislead the public as to the real reasons why the Department of Energy chose alternatives 4 and 5.

It is my belief in talking to representatives of Ranchers Exploration, that the Department of Energy has chosen the Long Hollow site because it was previously chosen by Ranchers Exploration. However, the Department of Energy has overlooked that Ranchers Exploration had offered Mr. Farmer a highly usable ranch of approximately 300 to 400 acres so that he could move his entire sheep operation to that property. In addition, the land was irrigated and was a highly desirable farm for a sheep operation, which would have yielded equal or better forage due to irrigation.

When the Department of Energy was informed of this factor at the November 29 meeting, they again appeared to be uninformed as to the total package Ranchers Exploration had offered Mr. Farmer and I believe that the Ranchers' plan the Department presently relies on is outdated.

It is Mr. Farmer's and my belief that the Department of Energy should give equal consideration to Mr. Farmer's concerns.

U.S. Department of Energy
December 20, 1984
Page Four

6.17 There will be an obvious devaluation of the surrounding lands which Mr. Farmers owns if this site is taken into consideration, and this should also be made a part of the Environmental Impact Statement.

The assurance of the Department of Energy that there is no danger to any inhabitants is not believed by the general public, and if the site is chosen, I seriously doubt that any of the property Mr. Farmer has would be marketable for any reasons because of the lack of reliable information as to the actual effects of radiation in our environment.

Mr. Farmer and I respectfully request that his concern be given consideration in making a determination as to a preferred alternative, and that alternatives 4 and 5 be deleted from the list.

Yours truly,

James C. Anesi

JCA/amh

cc: Gary Farmer

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

ER 84/1468

FEB 1 1985

Mr. John G. Themelis
Project Manager
Uranium Mill Tailings Project Office
U.S. Department of Energy
5301 Central Avenue, NE, Suite 1700
Albuquerque, New Mexico 87108

Dear Mr. Themelis:

We have reviewed the draft Environmental Impact Statement (EIS) for Remedial Actions at the Former Vanadium Corporation of America Uranium Mill Site, Durango, La Plata County, Colorado and our specific comments are enclosed.

6.14 We note that the preferred alternative, reprocessing and stabilization at the Long Hollow site, involves lands within the exterior boundary of the Southern Ute Indian Reservation. Another alternative considers use of the Long Hollow site without reprocessing. Although the surface ownership at the Long Hollow site is private the mineral interests at this site were restored to the Southern Ute Tribe by an Order of Restoration, September 14, 1938. The EIS indicates (pages 91, 92 and C-6) that Menefee coal underlies the site at considerable depth, but does not discuss oil and gas potential. The document should indicate what effect, if any, emplacement of the uranium mill tailings at this site will have on future exercise of the Tribe's mineral rights. In addition, if the tailings are reprocessed at the Long Hollow site prior to stabilization, failure of the leachate control system could result in contamination of groundwater underlying trust lands. The Southern Ute Tribe has expressed opposition to use of the Long Hollow site for this purpose. 6.13 We request that Department of Energy (DOE) initiate consultation with both the Tribe and the Secretary of the Interior pursuant to Section 108(a)(1) of UMTRA before taking any action which might adversely affect trust resources of the Tribe or which does not fully recognize the Tribe's interests.

6.16 A small portion of the Animas River Valley, a potential national natural landmark (NNL), might be affected by the action depending on the remedial action selected. Of concern is the southwestern portion of the potential landmark within the northwestern boundary of the Durango site. Further planning by the DOE should take into account this potential designation and avoid impacts that could adversely affect the outstanding ecological and geological features of the area. Information on the National Natural Landmark Program can be obtained from Carole Madison, National Park Service, Rocky Mountain Regional Office, P.O. Box 25287, Denver, Colorado 80228 (Phone 236-8699).

Sincerely,

Bruce Blanchard, Director
Environmental Project Review

Enclosure

Specific Comments

6.7.2 Page 13, para. 2. The statement mentions that environmental monitoring wells might be installed around the Long Hollow site. We believe that groundwater monitoring of both water quality and water levels will be especially important south and southwest of the proposed Long Hollow site. Ground water from the site area will contribute to the southwest-trending creek in Long Hollow, which becomes perennial about 3 miles below the site.

6.12, 6.10.1 Page 58 and B-14. The statement should indicate the expected efficiency of the coverings that would be used on the tailings haul vehicles to prevent the escape of radioactive materials during transport. Further, it should be noted if a radioactivity survey program of the haul roads is to be established and conducted during and upon completion of the proposed activities.

6.7.2 Page 70. Natural background concentrations of uranium in the waters of the Upper Colorado River Basin are about 2.1 micrograms per liter (ug/l). Dilution factors of 13 (initially) and 230 (long term) are assumed for leachate from the completed Long Hollow site. The latter figure gives projected levels of 270 ug/l uranium, 120 ug/l zinc, 580 ug/l sulfate, and 150 ug/l iron in the effluent stream from the collection pipes in the drainage blanket. It should be noted that initially these values may be nearly 20 times as high. The EIS should compare these levels to normal groundwater levels in the area as well as providing more explicit analysis as to effluent flow and character after leaving the downstream end of the pile.

6.14 Page 80, para. 1. The smelter slags, from prior lead smelter operations, may contain precious and/or base metal values that could be recoverable. The EIS should address what effects, if any, this project will have on possible future recovery attempts.

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6.19 Page 94, 2nd para. The city of Durango does not have storage rights in Lemon Reservoir. The city does, however, have a flow right of 8.92 ft^3/s in the Florida River.

6.7.2 Pages 116-118. This section references the proposed Animas-La Plata Project; however, there is no discussion on how the disposal alternatives may impact the implementation of project features. In particular, the Bodo Canyon site is located close to the proposed Ridges Basin Reservoir. If this site were chosen, what are the possibilities of contamination of the reservoir?

6.19 Also, the proposed Long Hollow Tunnel would be located almost underneath the Long Hollow Disposal site. What are the chances of contamination from this site?

6.19 The document describes Durango's proposed water treatment facilities being located near the Bodo Canyon site. This statement is incorrect. Durango would extract its municipal and industrial water at the Durango Pumping Plant and deliver it to treatment facilities east of town on College Hill.

6.16 Page 123, para. 1. It is not clear whether or not determination of eligibility for the NRHP has been requested.

6.4.2 Page 145. This section states that surface-water samples taken from the Animas River showed concentrations of radium above the Environmental Protection Agency's drinking water standards. After remedial action, will the Animas River continue to have the same excess radium readings? Presently, the Animas-La Plata Project is designed to divert water from the Animas River downstream from the existing tailings pile. The Bureau of Reclamation sampled the Animas River three times in previous years (5/20/81, 9/4/81, and 3/15/82). Analyses of these samples showed little or no increase in Radium 226 and Radium 228 from samples taken above and below the tailings pile. Only one sample showed an increase in Radium 226; however, the concentration was below the State's standards.

6.10.2 Page 145. The DEIS dismissed as unimportant the ingestion of windblown particulates from the tailings pile and ingestion of contaminated surface water. We should like to point out that a 1961 report for the Colorado River Basin Water Quality Control Project found that the amount of radium - 226 in alfalfa and hay feed crops on farms that irrigate with surface water and which are located below the Durango uranium mill was significantly elevated. Similarly, a 1966 report on the same project found that at one operating mill (presumably Durango, judging by the reference), "Tailings-associated radium levels of twice MPCw ..." (recommended maximum permissible concentration in water) "...levels were noted 30 miles below the mill, and near MPCw levels as far as 60 miles below the mill..." In addition another paper found that direct contamination of foliage by wind-borne contaminants from tailings piles can contribute more to the radionuclide content of plants than root uptake. Therefore, we believe that the EIS should further consider these routes of exposure and, thus, of potential contamination.

6.10.4, 6.16 Page 188, first full paragraph. Although it is not a BLM responsibility, dismantling the smelter stack does not seem appropriate as it is an historic feature. If it is not a safety hazard, then why not decontaminate the stack and allow it to remain as an historic feature?

6.11 Page 216. Although alternatives 2 through 5 would result in impacts to the BSWA, including the removal of borrow material from the area, the "Mitigation of Wildlife" section indicates that only Alternative 3 would result in the implementation of a plan to mitigate for impacts. However, a commitment to reclaim and revegetate the borrow area appears in each alternative. Therefore, in order to clarify this issue, it is recommended that the mitigation measures proposed for each alternative be specifically identified, or outlined in tabular form. Further, such measures should reflect coordination with the Colorado Division of Wildlife.

6.10.2 Page H-19 Biota Sampling. Some radionuclides are accumulated in bone tissue. We note that the study described in the DEIS analyzed only accumulation in soft tissue. It is our opinion that this could lead to an underestimate of background radiation in wildlife. Therefore, the EIS should include a discussion that addresses bone tissue accumulation of radionuclides.

UMTRA
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

JAN 11 1985

Mr. John Themelis
U.S. Department of Energy
Albuquerque Operations Office
Post Office Box 5400
Albuquerque, New Mexico 87115

Dear Mr. Themelis:

We have reviewed the October 1984 version of the Draft Environmental Impact Statement for the mill site at Durango, Colorado as you requested. Our specific comments are provided in the enclosure to this letter. Some of our general concerns are provided below.

6.5.1 Alternative 2 in the DEIS, stabilization in place, currently includes the use of a grouted rip-rap wall to protect against erosion. As you have acknowledged in the DEIS, the grouted rip-rap would require planned, repeated maintenance. This level of maintenance is more than intended by the EPA regulations. The EIS should make a statement that Alternative 2 is unlikely to meet the EPA longevity requirement for the control of the tailings because of the level of maintenance which would be required.

6.7.1 6.7.2 Alternatives 4 and 5 both involve stabilization at Long Hollow. The information available on ground water at this site is limited, but enough is available to know that springs under the site are likely to be a problem. The DEIS states that the potential ground-water problem could be solved by using underdrains or cutoff walls. However, at this time, we cannot agree with this conclusion and do not believe that either of these options are likely to meet the EPA requirements.

6.7.1 The EPA has found in their studies that drains are prone to clogging from various mechanisms, even in short-term applications. Given the longevity requirement, a design for an underdrain would need to be extremely conservative. The current design has not indicated how it would meet the longevity requirement given the probability of clogging occurring. Although it is probably possible to design around the ground-water problem, it will be very difficult.

6.4.1 Since Alternatives 2, 4 and 5 do not appear to readily comply with the EPA Standards, we believe that Alternative 3 should be closely examined. However, even Alternative 3 has some potential problems and shortcomings. Our comments in the enclosure discuss some of the changes to the design which will likely be needed at the Bodo Canyon site to protect the site against erosional forces. In a few cases, the suggested design changes may result in a change to the environmental impacts since larger quantities of rock may be required. We have

6.6.3 also raised a question regarding the potential for active faulting on-site which could directly affect the stability of the pile. Lastly, the potential
6.6.2 effects on ground water at the Bodo Canyon site have not been completely addressed.

A concern at each of the sites was the lack of data on the ground-water related impacts. Some improvements which could be made in this area are discussed in the enclosure.

Roger Pennifill has informed John D'Antonio that this document is also being reviewed by our Denver office. Mr. D'Antonio has agreed that if any additional comments result from that review, we can send them to you in about 2 weeks.

If you have any questions regarding our review of the Durango DEIS, please contact me or Roger Pennifill of my staff.

Sincerely,

Leo B. Higginbotham, Chief
Low-Level Waste and Uranium Recovery
Projects Branch
Division of Waste Management

Enclosure:
As stated

cc: John E. Baublitz, w/encl.

JAN 11 1985

NRC Comments on the Durango DEIS

GEOLOGY

1) Section 4.5.2.2, ¶5, Page 90:

6.6.3 The DEIS does not provide evidence supporting the statement that "the Ridges Basin Fault... apparently dies out south of the Bodo Canyon Site (p. 90)." The fault may displace lower sedimentary rocks without surface expression at the site (CGS, 1981). Geologic information is lacking in identifying the termination of the Ridges Basin Fault and whether it is connected to the faults east of Bodo Canyon. The Bodo Canyon site may be unstable if the fault is located beneath the disposal site. Site-specific data should be presented in the EIS to resolve the existence, termination and activity of the faults at Bodo Canyon.

2) Section 4.5.2.3., ¶3, Page 91 and E.2.3.1, ¶1, Page E-19:

The following comment refers to the statement that:

> "Faults mapped nearest to the Long Hollow site occur at distances of about...4 miles (Zapp, 1949). FOCERI (1978) indicates that anomalous steep dips in the Lewis Shale are present about 1 mile north-northeast of the site and that these may be fault-related."

6.4.3 Examination of Zapp's map indicates that: (1) the Long Hollow site is approximately 1 mile outside the southern edge of the area mapped, and (2) the only potential "fault" shown within 6 miles of the point on the map closest to the site is the same potential fault apparently mentioned in FOCERI (1978) i.e., a lineament about 1 mile north of the site associated with "anomalous dips in Lewis Shale."

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Further, the DEIS states that: "No known Neogene faults (within the last 25 million years) occur within 50 miles of Durango (Kirkham and Rogers, 1981)." However, the Colorado Geological Survey's preliminary report on the alternate sites indicates that site-specific data on the presence, age, and hydrologic significance of faults in the area of the disposal sites need to be ascertained through detailed studies (CGS, 1981).

The information provided in the DEIS does not provide a reasonable basis for assessing the seismotectonic character of the Long Hollow site. Site-specific geologic studies are needed to resolve the location and age of faults at the Long Hollow disposal area.

3) Section A.5.2.6, Figure A-18, Page A-46 and Section F.2.3.1, ¶4, Page F-83:

6.6.2 The DEIS indicates that the Cliff House Sandstone at Bodo Canyon consists of interbedded sands and shales. Borehole data from Dames and Moore (1983) suggests that the upper 25 feet consists predominantly of shales with interbedded sand lenses. Hydraulic conductivity data presented on page F-83 are higher in the upper 30-50 feet than in the rocks below 50 feet. This data
6.6.3 supports the existence of sand lenses in the upper shales. The DEIS should present information on the horizontal and vertical extent of the interbedded shales and sands of the Cliff House Sandstone. This information is needed since the DEIS assumes flow and attenuation of contaminants in the shale even though flow may be predominately in the sands.

4) Section 4.5.2.3., ¶5, Page 91:

6.7.3 The statement is made that, "Mudflows originating on the slopes to the east of Long Hollow extend to the valley floor (FOCERI, 1978) but they do not reach the disposal site." However, the EIS should mention the potential for mudflows impacting the site in the future. In addition, you should be aware that there will be increased risks from mudflow impacts on the pile if, as proposed on page 70 for ground-water protection, the location of the stabilization area is moved to the southeast toward the source of potential mudflows.

5) Section C.1.2, ¶1, Page C-4:

6.3 The DEIS states that it is more desirable for a disposal site to be located on a thick, laterally persistent shale. One of the criteria used to reject the Rabbit Mountain site is that the "Animas Formation (which underlies the site) does not appear to contain beds of shale that are at least 150 feet thick and laterally persistent for many square miles." Since the Bodo Canyon site also lacks such a shale unit, the EIS should clarify why Rabbit Mountain was eliminated while Bodo Canyon is still being considered.

SEISMICITY

6) Section E.2.3.1, Table E-6, Page E-20 and Figure E-8, Page E-21:

6.4.3 An inadequate data base for seismic hazards analysis was used in the DEIS. Table E-6 is inaccurate. Comparison of data in the table with NOAA Publication 41-1, "Earthquake History of the United States"(EHUS), (Coffman and von Hake, 1973; pp. 1a-50a, 1982 revision) indicates that only eight events in the table also appear in EHUS. Five events in the table do not appear in EHUS. Thirty events in EHUS of Modified Mercalli V Intensity or greater within 200 miles of Durango are not listed in the table. The omission of these events gives a

6.4.3 false picture of the regional seismicity. A listing of the 251 events presented in Figure E-8 would clarify the Table E-6 inaccuracies. The EIS should explain the rationale used in selecting the seismic data or provide a more complete listing. The listing should include at least the time, location, size, and reference for each event.

7) E.2.3.1, Figure E-8, Page E-21:

6.4.3 Presentation of the seismic events is misleading in the DEIS. The figure does not adequately portray important seismic events in the Durango vicinity; magnitude symbols, especially for the 4-7 range, bracket too large a range. Damage in this range would be from minor (or non-existent) to major. At least two brackets, 4-5 and 6-7, would help to emphasize the more important earthquakes in the vicinity. Also, a typographical error should be corrected. The scale should indicate 100 miles total, not 50 miles.

SURFACE WATER HYDROLOGY

Appendix A:

8) An examination of flood velocities in Lightner Creek and the Animas River, leads to the conclusion that the Durango site probably will not meet EPA standards for Alternative 2 (On-site Stabilization). The information provided in the DEIS indicates that it is not possible to provide a practical erosion protection design which will last for 200-1000 years with little or no maintenance.

6.5.1 The DEIS conclusion that maintenance will be required for the grouted riprap erosion protection appears correct. However, EPA longevity standards require a design that will provide the necessary protection with reliance placed on passive controls, rather than routine maintenance. Any erosion protection design which uses only riprap without grouting would require rock much larger than practical. The estimate that 11-foot diameter rocks would be necessary shows that this approach is clearly not practical, due to the difficulties in hauling and placement of such large rocks, and the impracticality of assuring adequate thicknesses and gradations. It is extremely unlikely that stabilization-in-place will be a viable concept that will meet EPA standards.

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9) Appendix A:

6.5.1 Based on the information provided in the DEIS, it is difficult to determine the need for, and the size and extent of, the 2-foot thick grouted riprap blanket which is proposed for the interface between the reclaimed tailings pile and the natural hillside. A discussion should be provided regarding the hydraulic effects that were considered in the design, including flow velocities, energy

6.5.1 dissipation at the ditch/blanket interface, and any other assumptions ... computations which led to the determination of average rock size, blanket thickness, and need for grouting. The results of hydraulic computations for the diversion ditch, including flows, velocities, location of hydraulic jump(s), and water surface profiles, should also be provided. Appropriate drawings and cross-sections which show the proposed configuration of the grouted riprap blanket, diversion ditch, and the natural hillside should also be provided. Finally, the reasons for providing a grouted rock blanket instead of an ordinary riprap layer should be discussed.

10) Appendix A:

6.9 A discussion should be provided to explain how monitoring and maintenance costs have been factored into the total costs. Because it is recognized that extensive maintenance of the grouted riprap will be necessary, these costs should be included in the overall cost assessments for the in-place stabilization option.

11) Appendix A:

6.4.1 The EIS should discuss the design methods which were utilized to size the slope-protection riprap which will be provided at the Durango site. The information presented does not justify or provide the design basis for the selection of rock size for the steep (1 Vertical on 3 Horizontal) embankment slopes.

12) Appendix A:

6.4.1 a. Based on site visits it appears that a significant stabilization problem at the Bodo Canyon site may be the long-term migration and head cutting of channels due to erosion toward the reclaimed embankments and tailings pile. It appears that the design proposed in the DEIS does not address this problem. The factors which led to the conclusion that no erosion protection will be required to prevent long-term migration and erosion of local drainage channels toward the pile should be documented. A rock layer of significant thickness and of considerable areal extent may be needed directly in the channels to prevent such erosion. If it is determined that such erosion protection will be required, the design bases that will be used in the selection of layer thickness, rock size, and areal extent of rock protection should be discussed. Additionally, the costs and impacts associated with placement of the rock layers should be discussed.

6.4.1 b. Additional information and analyses will be needed to justify the selection of the impoundment top slopes at Bodo Canyon which will not

6.4.1 be protected by rock. It is recognized that all design computations have not yet been performed; however, experience suggests that it is unlikely that a vegetation cover will be self-sustaining over a long period of time. It is, therefore, unlikely that EPA standards can be met by a vegetative cover.

13) Appendix A:

6.4.1 Additional analysis and discussion should be provided for the riprap protection which will be required to protect the toe of the Bodo Canyon embankments (particularly the north embankment) from erosion due to flood velocities in the drainage channels. It appears from examination of PMF flows and velocities that a considerable amount of rock protection may be needed to prevent erosion and long-term channel migration toward the embankments. The estimated PMF velocities of 17 and 19 feet per second in the channels (page F-6) indicate that a significant amount of rock protection may need to be extended both upstream and downstream of the embankments; in fact, enough may be required to greatly change the costs associated with reclamation at this site. An important point to be made is that the rock is needed <u>both</u> in the channels and at the embankment toe, and that the rock needed in the channels may be extensive.

14) Appendix A:

6.4.1 For the Long Hollow stabilization option, it is doubtful that vegetative covers will meet EPA standards and provide adequate long-term protection for the stabilization of slopes as steep as 1 Vertical on 5 Horizontal. Therfore, rock layers are likely to be required to stabilize these slopes. These concerns need to be addressed, or a preliminary rock layer design should be discussed and the rock protection factored into the costs and impacts at this site.

15) Appendix A:

6.4.1 Based on examination of flood velocities in the drainage channels at the Long Hollow site, particularly the lower portion of A-3, it appears that riprap will be needed in the channels (in addition to riprap along the dam toe) to prevent long-term channel erosion due to flooding. Velocities in excess of 8-10 feet per second normally require that significant erosion protection be provided depending an channel configuration and depth of flow. An analysis should be provided to delineate probable riprap requirements specifically for the drainage channels, not just the areas outside of the channels.

<u>GROUNDWATER HYDROLOGY</u>

16) Section 3.3.1,¶6, Page 70:

6.7.2 The projected dilution of leachate at the Long Hollow site results in concentrations of sulfate and iron that are above the National Secondary Drinking Water Standards. This fact should be included in the DEIS in addition to a discussion of other possible chemical constituents that may be present in elevated concentrations in the resulting ground water (see also comment 36). This is an important factor when considering possible future water uses.

17) Section 4.9.3:

6.7.2 The proposed Animas - La Plata Project would involve construction of a reservoir near the Bodo Canyon site and a water tunnel near the Long Hollow site. Construction and operation of these facilities may substantially alter the groundwater flow systems near both sites, yet the DEIS has not assessed these potential changes and environmental impacts associated with water contamination at both alternative sites. The DEIS should be revised to evaluate the potential effects of these projects on the remedial actions at Bodo Canyon and Long Hollow, as well as the potential effects of the remedial actions on future project activities.

18) Section 5.6.2.1, ¶5, Page 167:

6.7.2 The text states that: "rates of ground-water discharge are believed to be low...". The discharge rate should be supported and quantified in the DEIS because this parameter is critical in predicting the environmental impacts at the Long Hollow site.

19) Section 5.6.2.1, ¶6, Page 167:

6.7.2 The interceptor trench considered as a mitigation measure at the Long Hollow site may not be successful in preventing discharge at the proposed facility because it may not intercept groundwater that may be moving in from the east or vertically upward. Further analysis should be performed to document the effectiveness of the trench in removing groundwater from the site area.

20) Section 5.6.2.2, ¶3 & 4, Page 169-170:

6.6.2 In order to fully analyze the impacts on groundwater, a discussion should be presented in the EIS on the effects of the predicted release of leachate from the Bodo Canyon site. This information is critical to the analysis of impacts from this alternative. Predictions of resultant groundwater quality similar to those calculated for the Long Hollow site should also be done for the Bodo Canyon site.

21) Section 5.8, ¶11, Page 177 and Section 1.5, Page 17:

6.5.2 6.6.2 It is stated in the DEIS that development of the Durango site is likely to occur once the contaminated material is removed. The effect of the remaining contamination in the groundwater especially in the raffinate ponds area on future land development should therefore be assessed. In addition, possible groundwater contamination at the Bodo Canyon and Long Hollow sites, and future effects on land uses, should be evaluated.

22) Section A.4.2.4, ¶2 and ¶3 Page A-21:

6.5.2 Based on Figures A-6 and A-7, the location of the contacts between the tailings, the alluvium, and the Mancos shale bedrock are unknown at the Durango site (since they are all labelled with question marks). The EIS should discuss the uncertainity and depth ranges of these contacts. There is a possibility that the groundwater table is already above the base of the tailings. Therefore the analysis that concluded that a PMF would not result in a water table rise into the tailings is questionable.

23) Section A.7.2.2, ¶9, Page 88:

6.8.2 It is stated that the raffinate solution to be generated at the Long Hollow reprocessing site will in large measure be recycled. It is not stated what will be done with the portion that will not be recycled. This potentially important environmental impact should be discussed in the EIS.

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24) Section F.2.2.1, Page F-69:

6.5.2 The hydrogeologic units at the Durango site have not been adequately characterized. Detailed geologic cross-sections are needed through the mill site and raffinate ponds area that indicate the relative locations of the alluvial material, bedrock, and man-made material (slag and fill). The EIS or RAP should provide the geologic information necessary to adequately characterize the hydrologic system at the site.

25) Section F.2.2.2, Page F-69:

6.5.2 The rate and direction of groundwater flow at the Durango site have not been adequately assessed in the DEIS. Water table contour maps of the phreatic aquifers and potentiometric maps of the lower aquifers should be included. The

relationship between the alluvial aquifer, bedrock aquifers, and the Animas River should be determined in order to fully evaluate environmental impacts.

26) Section F.2.2.3 and Section 4.6.2.1:

6.4.2 6.5.2

a. The extent of groundwater contamination (plume delineation) and relative concentrations of contaminants at the Durango site have not been presented. Plume delineation maps should be included to determine the rate and direction of contaminant migration at both the tailings and raffinate ponds areas. This cannot be done however, until background water quality is determined. As it is presented in the DEIS, background water quality has not been adequately defined. No wells have been designated as background except for the well near the fault that is upgradient of the raffinate ponds area. However, this well is completed through a rubbish pile, the leaching of which may have affected background as indicated by the high iron and sulfate concentrations. Therefore, the well may not be an accurate representation of background.

b. Water quality in the bedrock aquifers cannot be considered background until local hydraulic gradients have been determined. There is no information to show that the existing background well in the bedrock aquifers is upgradient from the site. Background water quality is necessary to determine environmental impacts and the necessity of remedial or protective actions.

27) Section F.2.3.1, ¶5, Page F-83:

6.6.2 The DEIS states that all local wells are upgradient of the Bodo Canyon area. However, according to Figure F-7, well number 31279 is just to the northeast of the site which is downgradient according to Figures F-8 and F-9. If this well is downgradient, then there exists a strong possibility that this domestic water supply may be impacted. The actual well location should be clarified.

28) Section F.2.3.2, Page F-88:

6.6.2 It is stated that flow in the shallow aquifer in the Bodo Canyon area is towards the Animas River where it discharges. It should be stated that this direction is coincident with the movement in the fractured bedrock (Figure F-8). This is important in assessing the environmental impacts if the tailings are moved to this site.

29) Section F.2.4:

Rate and direction of groundwater movement at the Long Hollow site has not been adequately presented in the DEIS. A water-level contour map and an evaluation
6.7.2 of hydraulic properties should be provided in order to determine the rate and direction of groundwater movement, and to assess the environmental impacts from either of the two alternatives that are proposed for this site.

30) Section F.2.5:

The modeling studies do not adequately represent the flow systems at the two proposed relocation sites because the initial and boundary conditions are not justified in the DEIS and the input parameters are not site-specific. They are taken from other studies. The assumption that atmospheric pressure will be maintained in the drainage blanket proposed at the Long Hollow site is not realistic. A point-sink should be designated as representing the collection
6.6.2 tube (in the case of the 2-D simulation) and the contact between the bottom of the drainage blanket and the underlying soil should be assigned as flux boundary. This would allow the simulated system to develop in a more realistic
6.7.2 fashion and would allow the performance of the drain to be evaluated. If less-than-atmospheric pressure prevails at the upper boundary of the drainage blanket, then mounding of the water table into the tailings pile and liner would have been successfully prevented. By assuming a constant atmospheric pressure in the blanket (as was done in the DEIS), this evaluation cannot realistically be carried out. Therefore, the results should not be used to predict environmental impacts nor in the assessment of the performance of the impoundment design, especially in regards to the drainage blanket proposed at the Long Hollow site. The modeling studies should be re-evaluated based on proper consideration of atmospheric pressure.

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31) Section 4.2.1, ¶5, Page 80:

The proposed relocation alternatives do not include relocation of the lead smelter slag because, as stated in the DEIS, the slag is not a hazardous waste as indicated from the EP toxicity test (40 CFR Part 261.24). A solid waste may also be classified as a hazardous waste if it exhibits other characteristics
6.20.3 such as corrosivity (40 CFR 261.22) or reactivity (40 CFR 261.23). If the slag is a hazardous material (see 40 CFR Part 261), the projected beneficial impacts resulting from development at the Durango site could not be realized since the slag is not being relocated. You may wish to further reconsider the potential hazard posed by the slag.

32) Section 5.6.2.1, ¶4, Page 167:

6.6.1 The DEIS mentions cutoff trenches as a mitigation measure to be used at the Bodo Canyon site. These trenches should be described in the conceptual design portion of the DEIS.

33) Section F.2.5.1, ¶6, Page F-137:

It is not clear how the calculated dilution rates of 13:1 and 230:1 (initial and long-term, respectively) follow from the predicted inflows to the drainage blanket at the Long Hollow site are not understandable. Initially, the predicted groundwater contribution is stated to be 2.3 cfs and the leachate contribution equal to 2.5 cfs. This is a mixing ratio of .92:1, groundwater to leachate, not 13:1 as stated in the DEIS. After redistribution, leachate
6.7.2 discharge to the blanket is stated in the DEIS to be .18 cfs. This results in a long term mixing of ratio of 13:1, rather than 230:1. In addition, the resultant concentrations were not calculated using the natural groundwater quality that currently exists at Long Hollow. For instance, a resultant sulfate concentration of 580 mg/l appears unreasonable when the background concentrations range from 3660 to 8200 mg/l (Table F-39). Therefore, resultant dilution of contaminated waters should be recalculated to properly assess the impacts from mixing leachate with existing groundwater.

34) Section F.1.6 ¶2, Page F-12:

The DEIS does not adequately discuss relevant Colorado State Water Quality Criteria. As adopted by the Water Quality Control Commission (WQCC) of the Colorado Department of Health pursuant to C.R.S. 1973, 25-8-101 et. seq., these criteria provide for classification of water (groundwater and surface water) within the State of Colorado. Discussions of applicable Colorado State Water Quality Criteria, therefore, must present the classification of waters that are
6.5.2 to be protected by remedial actions at Durango. In addition, the WQCC promulgates appropriate water quality criteria similar to, but not necessarily identical to, the limits presented in Table F-10. The discussion of applicable Colorado State Water Quality Criteria in the DEIS should include the WQCC approved standards and classifications of waters that are affected or potentially affected by the remedial action alternatives.

GEOCHEMISTRY

35) Section 1.5, ¶5, Page 17:

The DEIS does not characterize the attenuative capacity of the clays and
6.6.2 sediments at the Durango, Bodo Canyon and Long Hollow sites. Sediments extracted from the borrow areas will be used for liner material. Because the

6.6.2 liners will be used to attenuate hazardous constituents including radium, the sorptive capacity of the sediments must be determined for liner materials if the EIS takes credit for this attenuation. Furthermore, the sorptive capacity of surrounding soils and sediments will be important in retarding contaminants which migrate through the liner materials. This is especially true on a 200-1000 year stability criteria where the clay and synthetic liners will not contain the contaminants leaching from the stabilized tailings. The EIS should quantify the attenuative capacity to be credited to the soils and sediments at the proposed disposal sites and borrow areas.

36) Section F.2.5.3, ¶5, Page F-137 and Section A.7.3.3, ¶13, Page A-88:

6.7.2 The DEIS assumes that the leachate pore water from the Durango tailings site is similar to the Riverton UMTRAP site. The DEIS also calculates the dilution factors assuming that the chemical concentrations are sustained over long time periods. These dilution factors are questionable as discussed in comment 33. Furthermore, it cannot be assumed that the pore water chemistries of leachate at Riverton and Durango are similar. The concentration of leachate is dependent on many factors, including the composition of heavy metals in the tailings. Alternative 5 calls for reprocessing the tailings to remove high concentrations of uranium and vanadium, which leads the staff to expect the Durango tailings to contain higher concentrations of metals, including radium, than the Riverton tailings. Hence, leachate concentrations at Durango are expected to be higher than at Riverton. The DEIS should not base calculations for leachate composition and dilution factors on data from other sites. The tailings pore water chemistry data should be determined at Durango. If this cannot be determined then the pore water concentrations should be bracketed for the dilution calculations.

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GEOTECHNICAL ENGINEERING

37) General:

6.4.1 The DEIS contains no information regarding the need for borrow materials as part of the construction to upgrade the haul roads associated with alternatives 3, 4 and 5. Volumes of materials needed, and planned borrow locations should be discussed. If it has been determined that the roads can be widened and upgraded with a balanced cut and fill, the DEIS should indicate this.

38) Section A.6.2.1, ¶4, Page A-66; Section A.7.3.4, ¶3, Page A-89:

6.4.1 Alternatives 4 and 5 both consist of stabilization of the tailings at the Long Hollow site. For alternative 5, the DEIS indicates that a two-foot layer of rock placed over the soil cover for erosion protection is necessary to provide reasonable assurance that the long-term stability standards will be met. In light of this design, the DEIS should discuss the basis for only providing a thinner vegetated soil cover for alternative 4.

39) General:

There exist a number of inaccuracies and inconsistencies in the proposals for radon barrier thickness for the various alternatives. A 5-foot thick soil cover is planned for alternatives 2, 3 and 4, while a 6-foot thick soil cover is planned for alternative 5. The discussion in the DEIS pertinent to the basis for these designs is unclear as follows:

a. A single layer analysis was used in all cases, but some of the cover designs consist of a layer of topsoil over a layer of clay.

b. The calculation of cover thickness performed for Alternative 2 is also applied to Alternatives 3 and 4. The sources for cover material, and the plans for erosion protection both vary from alternative to alternative, and thus parameters that are key to the calculation of cover thickness will vary among the alternatives. It is inappropriate to consider one analysis applicable to the three different alternatives.

6.4.1

c. The DEIS states that under alternative 5 (the reprocessing alternative), 6 feet of cover (as opposed to 5 feet for the other alternatives) would be needed because the tailings would not be covered with the contaminated soils which have a lower radon flux. There is no mention of this separation of materials in the discussion of alternatives 2, 3 and 4. In fact, alternative 2 indicates that mixing will occur.

d. The discussion on cover design in Section A.5.2.4 (Pg. A-43) incorrectly references the previous cover design as being discussed in Section A.4.2.5. The correct reference should be Section A.4.2.2.

Analyses and/or discussions pertinent to proposed radon barrier thicknesses should be modified to clarify the issues discussed above.

40) General:

6.4.3 The embankments associated with alternatives 2 and 3 have been analyzed for stability using the STABL 2 computer program. However, the embankments for alternatives 4 and 5 were analyzed by the infinite slope method; a simplified, quick method that is usually applied to long slopes of cohesionless materials. The use of this method is considered an inadequate assessment of stability. Consistency should be maintained by using the more appropriate methods as were applied to alternatives 2 and 3.

41) Page A-4[illegible], [illegible] A-10:

6.6.1 The slope stability factors-of-safety for the upstream and downstream slopes of the homogeneous embankments for alternative 3 under seismic, end-of-construction conditions are reported as 1.3 and 1.1 respectively. These values should be re-checked, for it would seem unlikely that the 1 horizontal to 1 vertical upstream slope would have a higher factor of safety than the 3 horizontal to 1 vertical downstream slope under the same loading conditions.

42) Section A.6.2.2, Page A-66:

6.7.2 The NRC has serious concerns regarding the long-term integrity of the proposed underdrain system. The DEIS should discuss the potential for reduction of the system's capacity due to clogging and/or pipe failure over the long-term, and what factors-of-safety (if any) have been incorporated into the design to allow for this capacity loss. In addition, the impacts resulting from the potential failure of the drainage system to prevent groundwater mounding into the tailings pile should be discussed.

Health Physics

43) Section 4.2, Page 79:

6.10.1 This section should discuss the contamination in the Animas River sediment and in the dry washes as part of the site description (Subsection 4.2.1) or as part of the vicinity properties description (Subsection 4.2.2). Section 4.8.1 does discuss this contamination (last paragraph on page 108), but it needs to be included in the site or vicinity properties description. The locations of the contamination could be included in Figure 3-1 as was done for the tailings piles and the raffinate ponds area.

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44) Sec. 4.8.1, ¶1, Page 107:

6.10.1 The DEIS in this section implies that the environmental concentrations for radioactive airborne particulates have been characterized for the Durango site area. Appendix H in Section H.1.1.3 (page H-8) correctly states that the airborne particulate samples may not be an indicator of long-term conditions because of limited sampling. The validity of the Durango site airborne particulate results is also questionable when compared to the Bodo Canyon sampling results (see Table H-3 and H-14 on pages H-8 and H-33). Airborne concentrations near the Durango site for uranium, Th-230, and Ra-226 are two and three orders of magnitude greater than the Bodo Canyon concentrations. At least three months of air sampling should be performed near the Durango site and results for airborne concentrations of uranium, Th-230 and Ra-226 should be reported in the final EIS. If there is insufficient time or resources to collect this data, then the present data should not be included in Volume I of the [illegible] [illegible] appropriate to leave this data in Appendix H.

45) Sec. 4.8.4, Page 113:

6.10.1 External gamma radiation and radionuclides-in-soil concentrations should be characterized for the haul road.

46) Section 5.8, Page 132:

6.10.2 This section should explain how the radiological impacts from the remedial action are incremental to present conditions at the site. The exposures due to radon are several orders of magnitude greater than exposures from other pathways because of the large radon flux which predominates over other source terms prior to, during, and after remedial action. Although the incremental amount of radon released due to construction activities is small, relative to the radon released prior to remedial action, it is still a dominant source term over direct gamma and airborne particulates. However, for completeness this section should discuss the relative increases in direct gamma and airborne particulate source terms. Increases of gamma exposure rates and airborne particulate concentrations will be significant when compared to their levels prior to remedial action. Airborne particulates will increase from essentially zero concentration to measurable levels of concentrations. There is a possibility of significant concentrations in the case of adverse meteorological conditions and ineffectual mitigative measures. A qualitative discussion of the mechanisms causing incremental radiological impacts from radon, direct gamma, and airborne particulates should be added to the quantitative discussion on radon and direct gamma impacts.

47) Page H-5 (last¶) and H-6:

6.10.1 The radionuclide concentrations used by the DEIS are 973 pCi/g for Ra-226, 1070 pCi/g for Th-230, and 103 pCi/g for U-238. Natural uranium (U-nat) concentration, not U-238, should be used in the DEIS analyses. U-nat concentrations would be twice that measured for U-238, or 206 pCi/g. Also, the Pb-210 concentrations should be estimated and used in the DEIS analysis.

48) Page H-52, ¶5:

6.10.2 The analysis of the radon source term during reprocessing fails to include several sources. It fails to determine radon releases from the drying and crushing operations prior to the heap leach process.

Other

49) Section 2.3, ¶1, Page 32:

6.19 The statement " . . . licensing of disposal sites will be for the purpose of ensuring compliance" should say "will be primarily for."

50) Section 5.21.6, Page 216

.20.3 The UMTRA health and safety plan does not include special state or local requirements which may be applicable at Durango.

51) Section 6.1.3.1, Oak Shrub, Page 6-19:

6.19 The last sentence states that shrub production was measured. However, it appears to be an estimated or calculated value.

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ENVIRONMENTAL DEFENSE FUND

January 11, 1984

Mr. John G. Themelis
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Uranium Mill Tailings Project Office
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5301 Central Avenue, N.E.
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Re: Draft EIS For Remedial Action at the Durango, Colorado UMTRAP site

Dear Mr. Themelis;

Enclosed are the Environmental Defense Fund's comments in the above-captioned matter. If you have any questions about our work, please do not hesitate to call.

Respectfully,

James Martin

James B. Martin
Staff Attorney

enclosures

... Arapahoe Avenue   Boulder, Colorado 80302   (303) 440-4901
... NEW YORK, NY (National Headquarters); WASHINGTON, DC; BERKELEY, CA; RICHMOND, VA; BOULDER, CO

COMMENTS BY THE
ENVIRONMENTAL DEFENSE FUND
ON REMEDIAL ACTION AT THE FORMER
VANADIUM CORPORATION OF AMERICA
URANIUM MILL SITE AT
DURANGO, COLORADO

Prepared by

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January 11, 1!

I. INTRODUCTION

The Environmental Defense Fund (EDF) is a national, not-for-profit public organization with over 55,000 members, more than 1,000 of whom reside in the State of Colorado. Through participation in administrative proceedings, litigation, education efforts, and lobbying, EDF strives to eliminate unnecessary human exposure to toxic and hazardous substances. As part of that program effort, the Environmental Defense Fund (EDF) submitted extensive comments to the Environmental Protection Agency concerning its development of standards for protection of human health, safety, and the environment from the radiological and nonradiological hazards associated with uranium mill tailings at both active and inactive uranium mill sites. In addition, EDF is a party to petitions for review of both sets of the Environmental Protection Agency's final standards.

These comments address the draft Environmental Impact Statement (EIS) for Remedial Action at the Former Vanadium Corporation of America Uranium Mill Site at Durango, Colorado. EDF is encouraged that the Department's preferred alternative is to remove the uranium mill tailiings from their current location for final disposal in a more remote location. However our review of the draft EIS demonstrates that it does not adequately address
6.10.3 key aspects of remedial action at the Durango site. For example, the draft EIS does not include an assessment of risk, to people living near the tailings, from radon exposure. Moreover,
6.4.1 the engineering designs for the four action alternatives are so conceptual in nature that it is not possible to assess whether

these measures will fulfill the requirements of the Uranium Mill
6.4.1 Tailings Radiation Control Act and the standards promulgated by EPA pursuant to that Act. In addition, the Department has not adequately characterized the potential disposal sites. As a result, there is insufficient information upon which to base a final decision for remedial action. Consequently, before the Department of Energy irrevocably commits to implementation of a
6.2 specific course of remedial action the Department should prepare, and circulate for public comment, a supplemental document that discloses and evaluates the environmental impacts associated with the alternatives, and that sets out proposed remedial action plans in sufficient detail to permit meaningful comment.

II. ASSESSMENT OF EFFECTS ON THE SURROUNDING POPULATION OF IONIZING RADIATION

In reviewing the draft EIS, EDF identified several serious flaws in the Department's radiological assessment. First, the draft EIS does not assess maximum individual risk from radiation exposure, a key decisionmaking component. Second, the Department apparently used an estimator for assessing excess risk to the regional population of fatal lung cancer due to radon exposure that was repudiated by EPA. Third, the radiation risk assessment does not incorporate dose commitments attributable to the ingestion pathway, even though these exposure pathways may exist at the Durango site.

A. The Department Must Assess Maximum Individual Risk from Radiation Exposure

One of the express purposes of the Uranium Mill Tailings Radiation Control Act of 1978 was to assure disposal of mill tailings in a safe and environmentally soun manner "in order to prevent or minimize radon diffusion into the environment." 42 U.S.C. section 7901(a). In promulgating standards for remedial action, EPA specifically found that there is a significant risk of lung cancer from exposure to radon decay products, and that exposures may be large for persons who live near abandoned tailings piles. 48 Fed. Reg. 590, 593 (columns 1,2) (Jan. 5, 1983). Indeed, EPA found that "[l]ung cancer caused by the short-lived decay products of radon is the dominant radiation hazard from the tailings." 48 Fed. Reg. 593 (column 3).

Compelling scientific evidence exists showing a direct connection between radon exposure and an increased risk of fatal lung cancer. The environmental impact statements prepared by EPA in
6.10.3 conjunction with development of health protection standards for active and inactive uranium mill tailings piles include a thorough discussion of the scientific literature on this subject. In a special report prepared for the Environmental Defense Fund, Dr. Julie Overbaugh reviewed the results of recent epidemiological studies of miners exposed to radon concentrations elevated above background. She found that those studies substantiate the risk estimator that was heavily relied upon by EPA in its rulemakings.

Moreover, the Uranium Mill Tailings Radiation Control Act and its legislative history leave no doubt that Congress was aware of the health risks associated with radon exposure and intended that remedial action measures be designed to "prevent or minimize" exposure to radon decay products. In addressing mill tailings, Congress specifically found that these wastes

> may pose a potential and significant radiation health hazard to the public, and that the protection of the public health, safety and welfare ... require that every reasonable effort be made to provide for the stabilization, disposal, and control in a safe and environmentally sound manner of such tailings <u>in order to prevent or minimize radon diffusion into the environment</u>....

42 U.S.C. section 7901 (emphasis added). The House Report accompanying the legislation contains equally emphatic statements. For example, the report states that "the legislation will require every reasonable effort to be made ... to provide for the disposal, stabilization and control in a safe and environmentally sound manner of such tailings <u>to prevent or minimize the diffusion of radon or the entry of other hazards into the environment</u>." H.R. Rep. 1480 (Part I), 95th Cong., 2d Sess., 13, <u>reprinted in</u> [1978] U.S. Code Cong. & Ad. News 7435
6.10.3 (emphasis added).

Despite the compelling scientific evidence of radiation risk to persons who live near uranium mill tailings piles, and despite Congress's insistence that the Department prevent or minimize the health risks associated with exposure to radiological hazards associated with mill tailings, the Department did not estimate the risk of radon-induced carcinogenesis for either the maximally exposed individual or for a set of individual receptors at different locations around the tailings piles.1/ Instead, the draft EIS includes only an aggregate estimate of risk to the population living within eighty kilometers of the tailings piles.

1/ While the Department calculated doses to an adult over a ten-year period for each alternative, using a MILDOS code, the Department did not calculate health risks attributable to such exposure levels.

This approach has several serious deficiencies. First, it diffuses risk to exposed individuals by aggregating health effects to the population as a whole--it averages risk for those who live far removed from the pile with the much greater risk to those who live near the tailings. As such, a population risk assessment neither describes distribution of risk among the population nor quantitates the magnitude of risk to an exposed individual. Second, by aggregating risks to a population, the draft EIS makes it difficult or impossible for the people in the community, and for the decisionmaker as well, to identify and consider the critical element of risk to individuals.

6.10.3 The purpose of a quantitative risk assessment is to give the decisionmaker and the public an estimate of the severity of health problems associated with exposure to a carcinogen. The Environmental Protection Agency has stated that in developing such an estimate, two measures are of particular interest: "maximum individual risk," and "total population impact":

> The two estimates taken together provide a better description of risk in a community than either number taken alone. "Maximum individual risk" tells us the worst risk, but not how many people bear that risk. "Total population impact" describes the overall health impact to the entire exposed population but not how much risk the most exposed persons bear. Two chemicals or regulations could have similar population impacts, but very different maximum individual risks, or vice versa. Consequently, <u>any sensible "risk management" sustem cannot rely on either measure alone; both are important</u>.

<u>EPA Background Paper Outlining Risk Asssessment Rationale, Regulatory Plan for Controlling Benzene Under Clean Air Act</u> (Dec. 15, 1983), <u>reprinted in</u> 13 Env't Rep. 1484 (Current Developments) (1983). Even though EDF may sharply disagree with

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the agency's weighing of risks or with its choice of a regulatory response, we strongly believe that if agencies use risk assessment techniques to aid in making policy decisions, those agencies must identify and disclose risks to the maximally exposed individual.

6.10.3 The Nuclear Regulatory Commission's regulatory guides for assessing compliance by uranium mills with the Commission's and EPA's radiation protection standards clearly mandate calculation of doses (and hence risks) for both individuals and populations. <u>See Calculational Models for Estimating Radiation Doses to Man From Airborne Radioactive Materials Resulting From Uranium Milling Operations</u> (NRC, March 1982); <u>Compliance Determination Procedures for Environmental Radiation Protection Standards for Uranium Recovery Facilities</u> (NRC, March 1982). More to the point, a document prepared by the Los Alamos National Laboratory for the Department of Energy, to guide its development of radiation risk assessments as part of environmental impact statements, clearly emphasizes the importance of estimating risk to <u>individuals</u>, including the maximally exposed individual. T. Buhl, W. Hansen, <u>Estimating the Risks of Cancer Mortality and Genetic Defects Resulting from Exposures to Low Levels of Ionizing Radiation</u> (May 1984).

These technical prescriptions reflect a key principle underlying the regulatory regime for radiation protection: identification and minimiziation of risk to individuals as well as populations. As long ago as 1960, the Federal Radiation Council made clear that federal agencies must devote their attention to reducing radiation exposure to individual members of the population. 25 Fed. Reg. 4402 (May 18, 1960). As recently as 1977, the International Commission on Radiological Protection reaffirmed that principle. Radiation Protection, ICRP Publication 26 (Jan. 1977).

There is no question but that the risks of radon-induced carcinogenesis for people living near the tailings pile is sigificant. Using the information presented in the draft EIS, the Environmental Defense Fund has calculated that **the excess lifetime risk of fatal lung cancer for a person living three kilo-**
6.10.3 **meters northeast of the piles is one-in-240 persons exposed.**[2/]

The Department of Energy's failure to assess risk to individuals of radon-induced carcinogenesis represents a dramatic and unjustified departure from federal policy and practice. It leaves unfilled a critical component of the decisionmaking calculus that must be applied in selecting and implementing a remedial action plan. The Department should clearly and explicitly quantitate the health risks to individuals due to radon exposure, and should make the results of its calculations available to the public.

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B. The Department's Radiological Assessment Is Unclear and Requires Greater Specificity

The draft EIS's presentation of radiation health risks to
6.10.2 the population is confusing and unclear. For example, in the draft EIS's treatment of population effects of radiation exposure,

2/ That calculation was made using the risk estimate of 18/WLM/MP derived by the BEIR III Committee (See Part II C, infra), and the dose to the bronchial epithelium presented at page H-54 of the EIS appendix, and a dose conversion factor of 5 rem/WLM.

the Department claims that "expected excess cancer deaths were obtained by multiplying the risk factors described in section 5.2.1 by the dose commitments." Yet section 5.2.1 refers to several risk estimators for assessing risk of radon-induced carcinogenesis but does not specify which risk coefficient was used in quantitating health risks to the regional population from radon exposure. Similarly, neither the draft EIS nor the appendices disclose to the public what dose conversion factors were used by the Department in calculating dose to the broncihial epithelium. For example, did the Department assume 100 percent indoor exposure
6.10.2 in a ventilated room using a dose conversion factor of 0.625 mrem/yr indoors per pCi/m^3 of radon-222 in outdoor air? Cf. 3 Final Generic Environmental Impact Statement on Uranium Milling G-45 (NRC Sept. 1980). This information is essential to meaningful review and comment on the Department's assessment of health effects associated with the proposed alternatives. The next generation of NEPA documents prepared for remedial action at the Durango site must explicitly state the assumptions made by the Department in calculating dose commitments and in assessing health risks to individuals and regional populations.

C. The Department Used An Inappropriate Risk Coefficient For Assessing Radon-Induced Health Effects

The Department's radiation risk assessment also raises a much more serious concern: selection of an appropriate
6.10.2 estimator for assessing risk of radon-induced carcinogenesis. A large number of epidemiological studies of radiation-induced carcinogenesis were summarized by the Committee on the Biological

Effects of Ionizing Radiation of the National Research Council. The Effects on Populations of Exposure to Low Levels of Ionizing Radiation: 1980 (National Academy Press 1980) (referred to hereinafter as "BEIR III"). The BEIR III Committee presented an estimate for radon-daughter exposure (18/WLM/MPY) that is independent of age and that was based on a consideration of all available epidemiologic results, assuming a linear dose-respone curve.

Since the BEIR III report was issued, new studies on radiation-exposed populations have appeared. Those studies have narrowed the range of risk estimators and support the results of the BEIR III Committee. Attached to these comments as Appendix A is a scientific report that thoroughly discusses several of the most recent epidemiological studies of radon-induced carcinogenesis.
6.10.2 J. Overbaugh, Discussion of the Lung Cancer Risk Resulting from Radon Exposure to the General Population (Sept. 1984). The report by Drs. Radford and Renard is particularly persuasive since it involved relatively low radon exposure levels, and included both careful smoking controls and a long follow-up period.

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Notwithstanding the availability of credible risk estimators, we understand from telephone conversations with the Department's contractors that the Department used a risk coefficient for exposure to radon decay products (high-LET alpha radiation) that was expressly repudiated by EPA when it was setting standards for disposal of uranium mill tailings. R. Evans, et al., Estimate of Risk from Environmental Exposure to Radon-222 and Its Decay Products, 290 Nature at pp. 98-100 (1981). [Evans derived a

lifetime risk estimate of 0.6 to 1.6 lung cancers per 10^4 .LM.] In reviewing Evans's work, EPA concluded that his risk estimates

> are not convincing. The upper limit of lung cancer risk given by these authors is apparently based on assuming that the total period of risk following exposure is only 15 years. However, the Japanese A-bomb survivor data, the only large body of data for a general population, leads to use of a lifetime period of risk following exposure.

48 Fed. Reg. 596 (columns 1-2). The final environmental impact statement prepared by EPA for its inactive mill site standards includes a detailed response to Evans's conclusions and identifies a number of methodological problems with that work. 2 Final Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites at D-20 to D-22 (Oct. 1982).

6.10.2 By way of contrast to Evans's lifetime risk of 1 x 10^4 WLM, Drs. Radford and Renard, in the recent scientific report reviewed by Dr. Overbaugh, derived a lifetime risk estimate (relative risk model) of one excess case per 1000 per WLM (1 x 10^3) "that is in agreement with other studies of miners based on a relative risk coefficient which incorporates risk in later years." J. Overbaugh at 7. Similarly, Cohen calculated an average lifetime risk from radon exposure (applied to average distribution of United States population) of 520 x 10^{-6}/WLM, based on the absolute risk estimate derived in BEIR III. B. Cohen, Health Effects of Radon Emissions from Uranium Mill Tailings, 42 Health Physics 695-702 (1982). The risk coefficient developed by Drs. Radford and Renard is roughly one order of magnitude greater than that derived by Evans, while Cohen's lifetime risk estimate is five times higher than Evans's.

In light of EPA's rejection of the risk estimator derived by Evans, the Department's reliance on that estimator is arbitrary
6.10.2 and capricious. The Department should assess risk of fatal lung cancer due to radon exposure using the risk coefficient derived by the BEIR III Committee or the risk coefficient presented in the more recent report by Drs. Radford and Renard.

D. DOE Should Estimate Dose Commitments Via the Ingestion Pathway

The Department concedes that groundwater samples from Ligntner Creek show concentrations of uranium significantly above those reported for upgradient wells. Draft EIS at 98. Elsewhere in the draft EIS, the Department states that surface water samples taken from the Animas River show that radium concentrations (radium-226 and radium-228) exceed EPA's drinking water standards (Draft EIS at 145), while samples from the Animas River alluvium show concentrations of uranium elevated above
6.10.2 background (draft EIS at 98). Finally, Ford, Bacon & Davis
6.5.2 reported that windblown tailings have been observed on the inhabited bluff northwest of the site and across the river in Durango. Ford, Bacon & Davis, Engineering Assessment of Inactive Uranium Mill Tailings/Durango Site/Durango, Colorado (1981).

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This contamination of surface and groundwater strongly suggests that a liquid pathway for radiation exposure to nearby residents may exist. The spread of airborne particulates offsite creates the potential for uptake by plants and animals, and further radiation exposure to humans through ingestion of contaminated vegetable and animal products. See Calculational Models for Airborne Radioactive Materials Resulting from Uranium

Milling Operations 3 (NRC, March 1982). Nevertheless, the Department summarily judged the ingestion pathway to be "insignificant," and decided not to treat the liquid exposure pathways because the City of Durango draws its water supply from the Animas River upstream of the tailings piles and because the contaminated groundwater "is not consumed." Draft EIS at 143-44.

The draft EIS does not offer any evidence to support the Department's conclusion that dose commitments received via these
6.10.2 pathways should not be included in calculating total radiation doses. Indeed, the evidence contained in the draft EIS suggests that these exposure pathways may exist, and that they are reasonably likely to exist in the future. Unless the Department can demonstrate (with evidence in the record) that these pathways do not exist, the dose commitments received via these pathways should be calculated. (Since surface and groundwater contamination would continue, though perhaps at a somewhat reduced level, after stabilization in place, these pathways should be included in a radiation dose assessment in any event.)

III. THE DEPARTMENT'S COVER DESIGN DOES NOT PROVIDE ASSURANCE IT WILL REMAIN EFFECTIVE OVER THE LONG-TERM

EPA's standards for controlling radon exhalation after final disposal require that controls be effective for up to one thousand years, and that the controls provide "reasonable assurance" that releases of radon-222 will not exceed an average
6.4.1 release rate of 20 pCi/m^2/sec. 40 C.F.R. section 192.02. However, EPA concedes that the uncertainty in estimating radon diffusion coefficients is as high as a factor of three at the 20

6.4.1 pCi level. Moreover, both EPA and the Nuclear Regulatory Commission have identified several key factors that will affect the cover's attenuation properties over the long-term. The Department should recalculate the cover design needed for remedial action at the Durango site, accounting for these key variables in a conservative manner.

A. Factors Affecting Cover Performance that the Department Should Incorporate Into Its Design Calculations

In order to achieve EPA's radon exhalation standard, the Department proposes to install a cover of compacted clay five feet thick for alternatives two, three, and four. Under alternative five, the Department proposes to install a cover of compacted clay six feet thick. Draft EIS at 5, 11, 12. In the short-term, the covers proposed by the Department may be sufficient to meet the EPA standard. However, covers of that depth, consisting of a uniform layer of clay, likely will not be

6.4.1 effective in attenuating radon exhalation over the long-term.

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"In sufficient thicknesses, soil covers are ... effective in reducing radon emissions. The soil moisture appears to be the dominant soil parameter affecting radon attenuation, owing to the very low diffusion coefficient of radon in water." 1 Final Generic Environmental Impact Statement on Uranium Milling at 8-14 (Nuclear Regulatory Commission 1980) (hereinafter cited as GEIS). However, it is not likely that a clay layer will retain high moisture levels over long periods of time if it is near the surface and subject to climatic influences:

> [t]he so-called zone of seasonal moisture fluctuation, that is the zone where soils are subject to climatic influence, is

> on the order of 10 feet deep or more. Moisture levels at the time of cover installation may be much greater than what is observed for undisturbed soils in this near surface zone. However, it is expected that moisture levels will eventually return to levels similar to those in soils in their undisturbed state. Natural moisture levels in undisturbed soils in arid and semiarid regions have been found to be on the order of 9 to 12% in clays and 6 to 9% in other soils. This can have a profound influence on the effectiveness of clay, as it has been shown that the diffusion coefficient for radon can increase by two orders of magnitude with a 20% decrease in moisture content.

Id. at 9-41.

Earthen covers will also become less effective in attenuating radon exhalation as the result of cracking. Clays, which tend to absorb water and swell, "are particularly susceptible to cracking upon dessication or when subject to wetting-drying and freeze-thaw cycling." Id. Cracking also may result from differential settlement as the tailings dry out and consolidate over

6.4.1 time.

In addition to the variables described above, cover integrity can also be significantly affected by forces generated from within the tailings material. Though much of the work on tailings management and disposal assumes (at least implicitly) that the material is inert unless acted upon by some outside force, there is compelling evidence from the work of Markos that uranium mill tailings are very unstable chemically and thus, highly reactive. G. Markos, Geochemical Mobility and Transfer of Contaminants in Uranium Mill Tailings (1979). The constituent compounds in the piles--particularly the deliquescent salts--can lead to substantial movement of materials from the interior to the surface, can create the conditions for exothermic reactions, and can generate osmotic pressures of several atmospheres. These and other conditions can lead to mechanical destabilization of the piles themselves and the covers designed to isolate the piles from the environment.

Each of these factors will affect cover performance in attenuating radon exhalation over the long-term. Each introduces a measure of uncertainty in designing covers. In the Final Environmenal Impact Statement for Standards for the Control of By-product Materials from Uranium Ore Processing, (Sept. 1983), EPA stated that

> [i]n practice, design techniques must take account of uncertainities in the measured values of the specific materials used, the tailings to be covered, and predicted long-term values of equilibrium moisture content for the specific location, in order to assure meeting any given radon emission limit over the long-term. The uncertainty in predicting reduction in radon flux increases rapidly as the required radon emission limit approaches background. Even at 20 pCi/m^2 the uncertainty may approach a factor of three.

6.4.1

Id. at 8-11 (citations omitted) (emphasis added).

In his oral testimony before EPA on the subject of cover design, Dr. Rogers reiterated that under our present level of understanding, the radon diffusion coefficient can be characterized within a factor of two. Dr. Rogers stated that while moisture content is the critical component in characterizing the effectiveness of a particular cover material to attenuate radon exhalation, other factors such as the degree of compaction and porosity of the system, as well as physical parameters such as distribution of particle size, will infludence the diffusion coefficient. (Excerpts of Dr. Roger's testimony are attached to these comments as Appendix B).

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B. DOE Should Compensate for the Effects of Key Variables on Cover Performance

Proper cover design can compensate for the effect of these variables on cover integrity and longevity. Dr. Rogers has concluded that mixtures of clay with coarser materials appear to be highly beneficial in minimizing cover defects and in maximizing moisture retention. V. Rogers & K. Nielson, UMTRAP Research on Cover Design for Uranium Mill Tailings (1984) (attached as Appendix C). Other researchers have reported that multi-layer covers provide "hydraulic isolation" of the clay component of a cover. For example, a gravel layer will be effective in maintaining the moisture content of the clay layer without active maintenance. P. O'Brien, The UMTRAP Technology Development Program: A Progress Report (1981) (attached as

6.4.1

Appendix D). At the same time, such a capillary barrier has been determined to be effective in retarding upward migration of water and salts. G. Gee, et al., Radon Control by Multilayer Earth Barriers (1981) (attached as Appendix E).[3/] Finally, the Environmental Defense Fund's review of the scientific literature, and our conversations with Dr. Markos, lead us to the conclusion that cover design should include both a capillary barrier constructed of a chemically reactive rock such as limestone and an impermeble layer to isolate any salts that penetrate the capillary barrier and also to retain surface moisture in the upper layer of the cover.

3/ The RAECO computer code allows analysis of an n-layered system in which each layer may have a different diffusion coefficient, poroxity, thickness, and radon source term. V. Rogers & K. Nielson at 247.

Incorporation of thesc features into the cover design for remedial action at the Durango site would substantially enhance the likelihood that the cover will remain effective for one thousand years. In addition to making these changes in engineering detail, however, the Department also should recalculate its cover designs to provide a "reasonable assurance" that radon emissions will not exceed 20 pCi/m^2/sec for one thousand years.

Thus, in designing the cover the Department should account, in a conservative manner, for the uncertainties in attenuaticn characteristics of material used. "This will tend to increase the cover thickness required over that calculated from 'best
6.4.1 estimated' values, which would yield an approximately equal probability of achieving at or below the design level." 48 Fed. Reg. 45926, 45938 (column 2) (Oct. 7, 1983) (active mill site standards). A key example of uncertainty that must be considered is the long-term equilibrium value of moisture to be expected in the cover material, and the use of coarse materials to inhibit capillary action. Other factors that must be considered include uncertainty in characterizing the radon diffusion coefficient for specific earthen materials, and the long-term equilibrium moisture content of the tailings themselves. The practical effect of this recalculation of cover design should lead to thick, durable covers that have a substantial likelihood of maintaining radon exhalation below 20 pCi/m^2/sec for one thousand years.

C. The Department Should Evaluate Use of Alternative Cover Materials

The Department of Energy has, over the last six years, sponsored an intensive program for testing the use of asphalt emulsion radon barrier systems. Asphalt emulsion systems have a very low radon diffusion coefficient and are therefore highly effective in attenuating radon exhalation. V. Rogers & K. Nielson at 250. In 1980, "a technology review panel concluded that there are no fundamental technical reasons why a properly designed and installed asphalt cover cannot function indefinitely as an effective radon seal." P. O'Brien at 43.

Extensive field tests of the effectiveness of different cover technologies, including asphalt emulsion systems, were conducted in 1981. The results of that research are persuasive and have been thoroughly documented. J. Hartley, et al., 1981
6.4.1 Radon Barrier Field Test at Grand Junction Uranium Mill Tailings Pile (April 1983) (Pacific Northest Library). Those researchers demonstrated that asphalt emulsion systems were the "most effective" cover tested, and showed a radon flux reduction of greater than 99.9 per cent. Id. at 97. They also reported that the asphalt systems were one of the two most cost-effective of all of the covers that were tested. Id. at 109. (Portions of this report are attached to these comments as Appendix F.)

In short, asphalt emulsion cover systems have been demonstrated to be effective, and cost-competitive, in significantly reducing radon flux from uranium mill tailings. Under any definition, such systems represent a reasonable alternative that the Department should have, but did not, consider.

The "linchpin" of an environmental impact statement is its consideration of alternatives. An impact statement must contain a detailed and careful analysis of the relative environmental merits and disadvantages of the proposed action as well as possible alternatives. NRDC v. Callaway, 524 F.2d 79, 92-93 (2d Cir. 1975). The implementing regulations promulgated by the Council on Environmental Quality (CEQ) add an important gloss to this statutory requirement. The CEQ regulations provide that an impact statement must "vigorously explore and objectively evaluale all reasonable alternatives...." 40 C.F.R. 1502.14(a),(d). Moreover, the agency must devote "substantial
6.4.1 treatment" to each alternative so that decisionmakers and the public "may evaluate their comparative merits." 40 C.F.R. 1502.14(c).

Attenuation of radon exhalation is one of the principal objectives of the remedial action program, reflecting the importance Congress attached to protection of human health from radon exposure. Asphalt emulsion systems clearly have been demonstrated to be exceptionally effective in reducing radon flux. The Department's failure to consider this cover technology as part of the draft EIS was unreasonable, and should be corrected in the next generation of NEPA documents.

IV. STABILIZATION IN PLACE LIKELY DOES NOT SATISFY THE PURPOSES OF THE ACT

When it enacted the Uranium Mill Tailings Radiation
6.2 Control Act of 1978, Congress was aware that the radiological end nonradiological hazards associated with uranium mill tailings will persist for many thousands of years. For that reason,

Congress cautioned the Department of Energy "not to rush headlong into using technology that may be effective for a short period of time. The committee does not want to visit this problem again with additional aid. The remedial action must be done right the first time." H.R. Rep. 1480 (Part II), 95th Cong., 2d Sess. 40 (1978).

In promulgating standards for remedial action, EPA rejected
6.2 alternatives that relied upon active institutional care such as access control and institutional care. EPA concluded that "primary reliance on passive measures is preferable, since their long-term performance can be projected with more assurance than that of measures which rely on institutions and continued expenditures for active maintenance." 48 Fed. Reg. 590, 597 (column 3) (Jan. 5, 1983).

The Environmental Defense Fund's review of alternative two (stabilization-in-place) revealed that this alternative relies extensively upon measures that are not likely to remain intact for one thousand years. A geotechnical report prepared for the Environmental Defense Fund bolsters our conclusion that stabil-
6.5.1 ization-in-place can likely not be implemented consistent with the Act and the EPA standards.

First, the draft EIS proposes that the toe of the stabilized pile would be protected from stream-bank erosion and flood waters by installation of a grouted riprap erosion barrier along the south bank of Lightner Creek and the west bank of the Animas River. Draft EIS at 5. The Department then concedes, at the outset, that this device "would require repeated maintenance over the design life to be effective." Id. at 11. That statement identifies a serious, perhaps fatal, flaw in the design of alternative two.

In addition to the grouted riprap along the stream and river banks, alternative two relies upon construction of diversion ditches to control surface flows and cap erosion. As stated in the enclosed report, such ditches will not be maintenance-free. They simply will not maintain their design characteristics for the long-term without routine repair and maintenance.

Finally, the conceptual design for alternative two also
6.5.1 requires installation of grouted riprap at the boundary between the tailings pile and the natural hillside. However, EDF's technical report concluded that this type of design is highly vulnerable to undercutting and uplift pressures due to underseepage from upslope. As a result, this design feature likely will not retain its design characteristics for the long-term.

Individually and collectively, none of these elements of alternative two are likely to remain effective over the long-term. Each of these design features would require either routine repair or maintenance even in the short-term. As a result, alternative two simply does not satisfy the requirements of the Act and the regulations promulgated thereunder.

V. THE DEPARTMENT MUST ASSURE THE LONGEVITY OF THE DESIGNS FOR ALTERNATIVE THREE, FOUR, AND FIVE

Alternative four (Long Hollow) would require the installation of a sand and gravel underdrain beneath the tailings impoundment. The purpose of the underdrain is to provide an avenue for groundwater movement away from the pile, thereby preventing groundwater mounding beneath the pile. Draft EIS at 12. That proposal raises several problems.

First, the draft EIS does not contain an engineering assessment of whether such a system can be constructed with reasonable assurance that it will remain intact for one thousand years. Second, the underdrain is to be designed to accommodate a maximum flow of three cubic feet per second (cfs). However,
6.7.1 EDF's technical report concluded that actual flows will exceed that value and recommended that tests be conducted to determine flow rates for proper design. Third, the installation of such a system must be done with meticulous care and must be supervised by qualified, functionally independent quality assurance teams. (For example, unless clay material is properly compacted over a gravel/sand drainage layer, it will provide a high-velocity pathway for erosion.) Development of a quality assurance program should, therefore, be incorporated into the final design if alternative four is implemented (assuming the Department can provide reasonable assurance, using standard engineering criteria, that the underdrain design will likely remain effective for one thousand years).

The use of groundwater interceptor trenches in alternative five (Long Hollow), to provide an avenue for movement of

groundwater away from the site, is the subject of the same set of concerns. Unless the Department can assure that such a design
6.7.2 will meet the longevity requirements of the EPA standards, reliance on this design will call into serious question the viability of this alternative.

A. <u>The Department Should Disclose the Results of Its Investigations and Permit Another Round of Public Comment</u>

Apparently, the Department recognizes that the use of an underdrain in alternative four, and an interceptor ditch in alternative five, raise serious questions of engineering design. In the Department's words, the ability of these elements of the remedial action alternatives to meet the standards' longevity requirement is "under investigation." Draft EIS at 13.

6.2 In fact, these questions are central to the feasibility and propriety of implementing alternatives four and five. The information to be developed in the continuing investigations is crucial to a reasoned and informed selection among the alternatives. Without this information, the draft EIS is so inadequate as to preclude meaningful analysis. In order to cure these information gaps, the Department should prepare and circulate a supplemental draft EIS, or its functional equivalent. 40 C.F.R. 1502.9(a), (c); 40 C.F.R. 1502.22.

VI. <u>THE DISPOSAL SITES HAVE NOT BEEN ADEQUATELY CHARACTERIZED</u>

The need for a supplemental draft EIS, or its functional equivalent, is highlighted by the absence in the draft EIS of site-specific information concerning the alternative

disposal sites. The principal problem identified in the enclosed geotechnical report is that the disposal sites have not been adequatly characterized geotechnically: as a result, designs are based on extremely limited data.

An analysis of geomorphic processes is indispensable to
6.4.3 evaluation of stabilization-in-place, as well as the other disposal sites. Yet the DEIS provides not such analysis. The geotechnical report also concluded that because of the way alluvium was deposited at the tailings site it is possible that it contains loose sands or soft clay layers. Consequently, a slope failure would be more likely to occur within the alluvium beneath the tailings pile. However, the Department did no analysis to assess this condition.

The draft EIS's treatment of groundwater is similarly sparse. For example, monitoring at the existing tailings piles shows that the groundwater is locatd within the alluvium that becomes saturated with depth. The Bodo Canyon site is situated within an area of groundwater recharge: piezometers indicate that the water probably is located on top of the shale bedrock, but no information has been presented to determine whether water is also within the bedrock or within the upper surficial soils or both. And at Long
6.5.2 6.6.2 6.7.2 Hollow, water occurs at a depth of 0.5 feet to a maximum depth of 28 feet.

Despite the compelling evidence in the draft EIS that groundwater contamination is a potentially serious problem at any of the proposed disposal sites, the Department has not conducted a contaminant transport study at any of the sites. This information is vitally important, and such studies should be performed to determine the fate of seepage water from the piles

6.2 and from each alternative disposal site. Similarly, the enclosed geotechnical report found that the borings and geotechnical test pits conducted at the Bodo Canyon site produced "minimal" surface information, and that subsurface conditions can not be adequately characterized on the basis of such limited information. And with respect to the Long Hollow site, the borings are too shallow to identify accurately subsurface materials that would be affected by a waste disposal sites.

A simple enumeration of the draft EIS's critical information gaps is compelling. The preceding materials show that the Department has not analyzed the geomorphic processes that will affect the long-term integrity of a disposal site wherever it is located. The Department lacks sufficient site-specific information to characterize the subsurface materials at each of the sites, and has not conducted a contaminant transport study. And the Department has not thoroughly investigated the potential of a slope failure within the alluvium located beneath the tailings piles.

This information, like the results of the Department's investigation of underdrains and groundwater diversion channels, is essential to a reasoned choice among alternatives. It is essential that adequate information on these key issues be developed, and made available to the public, before the agency makes a final decision and commits resources to implementation of a remedial action alternative. <u>NRDC v. Callaway</u>, 524 F.2d 79, 92

(2d Cir. 1975). Indeed

> the premise from which any environmental impact statement must begin is the recognition that its goal is to provide a detailed discussion <u>sufficient to allow the agency decisionmaker to fully consider</u> in his or her decisional calculus the possible environmental effects of various alternative paths the agency might choose to pursue with
> 6.2 respect to a given project.

<u>Sierra Club v. Coleman</u>, 421 F. Supp. 63, 65 (D.D.C. 1976).

The record in this case demonstrates convincingly the need for substantial additional information and studies that are, fundamentally, prerequisites to an informed decision.

VII. <u>A MONITORING PROGRAM IS NEEDED TO VERIFY COVER PERFORMANCE</u>

Given evidence that even after closure the uranium mill tailings may not remain stable and that the structural integrity of the covers could be adversely affected over time, and given EPA's judgment that the effectiveness of covers can not be predicted with a great deal of certainty, it would be unreasonable for the Department to fail to establish a program for monitoring the effectiveness of covers. If monitoring reveals that
6.4.4 defects have developed that allow radon releases in excess of the standards, these defects can be accounted for in the design of future covers, and remedial action can be taken to restore the effectiveness of covers found to be less effective than needed to achieve the level of public health protection required by EPA standards.

Such a monitoring program should include annual site inspections for the initial five-year period after closure to detect physical changes such as cracking and erosion of the cover, side-slipping of embankments, and so on. Site inspections

6.4.4 also should include monitoring of radon flux at the surface of the pile and measurement of ambient radon concentrations at the boundary of the pile. Over the ensuing forty-five years, the same protocol should be undertaken after major precipitation events, with a minimum frequency of at least one inspection every five years.

COMMENTS ON

RECLAMATION OF THE DURANGO URANIUM TAILINGS SITE

PREPARED BY

CURTIS O. SEALY, P.E.

CHEN AND ASSOCIATES

for the Environmental Defense Fund

Introduction

We have reviewed, from a geotechnical perspective, the Draft EIS--Remedial Action at the Former Vanadium Corporation of America Uranium Mill Site, Durango, La Plata County, Colorado (DEIS). The DEIS considers several site alternatives for stabilization of the Durango mill tailings. Though its designs are conceptual, some engineering details such as impoundment configuration, side slopes and cover thicknesses have been provided. However, because the sites have not been adequately characterized geotechnically, these design details are based on extremely limited data. More site specific information must be developed to determine the effects of geomorphic processes,
6.4.1 6.4.3 geological constraints and geotechnical parameters for conceptual designs of the facilities. Moreover, many of he assumptions made regarding subsurface site characterist' b, tailings properties and strength and durability of materials for the proposed designs are not supported by data.

6.4.3 Analysis of the geomorphic processes--those processes that will determine the long-term stability of the sites--is needed. Further, the conceptual cover designs that have been proposed do not consider local failures due to erosive forces, cracking due to differential settlements, and cracking and rupture due to material dessication. The designs rely on standard civil engineering practice and do not incorporate sufficient safety factors or redundant features. The designs as proposed offer no assurance of long-term containment of the tailings.

The Department of Energy's (DOE) goal is the construction of a maintenance-free containment system regardless of which site is chosen. However, it must be recognized that some period of surveillance will be necessary to verify that the designs are adequate.

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The following paragraphs present specific items of concern that must be addressed and corrected before an appropriate site can be chosen and a safe facility constructed. Without these corrections, no one site can be selected nor can its containment design be properly assured.

<u>On-site Stabilization of Materials at Durango Site</u>

6.4.3 (1) The existing slag and tailings piles are underlain by up to 45 feet of unconsolidated colluvium and alluvium. Stability analyses have been performed on the tailings assuming that all of the tailings and contaminated material will have a unit weight of 99 pounds per cubic foot (pcf) and an angle of internal friction of 28 degrees. It was further assumed that the alluvium will have a unit weight of 124 pounds pcf with an angle of internal friction of 34 degrees. The Mancos Shale was assumed to have parameters of 137 pounds pcf and an angle of internal friction of 38 degrees. The

6.4.3 strength parameters for the alluvium and Mancos Shale were assumed and apparently no strength tests have been performed to support these assumptions. Consequently, the stability analyses show extremely shallow failure surfaces within the sand tailings that resemble an infinite slope failure. However, because of the way in which the alluvium has been deposited, it is quite possible that it contains loose sands or soft clay layers. Consequently, a slope failure would be more likely to occur within the alluvium located beneath the tailings piles. It is also possible that loose saturated zones would be subject to a liquification failure during earthquake loadings. No analysis has been presented to verify the integrity of the pile under such conditions.

6.4.2 (2) The groundwater below the piles was investigated by installing 21 monitoring wells and three pressure vacuum lysimeters. The groundwater is located within the alluvium that becomes saturated with depth. No analysis has been provided in the DEIS that describes contaminant pathways. We suggest that a contaminant transport study be performed.

6.5.1 (3) The design relies heavily on diversion ditches to control surface flows and protect the cap from erosion. Such ditches are not maintenance free. They are very unlikely to maintain their design characteristics for the long-term period of 1,000 years without regular repair and cleaning.

6.5.1 (4) To reduce the velocity of flow onto the surface of the piles, the DEIS proposes that a two-foot-thick blanket of grouted riprap be placed at the boundary between tailings pile and natural hill side. This type of design is highly

6.5.1 vulnerable to undercutting and uplift pressures due to underseepage from upslope.

6.5.1 (5) The DEIS suggests that the surface of the stabilized pile be protected against erosion by covering the clay cap with a two-foot layer of gravel, cobbles and boulders up to 14 inches in diameter. Our analysis indicates that the 14 inch maximum size is not adequate for control of long-term erosion on the pile surface.

6.5.1 (6) A major threat to the stability of the pile is posed by the Animas River. A geomorphic analysis must be conducted to determine the effects of the present geomorphic processes on the proposed conceptual design. Such an analysis should focus on the potential failure mechanisms of long-term geomorphic changes, such as river relocation or meandering.

6.5.1 (7) The proposed conceptual cover design calls for two feet of protection gravel, a one-foot-thick filter bedding, and a five foot soil cover overlying the tailings. Considering the size of the riprap and the potential for erodibility, this scheme does not offer protection for the long-term.

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Bodo Canyon Site Alternative

6.4.2 (1) The suitability of the Bodo Canyon site was investigated by drilling a total of twelve borings and two geotechnical test pits. In our opinion, the amount of surface information obtained is minimal and the subsurface conditions at the site cannot be adequately characterized based on such limited information.

6.4.3 (2) The Bodo Canyon site is situated within an area of

6.6.2 groundwater recharge. Piezometers installed in selected borings indicating that the water is probably located on top of the shale bedrock, but no information has been presented to determine whether water is also within the bedrock and/or within the upper surficial soils.

6.6.2 (3) The conceptual design suggests that there will be a very substantial impact on the groundwater in the area. We recommend that a contaminant transport analysis be performed to determine the fate of seepage water from the impoundment over the long-term.

6.4.1 (4) The design relies heavily on ditches to carry surface water away from the stabilization cover. It is doubtful that these ditches will be able to perform their intended function over a long period of time. We recommend that the riprap on the surface of the proposed impoundment be designed for conditions that would be imposed by the probable maximum precipitation (PMP) event.

6.4.1 (5) The DEIS proposes a clay stabilization cover having a thickness of five feet over the tailings. Our analysis indicates that this thickness would not be stable under erosive forces for the long-term.

Long Hollow Site

(1) Subsurface conditions for the Long Hollow site were investigated by drilling a total of fifty-two borings. Thirty-nine of the fifty-two borings are located within or adjacent to the proposed disposal area. Based on the map provided in the DEIS there are many areas that need further investigation to

delineate accurately the subsurface conditions. The borings extended from depths of 19 to 48 feet with only one test boring extended to 48 feet. These borings are too shallow to identify accurately subsurface materials that could be affected by construction of the facility.

6.7.2 (2) The DEIS report states the groundwater is relatively shallow and generally occurs within the upper soils overlying the fractured shale. Data presented in the report suggest that water occurs at levels as shallow as 0.5 feet below the surface and to a maximum depth of 28 feet. Considering that only one boring extended to 48 feet, we think these conclusions are tenuous. We suggest that additional borings be made to determine permeabilities of zones at greater depths in order that the groundwater can be modeled accurately.

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6.4.1 (3) The facility as proposed will be a partial below-grade structure created by constructing an embankment across the gently sloping valley. The design will rely on perimeter diversion channels to prevent the flow of water onto the site. Velocities in the channels are predicted to vary from 5.9 to 14.1 feet per second. We think it extremely likely that the channels will be cut into the underlying shale which may not have the ability to maintain its integrity from erosion forces created by these velocities. The design should consider protection by the use of durable riprap or some other mechanism.

(4) Because of the shallow groundwater conditions at the site,

6.7.1 an underdrain system is proposed for the facility to accomodate a maximum flow of the three cubic feet per second (cfs). It is quite possible that actual flows will exceed this value. Pump tests are needed to determine flow rates in order that this system can be properly designed.

6.7.2
6.8.2 (5) Because the water table is extremely close to the surface, there is a high probability that the groundwater could be contaminated by seepage from the facility. It is imperative that a contaminant transport analysis be made for this site before final plans and specifications are prepared.

6.4.1 (6) The proposed cover design for the facility is a clay blanket having a thickness of 4.5 feet under a topsoil layer of 0.5 feet. It is not likely that this type of cover would maintain its integrity for the long-term against erosive forces. An analysis should be performed to determine adequate thickness of rock material that would protect the facility from a PMP flood.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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JAN 15 1985

Ref: 8A

Mr. John Themalis, Project Manager
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Dear Mr. Themalis:

In accordance with our responsibilities under the National Environmental Policy Act and Section 309 of the Clean Air Act, the EPA Region 8 Radiation Programs Office has reviewed the October, 1984, Draft Environmental Impact Statement (DEIS) for Remedial Actions At The Former Vanadium Corporation Of American Uranium Mill Site - Durango, La Plata County, Colorado (DOE/EIS-0111D). The DEIS is considerably enhanced over the preliminary DEIS, for which we provided comments in our letter dated February 10, 1984.

In our review of the PDEIS, major concerns were raised regarding the likelihood of meeting EPA's 1000 year longevity requirements, the lack of a reprocessing alternative, and uncertainties associated with the stabilization-in-place alternative. While the DEIS is considerably changed in format and content, we believe that our major concerns with the PDE's have been adequately addressed, and that the majority of our numerous other comments have received appropriate attention.

Meetings subsequent to the PDEIS preparation that DOE held with the Colorado Department of Health, NRC, EPA, and others have raised further questions, primarily regarding the relocation and disposal at either the Long Hollow or the Bodo Canyon alternatives. Some of these questions have not been adequately addressed in this DEIS. We believe that additional information should be provided for our review in a DEIS addendum prior to publishing the final EIS that responds to these questions. Following is a list of questions for which further clarification is needed:

6.4.1. - It is readily apparent that the Bodo Canyon area is subject to gully erosion. While the DEIS states that such erosion can be easily controlled in the proposed disposal site location, erosion-protection measures have not been provided. We believe that

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6.4.1 this information is needed before publishing the FEIS, and that it should specifically address control of existing gully erosion already evident at that location.

6.11 - The Bodo Canyon area is an important wildlife refuge area, particularily for elk migration and wintering. Detailed mitigation plans are needed for preserving this area to the maximum extent possible during both the construction period, and after reclamation. Specific attention should be given to measures for enhancing wildlife use. Estimates of potential use preservation (both with and without mitigation) are important and should be included.

6.7.1 - Information is needed regarding the likelihood of meeting EPA's longevity requirement for Long Hollow's underdrain system. Specifically, questions regarding clogging from sedimentation, deterioration, and chemical or biochemical deposition need to be addressed.

- Apparently, the specific location of the actual disposal location for the Long Hollow alternative is still in question. The stated cost comparisons for disposal, with or without reprocessing, are very close, and location adjustments could significantly affect the preferred alternative.

6.6.1 - The information on pages 47 and A-39 presents a confusing and contradictory discussion regarding diversion ditches and drainage channels for the Bodo Canyon site. The text states that the ditches will be preserved and sized for the PMP, while the appendix states that they will be abandoned following stabilization.

6.20.1 We appreciated the opportunity to work closely with DOE in the development of the PDEIS and this DEIS. Our meetings and discussions were instrumental in gaining more detailed insight into the proposed actions, and resolving our concerns early. As such, we are in agreement with DOE's preferred alternative to date for disposal of the tailings at the Long Hollow site (with or without reprocessing), primarily because the Bodo Canyon site is in a ground water recharge area.
6.12 However, we are sympathetic to the Durango residents' interests in minimizing truck traffic through town (which would be accomplished with the Bodo Canyon alternative), and the corresponding reduction in traffic risk.

Based on our concerns and the criteria EPA has established to rate the adequacy of draft EISs, we have rated this DEIS as Category EC-2 (environmental concerns-insufficient information). As noted above, the EPA review has identified additional information that should be provided for comment in a DEIS addendum prior to release of the FEIS. We feel that this information would be valuable in selecting the best uranium mill tailings disposal site from the alternatives being considered. If you have any questions regarding this review, please feel free to contact John Giedt, Chief of the EPA Region 8 Radiation Control Branch at FTS 564-6008.

Sincerely,

Kerrigan G. Clough
Kerrigan G. Clough
Assistant Regional Administrator
for Policy and Management

cc: William Dickerson, A-104 (OFA)
Sheldon Meyers, ANR-458

COLORADO DEPARTMENT OF HEALTH

Richard D. Lamm
Governor

Thomas M. Vernon, M.D.
Executive Director

February 25, 1985

Mr. John G. Themelis, Project Manager
Uranium Mill Tailings Remedial Action
Project Office
U.S. Department of Energy
5301 Central Avenue, N.E. - Suite 1700
Albuquerque, N.M. 87108

RE: Durango DEIS

Dear Mr. ~~Themelis~~ John:

Colorado's comments on the Durango DEIS are provided in three formats; narrative summary, specific page and line items, and attached letters from certain reviewers.

Our general comments are summarized as follows:

I. Stabilization in Place

6.5.1 It should be stated that the SIP alternative was engineered to meet the 200 year criteria, while the other alternatives used the 1,000 year criteria. The feasibility, costs, and impacts of constructing a wall of 11 foot boulders, as indicated on page 219, should be presented so that one can make a fairer comparison with the other alternatives.

II. Stabilization at Bodo Canyon

6.4.1 1. An adequate design and costs needs to be presented to control for 1,000 years headward erosion of the gullys that cross the site.

6.6.3 2. The lateral extent of area faults and their potential future activity needs to be determined.

3. We have received the draft wildlife impact mitigation plan.

6.11 4. A land arrangement needs to be presented for consideration by the Colorado Division of Wildlife and the Nature Conservancy.

6.4.2 5. The results of the current site drilling program need to be presented.

6.16 6. An archaelogical site mitigation plan needs to be developed for consideration by the State Historic Preservation Officer.

4210 EAST 11TH AVENUE DENVER,COLORADO 80220 PHONE (303) 320-8333

III. Stabilization at Long Hollow

6.4.2 1. The groundwater regimen as defined by the current drilling program needs to be presented. Indicated design adjustment may need to be costed and evaluated.

6.17, 6.15 / 6.8.2, 6.11 2. Economic, noise, groundwater, and wildlife impacts to neighboring properties need to be evaluated.

6.7.1 3. Mitigation of potential increased gully erosion needs to be costed and presented.

IV. Comments applicable to all alternatives

6.10.2 / 6.10.3 1. Health effect calculations need to be made consistant with methodology used in the EPA standards. Health impacts to nearest residents need to be identified.

6.4.1 2. Erosion covers over the radon barriers need to be designed and costed to last for 1,000 years against the impacts of erosional forces, burrowing animals, and deep rooted vegetation. The calculation methodology and all pertinent factors for determining the radon barrier need to be clearly identified.

6.4.3 3. The instability of the present pile needs to be recognized and accounted for in designs to recountour or move it.

6.9 4. The cost of construction and maintenance of all haul roads (including on site) need to be identified.

6.9 5. Transportation costs in current economic conditions need to be identified.

6.9 6. Cumulative maintenance costs need to be identified for all alternatives.

6.20.3 7. Mitigation plans and Colorado Air Pollution Control permits will be required for all earth moving and demolition activities.

6.20.3 8. Water rights and well permits will be required.

6.9 9. Land values from the official appraisals should be utilized.

6.17 10. The presentation of economic impacts should be revised to reflect a commitment to maximize local expenditures, including requirements to pay state and local taxes.

6.16 11. Decontamination and preservation of the smelter stack should be costed and presented.

Page 3
February 25, 1985
Mr. John G. Themelis, Project Manager
Durango DEIS

The concerns expressed by the citizens of Durango, and the distinct likelihood that SIP may not meet the 1,000 year criteria of the EPA standards, indicate that the Bodo Canyon Site should be considered as the leading technical alternative for the Durango Tailings Pile. Final decision of the State's position will follow closure of the public comment period, the review of the comments, and analysis of additional data, along with discussions with the Division of Wildlife.

The following detailed comments relate to specific page and line items in the DEIS. Also, attached are letters of comment from certain other State agencies.

We appreciate the opportunity to review and comment on the DEIS. Please contact me if you have any questions.

Sincerely,

Paul Ferraro
Program Manager
UMTRA PROJECT

ENCLOSURES

PF/dkg

	Comment	Page	Paragraph	Line	
6.19	1	cover sheet a	5	3	the tailings piles are located at not in Durango.
6.19	2	cover sheet a	5	7	same dates twice.
6.10.2	3	cover sheet b	2		the health effects calculations here are not in concordance with the earlier DOE commissioned studies. The risk factors used by the EPA in setting the standards should be used. Other variables such as population at risk, population growth factors, distance, life span, etc. should be clearly identified. It would be well to use a 1,000 year timeframe consistent with the EPA standard.
6.4.1	4	cover sheet b	3	6	does this traffic scenario include hauling in 11 foot boulders?
6.19	5	cover sheet c	2	3	in 1977.
6.20.3	6	cover sheet c	4		Colorado believes that the the FEIS should be a stand alone document. It would be very cumbersome to republish and use a complementary set of documents.
6.19	7	1	1	3	Hecla Mining Company.
6.19	8	1	3		acquired by Hecla Mining Company in 1984.
6.16	9	5			all alternatives: there is local sentiment to preserve the smelter stack. The cost of decontaminating and stabilizing it needs to be presented.
6.5.1	10	5			Alternative 1 - it should be stated that this alternative is not viable because it doesn't meet the EPA standards for 1,000 years when compared against the other alternatives.
6.19	11	5	1.3.2	4	Hecla Mining Company.

	Comment	Page	Paragraph	Line	
6.8.1	26	17	4	8	why would this operation take so much longer than the Naturita operation (2-3 years)?
	27	18	Table 1-3		see comment 3.
6.17	28	23	2		This paragraph is contrary to documents justifying the program. A population increase of over 200-300 and expenditures of $20-40 M is not inconsequential.
6.9	29	23	3		the cost for Alt 2 and 3 is biased low because it doesn't reflect an adequate control for river or gully erosion.
6.19	30	25	Table 1-4		footnote a - the program ends in 1990 not 1993.
6.4.4	31	25	4		Colorado believes the Act foresaw the need for occassional maintenance due to unforseen natural disasters, but did not allow for designs dependent on substantial on-going maintenance.
6.19	32	27	3	1	how many Title I sites are there? 22, 23, 24?
6.19	33	31	4	2	wording is incorrect. If building exceeds .02 WL an attempt at clean up must be made, achieving at least .03 WL and .02 WL where feasible. Exact quote: 192.12 standards (b)(1) "The objective of remedial action shall be, and reasonable efforts shall be made to achieve, an annual average (or equivalent) radon decay product concentration (including background) not to exceed 0.02 WL. In any case the radon decay product concentration (including background) shall not exceed 0.03 WL."
6.19	34	35	1	10	should read acquired by Hecla Mining in 1984.
6.4.1	35	38	1	2	Colorado does not think that the EPA standards can be met for 1,000 years with this SIP proposal.

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	Comment	Page	Paragraph	Line	
6.9	12	9	Table 1-2		all alternatives: road construction costs need to be identified.
6.5.1	13	9			Alternative 2 - ongoing maintenance costs required by this alternative must be identified in order to make a fair comparison with other alternatives.
6.19	14	10	Table 1-2		Alternative 5 - there aren't 82 months left in the project authorization.
6.19	15	11	1	2	probable maximum flood.
6.5.1	16	11	1	1.3.2	Colorado does not believe that this SIP proposal meets the requirements of PL 95-604, or the EPA criteria.
6.19	17	11	2	8	it should be clarified that Bodo was not donated by the Nature Conservancy but was bought by the State from the Nature Conservancy with restrictions.
6.6.1	18	11	2	26	much greater acreage would be required for gully control.
6.4.1	19	12	2 and 3		why are the reclamation covers different for options 4 & 5 - 5 feet clay cover vs. 6 feet clay cover + 2 feet of rock.
	20	13	2	10	see comment 14.
6.19	21	14	3	5	should be changed to Hecla Mining Company.
6.4.1	22	16	7		what is the stability of this rock against long term erosion?
	23	17	2	7	see comment 3 - why wasn't 1000 year period used?
	24	17	3	6	see comment 13 on maintenance.
6.4.1	25	17	3	8	why gravel cover in Alt 5 and vegetation in Alt 4?

Section	Comment	Page	Paragraph	Line	
6.19	36	38	3	5	Section 3.2.7 not 3.2.6
6.4.1	37	39			construction of haul roads and bridges must be factored in for SIP as well as the other alternatives
6.4.2	38	39	3.2.3.3		why do the various contaminated materials have to be blended? How would the present pile be drained?
6.5.1	39	43	1		the expected life of the grouted rip rap should be specified.
6.4.1	40	45			gully control must be adequately addressed at Bodo.
6.4.1	41	47	3		the utility of a 2 stage truck wash station is questionable. None was needed at Naturita. Ore trucks are not washed, and carry the same concentrations of radioactivity. This station as presently proposed would be the largest single item of worker exposure.
	42	47	6	5	see comment 41.
6.4.1 6.6.3	43	49	4		the feasibility of this plan cannot be determined until adequate provision is made for gully erosion control and for the potential threat of a nearby fault.
	44	49	5	1	see comment 41.
6.5.1	45	52	1		the pile may be too wet and unstable for haul roads. Rancher's proposal for removal should be considered.
	46	52	4		see comment 41.
6.19	47	52	5	4	excavated would be a better word than imported.
6.4.1	48	53	2		it is not reasonable to think that 6" of topsoil would protect the clay cap for a 1000 years from erosion and drying out.

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Section	Comment	Page	Paragraph	Line	
6.4.1	49	52	2		what protection is provided against burrowing animals and deep rooted vegetation?
	50	55	6	1	see comment 41.
	51	58	3	1	see comment 45.
6.4.1	52	58	3		project impact on present utilities at Durango, Bodo and Long Hollow needs to be addressed for all alternatives.
	53	58	4	6	see comments 48 & 49.
	54	59	1	5	see comment 47.
6.8.1	55	61	3.2.6.2		acquisition and disposal of the Durita mill equipment needs to be addressed.
	56	64	1		see comment 41.
	57	64	3		see comment 45.
6.8.1	58	64	5		Ranchers experience is that the tailings must be blended and mixed with acid before deposition in the leach tanks.
6.8.1	59	64	5		potential groundwater problems at Long Hollow might be reduced if the leach tanks could be made large enough to receive all contaminated materials and the evap pond area was not made into a disposal site.
6.4.1	60	65	1		if 2 feet of gravel erosion protection is needed in Alt. 5, it's also needed in 2, 3 & 4.
6.3	61	67	3		there is not sufficient disposal space at Naturita for the Durango tailings.

Section	Comment	Page	Paragraph	Line	
6.6.3	80	90	5	5	the extension of these faults into the Bodo disposal area and their potential for activity if lubricated by reservoir waters needs to be identified and appropriate design changes indicated, if necessary.
6.7.2	81	101			the potential impact on private wells in the Long Hollow area need to be identified.
6.15	82	119			the attached comments by CDH on noise control need to be addressed.
6.19	83	121	3	4	Ranchers purchased the millsite from Foote Minerals Company in 1977. Hecla Mining acquired it in 1984.
6.16	84	123	1		this paragraph needs to be updated in accordance with the letters of 9-27-84 and 12-11-84 from the Colorado Historic Preservation Office. The smelter stack has been designated eligible and the superintendents house ruled ineligible.
6.16	85	123	2		costs of the archaeological mitigation plans need to be identified.
6.16	86	123	2		the surveys along county roads 211 and 141, and the borrow sites should be done as soon as possible, as those areas may be impacted regardless of the selected disposal alternative.
6.16	87	123	3		the cultural site at Long Hollow with potential for inclusion on the NRHP should be tested as soon as possible. It is of such a nature that it could be seriously compromised by surveyors and well drillers.
	88	132	3		see comment 68.
	89	145	5		see comment 3.

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Section	Comment	Page	Paragraph	Line	
6.19	62	68	2	3	the tailings are controlled but to a limited extent - elevated radioactivity would be a better wording.
	63	68	3	6	see comment 3.
6.10.3	64	68	2		which is the population at risk here?
6.15	65	68	4		there is an ongoing impact on air quality by Alt. 1.
	66	69	1	19	see comment 60.
	67	70	2	15	see comment 59.
6.9	68	71	2	3	land values figures from the official appraisals should be used.
	69	71	4	4	see comment 28.
	70	71	5	4	see comment 28.
	71	72	1	5	see comment 28.
	72	72	2	4	see comment 28.
	73	72	2	1	see comment 14.
6.12	74	72	2	8	why more truck injuries in Alt. 5 than Alt. 4?
	75	73	4	5	see comment 13.
6.15	76	74	4	3	what noisy activities would be restricted to 7 AM to 7 PM?
6.9	77	74	3	9	the potential cost of wildlife mitigation for all options needs to be identified now in order to get a fair cost comparison of the alternatives.
	78	75	4	2	see comment 13.
6.19	79	90	2	4	verb missing.

Section	Comment	Page	Paragraph	Line	
	90	146	6		see comment 3.
6.19	91	148	Footnote d		this should read Table A-20 not A-29.
6.10.3	92	148	Table 5-2		numbers for Alt. 5 are not based on a realistic time frame. See comment 14 and comment 41.
	93	149	2		see comment 3.
6.10.3	94	149	5		what about exposure to clean-up personnel?
6.4.2	95	150	1	8	it is not justified to consider all the radium in tailings as insoluble without experimental verification. The standard for soluble radium release is 30 pCi/1.
6.19	96	150	2		the slurry would be transported in specially constructed double wall tank trucks.
6.20.3	97	150	3		it should be stated that a permit will be required from the Colorado Air Pollution Control Division for earth moving and demolition activities. Other items in the attached memo need to be addressed.
6.15	98	151			1.6 M yds^3 does not appear to include the cover materials nor onsite road construction.
6.15	99	154 156	2 3	4 6	the fact that CR 141 is paved should be taken into account.
6.4.3	100	157	5.4.1		under the no action alternative is the likelihood of the pile sliding into the river addressed? This would have a considerable impact on topography and water quality.
6.4.1	101	158	Alt. 3, 4, 5		given the high net evaporation rate, would it be better to have a concave final surface to keep the clay cap moist? See comment 48.
6.4.1	102	159	3	8	this does not appear to include the many acres of boulders needed for gully erosion control.

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Section	Comment	Page	Paragraph	Line	
6.14	103	159	4	7	sand and gravel is reportedly available on private land across the road (CR 141) from Long Hollow.
6.7 6.8	104	161	1		there may well need to be a subdrain blanket of sand under the clay liner for alternatives 4 and 5 and a sand blanket under and over the clay cap for alternatives 3, 4 and 5. See also comment 25.
	105	161	1		see comment 102.
6.14	106	162	2		it should be stated that future recovery of uranium would be much cheaper and more feasible under option 4 than 1, 2, or 3.
6.20.3	107	162	5		the government needs to purchase water rights to take water from the river. Other requirements of the State Engineer's office must also be met as identified in the attached letter.
6.10.4	108	164	2		response to truck accidents need to be planned for with tarps and equipment to build temporary dikes, etc. Local medical units need appropriate training and support.
6.4.1	109	169			the degree of saturation of the pile might be quite high in spots. It may or may not be stable enought to allow surface windrowing to enhance drying before recontouring or removal. If the tailings are saturated bottom liner design may need to be as stringent for options 3 and 4 as for 5 in order to minimize potential groundwater impacts.
6.7.1	110	170	3	9	the underdrain might have to have to be of such size as to allow for future entry and maintenance.
6.13	111	170	4	6	cumulative and synergistic effects with the Ridges Basin Project should be addressed.
	112	172	2	1	see comment 18.

Section	Comment	Page	Paragraph	Line	
6.11	113	173	2		a wildlife mitigation plan needs to be developed for Long Hollow.
	114	175	7		see comment 68.
6.9	115	175	7		land values might well justify private cleanup of the raffinate area at the owner's expense outside of the UMTRA program.
6.13	116	176	4		additional areas would be impacted for obtaining gravel and boulders.
	117	177	1	4	see comment 18.
6.7	118	170	1,2		the economic impact on the remaining property of the present land owner, as well as adjacent land owners, should be addressed.
	119	179			see comment 82 for state concerns on sound levels.
6.5.1	120	180			would blasting be required to quarry the huge boulders needed for river channel stabilization in Alt. 2?
6.19	121	184	3,6		there was testimony at the public hearing from a man who lives less than 4,000 feet from Long Hollow. Another testified to the presence of a day care center 3/4 mile from Long Hollow.
6.16	122	187	5		Alt. 1 would allow the smelter stack, which has been declared eligible for the National Register of Historic Sites, to gradually disintegrate.
	123	188 189	2,5 2,6		These paragraphs need to be revised in accordance with comments 9 and 122.
6.19	124	190	1		this paragraph needs to be made consistent with paragraph 3, page 123.
6.17	125	190	4		it is not clear whether the employment figures include persons involved in vicinity property cleanup, and road construction and maintenance.

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Section	Comment	Page	Paragraph	Line	
6.11	126	192	4	13	this is inconsistent with DOE contractor clauses which state that all state and local taxes will be paid.
	127	193	1	2	see comment 28.
6.20.3	128	193	2	1	there might be considerable economic impact on city facilities and tourism if the pile slid into the river under Alt. 1.
	129	193	2	8	see comment 68.
6.17	130	194 195 196 197	2 2 4 5		this is inconsistent with DOE public pronouncements that local expenditures would be maximized. What about purchases of sand, clay, gravel, rock, asphalt, tools, construction equipment, fencing, office buildings and supplies, electricity, water, and in the case of Alt. 5 mill processing supplies as outlined in Table 5-14.
6.17	131	194 195 196	3 3 5		it is not just the potential increase in raw land value that is important for this site. Development for commercial use creates income and sales taxes as well as property taxes.
6.20.3	132	198	3		in Alt. 1 if the pile slid into the river, highway 160/550 might be severly impacted.
6.20.3	133	199	3		haulage of 11 foot boulders on flat bed trucks from a quarry to the site for river control, might create some transportation problems that have not been evaluated here.
6.12	134	199	3	6	who would pay for the road maintenance program?
6.12	135	200 201 202	3 3 2		road segment specific traffic accident ratios should be used when available. State averages would be better than national.

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	Comment	Page	Paragraph	Line	
6.12	136	201	2		a traffic signal might be needed at the intersection of CR 211 and CR 141 and at Long Hollow.
6.13	137	206 207	3,5 1		disposal at Bodo or Long Hollow would also require zoning approval by La Plata County. The borrow areas would also need land use approval.
	138	207 208	5 1,2	10	see comment 3.
6.4.1	139	209	2,7		there would also be topographic and habitat changes at Bodo due to filling in as much as a hundred acres with boulders for gully control.
6.5.1	140	210	2		can reclaimed areas armoured with gravel or rocks to prevent erosion, be further covered with shallow soil to support some vegetation useful to wildlife?
	141	211	3		see comment 82.
	142	212	2	2	see comment 135.
	143	212	6		see comment 106.
	144	213	5	2	see comment 14.
6.11	145	216	3		the wildlife migitation plans need to be finalized with the Colorado Division of Wildlife before publication of the FEIS.
6.5.1	146	219	7		since DOE has not requested a variance from the concurring agencies with regard to the 1,000 year EPA standard for the Alt. 2 design, it is imperative to cost out the only proposal to date which attempts to meet that criteria - a massive wall of 11 foot boulders. Failure to present this real cost of Alt. 2 has led to a lot of public misconception that Alt. 2 is the most feasible and least expensive option.
6.4.1	147	220	3		penetration of the radon barrier in the reclamation cap by burrowing animals and deep rooted vegetation, both of which could increase radon emanation, needs to be adequately addressed. Rock layers of suitable size and depth may be useful. Such layers in turn need protection from salt, fire and weathering action. A final cap of soil and vegetation can serve this function, in addition to reducing the chances of future "removal" of the rocks for other purposes, and reducing the visual and wildlife impacts.
6.4.1	148	220	4		mitigation of headward erosion of gullies at Bodo needs to be more adequately addressed since it could permanently involve as much as 100 acres with large boulders at tremendous expense. The other impacts of this such as quarrying, transportation, preclusion of wildlife use, etc. need to be addressed. Cut off of evapotransporation of groundwater by the tailings pile and channelization of ground water by an underdrain system at Long Hollow could lead to increased surface flow and gully erosion at Long Hollow. Appropriate mitigation measures should be addressed and costed. The costs of the items in the last three comments and in the next paragraph on page 220 are examples of information that need to be in hand before one can meaningfully compare alternatives.
6.5.1	149	221	5.22		Colorado does not believe that the level of maintenance required by the present design in Alt. 2 would be in accordance with PL 95-604 or its legislative history.

.TE OF COLORADO
..hard D. Lamm, Governor
DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WILDLIFE

James B. Ruch, Director
6060 Broadway
Denver, Colorado 80216 (297-1192)

December 13, 1984

Albert J. Hazle, Director
Colorado Department of Health
4210 East 11th Avenue
Denver, Colorado 80220

RE: Durango, UMTRAP, DEIS

Dear Mr. Hazle:

Various personnel from Colorado Division of Wildlife have reviewed this document and feel that it is inadequate in nearly all areas affecting wildlife. I must also lodge a strong complaint as to the way DOE and its consultants are carrying out this procedure. We feel that we have been cooperative to the best of our abilities, but this cooperation has not been reciprocated.

Our specific problems with the DEIS remain more or less what they have been for some time. Our comments, repeatedly made, are:

6.11 1. All alternatives except "no action" will impact wildlife, not just alternative (3). All except "no action" will require mitigation.

6.14 2. Alternative (3) will cause the loss of mineral resources to CDOW.

6.19 3. The area was acquired by purchase, not donation. The Nature Conservancy will be affected due to deed covenants.

6.2 4. Ground water studies are either incomplete, not done, or unavailable. Whatever the case, we have not seen them.

6.19 5. Numerous minor editorial comments, previously submitted, have also been ignored.

6.11 Our primary concern now, and for some time, is the "mythical" mitigation plan; "mythical" because we have seen little physical evidence of it. The mitigation plan was to be presented to us prior to the publication of the DEIS. To date we have not seen any plan other than the vague statements in the DEIS. Any further cooperation by us with DOE is entirely contingent upon an acceptable mitigation plan being presented in the very near future.

We are also concerned that DOE and its consultants continue to ignore our requests to work with regional and field personnel. Despite repeated requests, CDOW personnel who are directly involved in this project continue to receive second hand information, late notices and last minute requests for comments.

Major technical concerns for the Bodo Canyon site are:

6.4.1 1. Erosion potential of the gullies, embankments, and cover material;
6.6.2 2. Seepage, infiltration, and shallow ground water conditions; and
6.6.3 3. Potential faulting or fracturing;

Major technical concerns for the Long Hollow site are:

6.7.2 1. Seepage, infiltration, and shallow ground water; and
6.4.1 2. Erosion potential of the cover and embankment.

6.4 Features that should be considered in mitigating these technical concerns include cover, liner, erosion, and seismic designs. Cover design should include limiting infiltration, protection of the radon barrier, and minimizing erosion. Key aspects in the liner design are its permeability, thickness, and geochemical properties. Erosion protection should include an analysis of channel erosion of the embankment and cover slopes as well as erosion from head-ward cutting of gullies. Seismic stability should be analyzed after an appropriate design is developed.

In addition to the specific design features, an analysis should be conducted of the disposal designs presented in the DEIS to determine if an alternative design or method of construction could be used to reduce costs. Such major changes are most likely at Long Hollow.

In summary, additional analysis and design features should be evaluated and included in the FEIS. Details regarding this work should be a joint local, state and federal effort.

Sincerely,

Walter R. Junge
Engineering Geologist

bj

WRJ-85-001

STATE OF COLORADO

RICHARD D. LAMM
GOVERNOR

COLORADO GEOLOGICAL SURVEY
DEPARTMENT OF NATURAL RESOURCES
715 STATE CENTENNIAL BUILDING — 1313 SHERMAN STREET
DENVER, COLORADO 80203 PHONE (303) 866-2611

JOHN W. ROLD
DIRECTOR

January 8, 1985

Mr. Albert J. Hazel, Director
Radiation Control Division
Colorado Department of Health
4210 East 11th Avenue
Denver, Colorado 80220

Dear Mr. Hazle:

RE: DEIS DURANGO UMTRAP PROGRAM

We have reviewed the draft environmental impact statement that assesses remedial activities for the Durango project. The review concentrated on site and design features necessary to achieve adequate long-term control of the radioactive materials and to assure impacts from seepage, radon flux, and tailings releases are minimized. Basic conclusions regarding the review can be summarized as follows:

566 6.5.1
1. Stabilization In-place (SIP) of the Durango tailings ponds is not technically viable because of extreme costs associated with adequate erosion and ground water protection measures. Although discussion of the SIP should be included in the Final Environmental Impact Statement (FEIS), we recommend that no further work be conducted concerning this alternative.

6.20.1
2. The Durango uranium tailings and associated contaminated material must be relocated to a suitable disposal area which must be adequately designed to minimize future impacts. We recommend that such site and design features be discussed with local, state, and federal personnel prior to preparation of the FEIS.

In general, the alternative sites (Bodo Canyon and Long Hollow) have certain deficiencies that must be supplemented with adequate design features so that EPA standards can be met. Where inherent site inadequacies exist, special design features are usually costly. The major technical concerns that follow should be analyzed in terms of design features necessary to meet EPA standards. We recommend that the analysis of the concerns and design features selected to mitigate these concerns be included in the FEIS. This analysis should include an estimation of the changes in the geologic and hydrogeologic setting caused by the disposal facility.

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6.4.4

Comment	Page	Paragraph	Line	
150	223			provision of funding to a unit of state or local government to give a periodic cursory visual inspection could allow for a more prompt recognition of damage by natural events or human intrusion.

RICHARD D. LAMM
Governor

JERIS A. DANIELSON
State Engineer

OFFICE OF THE STATE ENGINEER
DIVISION OF WATER RESOURCES

1313 Sherman Street-Room 818
Denver, Colorado 80203
(303) 866-3581

December 6, 1984

MEMORANDUM

TO: Albert Hazle, Director, Radiation Control Division

FROM: Hal D. Simpson, Assistant State Engineer
and John Romero, Supervising Water Resource Engineer

SUBJECT: UMTRAP, Review of October 1984 Draft EIS regarding uranium mill tailings site at Durango, Colorado

The October 1984 Draft EIS on the Durango UMTRAP has been reviewed. We acknowledge the insertion of numerous additional statements and estimations, and revisions with respect to water withdrawal estimates. We also find that a number of deficiencies are still present which must be addressed in the Final EIS. The October draft does state that data collection regarding Alternatives 4 and 5 are ongoing.

6.7.2 The hydrogeologic description of the Long Hollow site is sufficient for regional and general purposes but is insufficient for detailed evaluations (including modeling efforts). Since at least two ground water systems are present, they must be more thoroughly described and must be supported by sufficient field data. Statements in the draft reports reveal the presence of a relatively complex shallow-aquifer system; water in the surficial deposits and in the underlying, highly fractured, Lewis Shale. The consultant's (Dames and Moore) test hole/monitoring well program consists of only three wells less than 20 feet in depth. This represents only three data points over a one square mile area of interest. The F.M. Fox boring program (1978) is described but no attempt was made to present other than two simplified north-south and east-west cross-sections. Maps showing the configuration of the alluvium-bedrock contact and the water table (or perched water zones) would be highly useful. Additional findings on the interrelations between water in the alluvium and water in the fractured Lewis Shale is necessary before the shallow ground water system can be adequately defined.

6.7.2 The test well drilled by Ranchers Exploration and Development Corporation on the Long Hollow site should be located on a map and discussed in more detail. This will allow UMTRAP reviewers to evaluate the need for additional information on the area's deep-aquifer system. Updated estimates of water requirements reveal that over the duration of Alternatives 4 and 5 from about 95

Albert J. Hazle
Page Two
December 12, 1984

6.2 As things stand at this moment, we feel that the DEIS is inadequate as it pertains to wildlife, wildlife habitat and the interests of the Colorado Division of Wildlife. Based upon this DEIS, we will advise the Wildlife Commission to deny any and all access to Wildlife lands by DOE and its contractors for any purpose whatsoever.

We commend the Department of Health, particularly Dick Gamewell, for handling an especially difficult document. Do not hesitate to call on us in the future.

Sincerely,

for Ed [signature]
James B. Ruch
Director

SJB/lls

cc: Ruch
Barrows
Towry
Zgainer

Memo to Albert Hazle
December 6, 1984

acre-feet (Alt. 4) to 750 acre-feet (Alt. 5) of water might be withdrawn from the Animas and La Plata River systems and that one or two deep wells might be considered for some water at the Long Hollow site. Additional statements describe how estimated water-withdrawal rates are only 0.0016 and 0.0037 percent (for examples) of the average river flow rate, and that "these rates of
6.7.2 withdrawal would not have noticeable effect... on the rivers flow rate under any conditions". Relatively low withdrawal rates do not eliminate the necessity of taking the proper legal procedures for the acquisition and storage of surface and ground water. In addition, well and test hole construction must be in compliance with the Rules and Regulations and Water Well and Pump Installation Contractors Law.

6.8.2 Estimates of water requirements are for withdrawals only. The final EIS should include return flow estimates.

Results of models of liquid flow in a proposed tailings pile at Long Hollow are realistic, but would be different if horizontal and vertical hydraulic
6.7.2 conductivities were given separate values and fewer 'best-guess estimates of materials' were incorporated.

If you have additional questions, please contact John Romero.

HDS/JCR:ma

cc: Ray Junge (Colo. Geological Survey)
George Van Slyke

COLORADO DEPARTMENT OF HEALTH
Division or Section of Radiation Control

INTER-OFFICE COMMUNICATION

TO : Al Hazle Dick Gamewell DATE : 12-3-84

FROM: David Gourdin Dave SUBJECT: Durango Deis

The following are comments generated from my review of the Durango UMTRAP DEIS dated October, 1984. Essentially, the document continues to be cleverly vague and does not clearly address the impact of increased noise levels. The adverse health effects caused by excessive noise needs to be included to adequately review the noise impacts.

The noise section is much improved considering the previous draft DEIS; though, the presentation is typical of boiler plated data. The ambient sound levels will be substantially increased along the transportation corridors as stated within each of the proposed alternatives.

The document does not address transportation noise completely. All data is expressed at distances of 500' feet or greater generating sound levels appearing to be low and of little consequence.

Therefore, I recommend that noise level contour maps be constructed to adequately address the impacts of increased transportation noise. Below is a summary list of deficiencies as presented within the DEIS; each of which, should be thoroughly discussed in order to evaluate the true impacts of increased noise levels.

6.15
- transportation noise mitigative measures;
- Noise contour maps of major transportation networks not available;
- general subjective boiler plating of noise data;
- vagueness and lack of clarity in comparing different noise descriptors to different noise environs;
- lack of discussion of adverse health and wildlife affects;

Attached are support comments relating to the inadequacy of the noise impact sectio

Signature

HD BES-29 (10-29-100)

Comments Durango Umtrap Deis dated Oct. 1984:

...of the alternatives (2-5) the noise impacts were defined from minor to moderate. Most all project noise levels will exceed the estimated ambient sound environment by at least 10 decibels. Sound levels of 10 decibels or greater over an identified ambient level is perceived by individuals to be twice as loud. Whereas technically an increase of 3 decibels represents a doubling of sound pressure levels.

6.15 Contrary to the presentation of noise impacts within the DEIS, adverse population and wildlife health effects can be expected to occur. The document does not address the adverse health effects nor mitigative measures available to reduce these avoidable impacts.

6.17 Adverse health effects from human populations can be observed through physiological psychological reactions. These health effects occur at varying sound level intensities and magnitudes affecting population age groups differently. Generally, sleep and speech interference, hearing and activity interference, stress reactions, ability to disseminate and retain necessary information are identified as adverse health effects caused by excessive noise.

6.11 Wildlife habitat will be adversely affected as calving areas and major winter grazing areas were identified adjacent to the transportation corridors and the sites of remedial action.

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The document stated "people and wildlife acclimate to noise." They do not acclimate to noise--they react. The document does not adequately discuss the above topics and should be expanded to include mitigative measures.

The document continues to discuss environmental noise using three descriptors, Ldn, Leq, and decibels. Each descriptor identifies different monitoring methodology results, none of which can be compared generically.

The City of Durango's central business districts sound level is expected to increase by 13 dBA using the Ldn (24 hr) descriptor. Also, the sound level is expected to average 68 dBA (Ldn) above the EPA's goal of 65 dB. Of importance here is that this goal is intended for noisy urban communities of which the City of Durango is not.

6.15 The document classifies the City of Durango by population density (National Academy of Sciences) as a noisy urban community with a 55 decibel Ldn (24 hr) base sound description. As stated in Alternative #2 an increase of 13 decibels to 68 dBA (Ldn) would in fact be significant and not minor.

Durango is not a noisy urban community. The community has attributes of an urban community with a sound environment of a rural, partially developed quiet suburban community. The Ldn sound level base should be required to be reduced to more closely represent the community's sound environment.

The City of Durango's Noise Ordinance classifies the Durango site as an Industrial zone capable of producing 80 decibels on-site during daytime hours. For clarity sake, action for enforcement of excessive noise emanating onto less restrictive

Landuse zones would apply to the most restrictive noise level such as a residential property of 55 dBA. This also applies to the Colorado Noise Abatement Act CRS 25-12-101 as amended 1971.

6.15 The issue of increased vehicular and truck traffic was extensively discussed but remained vague and alludes the true noise impact caused by the substantial increase in the mix of the average daily traffic (ADT). Considering the impact on transportation networks (ADT), truck trips per day and duration of project for each alternative, noise contour maps are needed to adequately evaluate the noise impacts. Road conditions (ruts and chuckholes) were identified to exist as a norm and will substantially increse the conservative noise estimates produced by transportation activities. As a result the environmental noise levels will increase. Mitigative measures have not been addressed in relation to transportation noise sources. Excessive noise produced by transportation is the primary source causing a substantial potential adverse population and wildlife health effects. The document does not address this subject at all.

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... or Section of APCD

INTER-OFFICE COMMUNICATION

TO : Dick Gamewell

FROM : Dick Fox

DATE : December 6, 1984

SUBJECT: Durango Draft Environmental Impact Statement

The above-referenced document was reviewed for problems dealing with air quality and specifically fugitive particulate emissions. Most of the problems noted in my October 17, 1984 memo to you concerning the draft UMTRAP document have been addressed in this EIS.

The controls they have mentioned are acceptable to the Division, however, there are some additional items which could be considered to improve the control of fugitive emissions.

1. Speed controls on unpaved roads (i.e., 20 or 30 m.p.h.) can lower emissions and increase the life span of pallatives applied to the road surface.

2. Techniques for use of front end loaders. (See memo of 10-17-84, item number 1).

6.15 3. Hydro mulching being used on slopes of piles. This provides good seed cover, protection for seeds and less surface disturbances.

4. Farrowing of surface during pile construction.

5. "se of synthetic covers until revegetation is completed.

6. Trucks hauling uncontaminated soil should be covered as they plan to do with these hauling contaminated material to prevent off truck transport.

6.20.3 One other item which was not addressed was the need for permits from the Air Pollution Control Division. These would include earth work projects and the demolition of structures if that portion of the plan is carried out.

In summary, the documents received had better control plans and data evaluation than the previous document. Should you have any specific questions, please contact me.

DF/na

Richard D. Fox
Signature

... (10-29-...)

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COLORADO HISTORICAL SOCIETY

The Colorado Heritage Center 1300 Broadway Denver, Colorado 80203

December 11, 1984

Albert J. Hazle, Director
Radiation Control Division
Colorado Department of Health
4210 East 11th Avenue
Denver, Colorado 80220

RE: Durango Draft Environmental Impact Statement

Dear Mr. Hazle:

This office has reviewed the above document and have the following comments:

6.16 1. p.188 - The Durango Smelter Stack was determined eligible to the National Register of Historic Places in consultation with this office on September 27, 1984.

6.16 2. We would prefer to see Alternative #2 (Stabilization on the Durango Site) Alternative #4 (Stabilization at the Long Hollow Site) or Alternative #5 (Reprocessing and Stabilization at the Long Hollow Site) chosen for this project. The impacts to cultural resources by these alternatives are minimal.

6.16 3. When the final alternative is chosen the Department of Energy must complete a determination of effect and develop a plan to avoid, minimize or mitigate the adverse effects to any eligible cultural resources. We anticipate that alternatives to demolition of the Durango Smelter Stack will be considered.

6.16 4. We look forward to the review of all future testing and mitigation plans developed for this project.

If this office can be of further assistance, please contact the Compliance Division at 866-3395 or 866-3392.

Sincerely,

Leslie E Wildesen
for Barbara Sudler
State Historic Preservation Officer

BS/WJG:ss

STATE OF COLORADO

DEPARTMENT OF HIGHWAYS

42... East Arkansas Ave
Denver, Colorado 80222
(303) 757-9011

January 9, 1985

Mr. Ross Fraser
State Clearinghouse
520 State Centennial Building
1313 Sherman Street
Denver, Colorado 80203

Dear Mr. Fraser:

The Colorado Department of Highways has completed its review of the Draft Environmental Impact Statement for the uranium mill tailings remedial action for the Durango Tailings Pile. None of the alternatives presented in the DEIS would directly affect the operations of the State highway system. The Department of Highways does own right of way up to the toe of the large tailings pile, and we would, therefore, be involved in any remedial action. We will cooperate completely with any action by the US Department of Energy and the Colorado Department of Health.

Thank you for the opportunity to provide comments on this document. We have really appreciated the extensive coordination offered on this project.

Very truly yours,

Harvey R. Atchison
Director
Division of Transportation Planning

By Barbara L. S. Chocol
Barbara L. S. Chocol
Manager
Project Development Branch

cc: Steve Norris, CJRP

Feb 13, 1985

US Dept of Energy
UMTRA Project Office

To all those involved:

First let me thank you for coming to Durango early in February and stating the information on stabilization of the tailings in such a clear and concise manner.

6.20.1 After reading, listening and thinking on this matter I still urge you to stabilize in place. I understand the drawbacks and risks however I feel it is best
6.20.1 to preserve the clean land around Durango as it is and use the site which is already contaminated to contain the material.

The cosmetic concerns expressed by the Task force are of little concern to me. They are unattractive and dangerous now. Elimination of the health hazard is sufficient.

6.10.3 I also would like to see the final EIS address the health hazard to boaters on the Animas River.

Sincerely,

Jennifer Sullivan Carney
950 C.R. 205
Durango, Co 81301

Feb. 13

Dear Mr. Themelis,

I really appreciated the DOE presentation in Durango 2 weeks ago. I am much less apprehensive now & like you, my feeling now is let us proceed with the greatest possible speed.

6.20.1 I still support stabilization in place (# 2). Why?

1. It's cheaper
2. Negative impacts on the town will be more short lived.
3. 6.4.1 You did admit you didn't really know what was in the middle of the pile. Let's not find out.
4. New people & new money, I feel, only cause a small community to suffer in quality of life & therefore because of # 1 & # 2 above, this will be lessened with stabilization as opposed to movement to Bodo.

Thanks for your consideration & again for your professionalism. I am sorry if some of my fellow citizens became rather shrill, repetitive and accusatory. They are loud but in a minority. Looking forward to working with you.

Sincerely
Jerry Carney
950 C.R. 205
Durango, CO. 81301
303-259-5384

506

701 PIONEER CIR.
DURANGO, CO 81301

FEB. 19, 1985

MR. JAMES A. MORLEY
PROJECT MANAGER
URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT.
U.S. DEPT. OF ENERGY
5301 CENTRAL AVE. N.E. #1700
ALBUQUERQUE, NM 87108

DEAR MR. MORLEY:

ALTHOUGH I AM NOT AWARE OF LEGAL OR OTHER RAMIFICATIONS TO SOLVING THE SMELTER MOUNTAIN TAILING PROBLEM IN DURANGO THROUGH MY RECOMMENDATION, IT IS AS FOLLOWS:

6.3 * IF IT IS DECIDED THAT THE TAILINGS BE MOVED TO BODO CANYON, USE A CONVEYOR SYSTEM INSTEAD OF TRUCKS. NOT ONLY ARE CONVEYORS LESS COSTLY TO PURCHASE AND MAINTAIN, THEY ARE MORE PRODUCTIVE THAN TRUCKS. NOT ONLY WOULD THEY ELIMINATE TRAFFIC & NOISE PROBLEMS, AN ENCLOSED SYSTEM WOULD ALSO ELIMINATE DUST PROBLEMS. THE SYSTEM COULD EVEN BE RUN NEARLY 24 HRS. A DAY. IT IS WORTH INVESTIGATING.

AS I HAVE NINE YEARS EXPERIENCE SELLING EARTH-MOVING EQUIPMENT, INCLUDING TRUCKS & CONVEYOR SYSTEMS, I WILL GLADLY OFFER INPUT, SHOULD YOU SO DESIRE.

SINCERELY,

TIMO LAHDEKORPI

507

JAMES C. BRUVOLD
Mechanical Engineer E.I.T.

February 20, 1985

Mr. John D. Themelis
U.S. Dept. of Energy
UMTRA Projects Office
5301 Central Ave NE, Suite 1700
Albuquerque, NM 87108

Dear Mr. Themelis:

I wish to comment on the DEIS concerning remedial actions at the former Vanadium Corp. uranium mill site in Durango.

6.10.3 I found no reference to risk to maximally exposed individuals due to Radon gas exposure. Paragraph 2.2.3 Radon Emissions Control specifically states that the second objective of remedial
6.10.1 action is to establish a radiation concentration limit of 0.5pCi/l and an emission limit of 20 pCi/m²sec. It is my contention that compliance with this directive must be based upon measured values at the site, and not predicted rates as stated in the DEIS.

6.10.3 In reference to Paragraph 3.3.2 Mitigation Measures, nothing is mentioned about Radon gas, only dust control measures. The health hazard arises from breathing an unstable radioactive gas as well as particulate matter. The DEIS does not consider Radon gas dispersion as a result of moving the pile. We would logically expect increased gas emissions when the pile is disturbed. Paragraph 5.21.1 specifically states that mitigation of radiation release is one of the primary objectives, and Paragraph 5.21.8.1 states that UMTRA policy is to take all reasonable precautions to insure the health and safety of employees and the public.

6.10.2 Exposure to Radon Daughters must also be considered. Before remedial aciton begins, the responsible agency must be required to measure the radiation/particle cross-section energy profile of the Radon Daughter Decay Scheme. Investigation on my part indicates that the total activity of Radon Daughters is on the order of 30 minutes, much less than the 3.8 day half-life of Radon. This leads me to believe that remedial-action workers may be exposed to levels of radiation vastly in excess of previously estimated values. Paragraph 5.22 Maintenance and
6.10.1 Surveillance, has nc mention of emissions tests to be performed before of after remedial action. Surveillance must include

259-1911
Office
1480 East Second Avenue
Durango, Colorado 81301
Energy Management
Solar Heating
Automotive

JAMES C. BRUVOLD
Mechanical Engineer E.I.T.

Page Two

Radon gas emission tests, performed on a specific schedule, by a team of qualified professionals.

6.5.2 In reference to Table F-11, page F-16, Vol II, the reproted gross alpha radiation levels measured in the Animas River on 6/01/82 indicate such a great variation in values as to lead one to believe there is a serious deficiency in instrumentation standards. Air sample monitors for detecting $Radon_{222}$, having calibrated primary sensors with tracability to National Bureau of Standards primary standard, should be placed around the site before remedial action begins to obtain background reference data. These monitors should be regularly inspected by qualified professionals during and after remedial action, to assure that instrumentation errors do not lead to invalid results.

The program for evaluating the hazard due to Radon Daughters decay should be defined by the Dept. of Energy and the Nuclear Regulatory Commission during the liscense application and approval process. If not, such a program should be initiated before the uranium tailings pile in Durango is distrubed.

Cordially,

James C. Bruvold

James C. Bruvold

jcb/jb
cc: Tim LaFrance, Durango Uranium Mill Tailings Task Force

Ref: Attachment, Radon Daughters Decay Scheme, private correspondence from Dr. David Sheldon, nuclear engineer at University of New Mexico, 1971.

259 1911
Office
1480 East Second Avenue
Durango, Colorado 81301

Energy Management
Solar Heating
Automotive

RADON DAUGHTERS DECAY SCHEME.

Radium $({}^{88}Ra_{226})$ → n, β, γ

⇓

Radon $({}^{86}Rn_{222})$ NOBLE GAS → α ½ Life 3.8 days

⇓

Polonium $({}^{84}Po_{218})$ → α ½ Life 3.0 min

⇓

Lead $({}^{82}Pb_{214})$ → β, γ ½ Life 25 min

⇓

Bismuth $({}^{83}Bi_{214})$ → β, γ ½ Life 20 min

⇓

Polonium $({}^{84}Po_{214})$ → α ½ Life 0.0002 sec

⇓

LEAD $({}^{82}Pb_{210})$ → β, γ ½ Life 20 YEARS

TOTAL ACTIVITY ½ Life EFFECTIVELY 30 MINUTES

PRODUCES 3 α PARTICLES, 3 β PARTICLES, 3 γ RAYS

February 22, 1985

Project Manager, UMTRAP
U.S. Department of Energy
Albuquerque Operations Office
5301 Central Avenue, N.E., Suite 1700
Albuquerque, NM 87108

Greetings!

This letter contains my comments on the Draft Environmental Impact Statement (DEIS) for Remedial Actions at the Former Vanadium Corporation of America Uranium Mill Site, Durango, La Plata County, Colorado.

6.2 Overall, I have found the DEIS to be inadequate. There is considerable lack of information, not only technical but also sociological, environmental and economic. For example, at a public information meeting in Durango on January 30, 1985, it was revealed that no core sample drilling had taken place on the existing tailings since, according to DOE officials at the meeting, drilling contractors were unsure of the pile's stability and were afraid of liability should an accident occur.

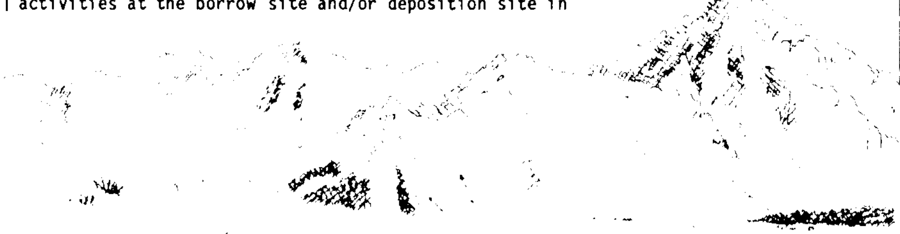
6.11 Also, at that meeting, DOE officials stated that no mitigation plan had been worked out with the Colorado Division of Wildlife (DOW) regarding the impacts to the Bodo Canyon wildlife area.

In light of these examples, I clearly do not have sufficient information to select my "preferred alternative" or to evaluate the alternatives presented in the DEIS.

6.11 I am opposed to any alternative that adversely impacts the Bodo Canyon wildlife area without adequate mitigation measures, which, in my opinion, would have to include obtaining additional lands in another area to dedicate to the Division of Wildlife as a separate wildlife habitat area approximately the size of the Bodo Canyon wildlife area. This, then, would preclude alternatives 2-5 as presented in the DEIS.

A mitigation plan (or alternative borrow site) should be made public prior to the issuance of a Final Environmental Impact Statement and with sufficient lead time for additional public review and comment.

6.11 It should be noted that any such mitigation plan that may be forthcoming must be coordinated with, and approved by The Nature Conservancy, which deeded the land for the Bodo Canyon wildlife area to DOW. That deed, as I'm sure you're aware, carried restrictions on land use that could enable The Nature Conservancy to reclaim title should that land be used for any purpose inconsistent with wildlife habitat. It is clear from reading the DEIS that activities at the borrow site and/or deposition site in



McCool · 1045 E. 4th Avenue · Durango, CO 81301

Bodo Canyon would be inconsistent with sound game management practices.

6.4.3 The revelation that no core sample has been taken of the existing tailings piles leads me to conclude that insufficient data exist to formulate a safe, practical, economical plan for resolving the problems posed by the piles. If, in fact, drillers are fearful of the current stability of the pile, that stability must be questioned in connection with the proposed activities in the DEIS.

6.20.1 I am strongly opposed to alternative 5 in the DEIS. I believe that reprocessing the tailings material will compound the negative environmental impacts at the existing site, during relocation, at the new site and at sites throughout the country where these reclaimed products would be transported, stored, utilized and deposited as waste. Compounding the problem is no answer.

Should the unknowns regarding stabilization-in-place be resolved and refined techniques be presented that show true feasibility, I would favor that remedy, assuming that an alternative borrow site be located or that substantial and adequate mitigation measures be taken regarding the impacts to Bodo Canyon wildlife area.

I was very disappointed in the DEIS. I believe that it is inadequate and insufficient. I hope that DOE will review this document and make major modifications and undertake the additional studies necessary to propose realistic alternatives for this project.

Sincerely,

Lewis McCool

Lewis McCool

Susan McCool

Susan McCool

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511

AMANDA & RICHARD WHITE
3695 CR 141
DURANGO, COLO. 81301

FEB. 19, 1985

DEAR MR. THEMELIS:

IN REGARDS TO OUR FEELINGS ABOUT THE TAILINGS
PILE IN DURANGO, WE ARE IN FAVOR OF:

6.20.1 1 - NO ACTION, OR

2 - STABILIZATION IN PLACE.

WE LIVE ON COUNTY ROAD 141, NEAR BOTH THE
LONG HOLLOW & BODO CANYON SITES. WE HAVE
6.12 2 SMALL CHILDREN & FEEL BOTH THESE OPTIONS
WOULD ENDANGER THEIR HEALTH. SECONDLY, WE
FEEL THE DEIS DID NOT TAKE INTO ACCOUNT THE
6.15 WIND FACTOR, WHICH WOULD BRING THE DUST DOWN
OUR VALLEY.

SINCERELY, Amanda White Richard A. White

512

1850 W. Third Ave.
Durango, Colo. 81301

U.S. Dept. of Energy
5301 Central Ave., N.E. Suite 1700
Albuquerque, New Mexico 87108

Gentlemen,

I am a ten year resident of Durango and currently live about one mile north of Smelter Mountain. I work as a chemist in Bodo Industrial Park about a mile south of the tailings site. I have great concern about the impending decisions about our uranium mill tailings.

While attending a few meetings arranged to allow for public comment and questions I was greatly distressed to find that all of the options put forth seemed to be very poorly thought out. The cost estimates were amazingly unrealistic, health risks were considered incidental and the whole project was looked upon as
6.20.3 an engineering task. Obviously the foremost consideration is public health. The original impetus for the action should not be shouldered aside in the accomplishing. I was appalled to find that the citizenry better grasped the pertinent aspects of the project and the flaws in planning than did the "experts" from the D.O.E. The questions were better than the answers.

Unfortunately it is much easier to criticize the fellow on stage than it is to take his place. The ideal solution escapes me. I understand the long term need to stabilize these hazardous wastes and that to satisfy this requirement the tailings must be moved. On the other hand, it makes little sense to disturb the mostly revegetated mounds and sloppily dribble radioactive
6.3 dust all over the county just to fulfill this long term need. I suggest we soon attack the imminent health risk presented by in-town radioactive sites. Meanwhile a complete plan concerning the Smelter Mountain wastes should be well considered and revised down to fine detail before it is implemented. This plan should provide for rapid movement and encapsulation with wildly strict

Feb 2, 1985

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Project Manager
Uranium Mill Tailings Project Office
U.S. Department of Energy
5301 Central Ave N.E.
Suite 1700
Albuquerque, New Mexico 87108

Dear Mr Themelis:

6.20.3 As a Durango resident I have two main concerns regarding the uranium tailings pile. One concern is the effect on our health. A second concern is the effect the

6.17 pile has on tourism, Durango's principle economy. Although I would like to see the pile moved from its present site to remove the constant exposure and to remove dangers of pollution during a future high flood,

6.4.3 I feel there are too many unknowns at this time. Specifically no core drilling has taken a sample of soil beneath the pile or in the river bed to determine whether radioactive particles exist and whether it would be realistic to remove any contaminated soil beyond the estimated 2,587,200 tons of the tailings. I also have

6.12 concerns about whether the road to Bodo would meet necessary standards for transportation during moving. A third concern is about the actual time it would take to remove the pile. Would the actual time[513]

6.4.5 estimated to remove the pile to Bodo be a consecutive 1.5 years or would it cover three summers of tourist season?

6.20.1 Unless the above concerns can be addressed I am in favor of stabilization in place, at this time.

6.5.1 I urge DOE to design the retaining wall on a contour or terrace which would enable some landscaping. Who is responsible for maintaining the

6.4.4 site once stabilization has taken place needs to be addressed.

I appreciate your extension for the comment period on the DEIS.

Sincerely,

Maryanne Wm??? Kenney
3140 E 5th Ave
Durango, CO 81301

FEB 8 3 02 PM '85

STATE OF COLORADO

Department of Local Affairs

Richard D. Lamm
Governor

DIVISION OF LOCAL GOVERNMENT
Pat Ratliff, Director

February 22, 1985

Mr. John Themelis, Manager
Uranium Mill Tailings Project Office
U.S. Department of Energy
5301 Central Avenue NE, Suite 1700
Albuquerque, NM 87108

Subject: Draft Environmental Impact Statement (DEIS)
Durango Uranium Tailings

Dear Mr. Themelis:

The following are our comments regarding the subject DEIS.

6.20.3 Upon reviewing the preferred alternatives, it appears that alternatives 4 and 5 (Long Hollow and Long Hollow with reprocessing) are the least desirable for the following reasons:

1) significantly greater cost;
2) potential ground water problems;
3) significantly longer project duration which may adversely affect two Durango summer tourist seasons;
4) increased truck traffic (which also relates to 1 and 3 above); and
5) the apparent strong public opinion of Durango residents against these alternatives.

As you are well aware, the Federal legislation that addressed uranium mill tailings clean-up requires a 10% match (90% Federal funds) from the appropriate states. In Colorado, the State Legislature has not demonstrated support for providing the 10% match and instead has attempted to extract this match from the State Department of Local Affairs Impact Assistance Program. This is Colorado's most active grant program that funds local government public facility and service projects across the state.

6.9 Although the State has not made any decisions regarding the match for the tailings pile, the Department of Local Affairs has agreed to provide $5 million over the next 5 years for for the vicinity property clean-up effort. As part of this effort, local governments will have to provide 1% of the required 10% match.

No agreement has been reached regarding the source of the state match for the tailings pile clean-up; however, it is essential that the most cost-effective alternatives (excluding the do-nothing alternative) -- which at this time appear to be either stabilization in place and burial at Bodo Canyon -- should be given serious consideration.

6.9 Even though these alternatives are the least expensive, the match will still be considerable. The more expensive the match becomes, the greater the potential for impacting State and local government financing alternatives as well as delaying the start of the clean-up effort as the match issue is debated.

With the vicinity property clean-up effort scheduled to begin this year and the large number of property owners involved, it is very important that coordination with the Durango community be a primary goal of both the DOE and the State Health Department.

Sincerely,

Ken Francis

Ken Francis
Field Representative

KF:ps
c.c. Al Hazle
Colorado Dept. of Health

Greg Hoch
Durango City Planner

CITIZENS CONCERNED ABOUT MOVING
THE PILE (CCAMP)
Post Office Box 1484
Durango, Colorado 81302

February 21, 1985

Mr. John T. Themelis
U.S. Department of Energy
UMTRA Project Office
Durango DEIS Comments
5301 Central Avenue, N.E., Suite 1700
Albuquerque, New Mexico 87108

Dear Mr. Themelis:

The Citizens Concerned About Moving the Pile (CCAMP) presents its comments on the Department of Energy's (DOE) Draft Environmental Impact Statement (DEIS) for "Remedial Actions at the Former Vanadium Corporation of America Uranium Mill Site, Durango, La Plata County" and would like to submit them for consideration as part of the formal testimony.

6.2 We have a number of problems with each of the alternatives presented in the DEIS and feel that the DOE has not adequately addressed many of the issues essential to the actions defined therein, and that there is not sufficient information to allow us to select a preferred alternative. The DEIS contains vague assertions and lacks specific details on how the project will be accomplished. The volume of words contained in the DEIS does not make up for the fact that hard information is lacking.

In addition to presenting our concerns with respect to each alternative, we are going to focus on five major areas for which we feel there is significantly more information needed. They are as follows:

- Vicinity Property Remedial Action
- Tourist Industry
- The Procedures for Comprehensive Remedial Action
- Health Risks Inconsistencies
- Miscellaneous Issues Needing Clarification

The Citizens Concerned About Moving the Pile have raised numerous questions and concerns about the technical and

management issues surrounding this controversial project in the attached Technical Comments. We are particularly uncomfortable with the fact that the Durango tailings pile has been one of two national sites selected by the DOE to be moved. To date, the Department of Energy (DOE) has not yet attempted or accomplished the movement of a tailings pile the size of the Durango pile (2.2 million tons). Any comparison to the Naturita pile is irrelevant because of the high uranium and vanadium content in the Durango pile which makes movement of the pile a hazardous project. Such high reserves of uranium and vanadium prejudices DOE's selection of a preferred alternative which includes reprocessing. In addition, the DOE's lack of experience and real application makes the Durango Remedial Action an experiment at the expense of our citizens.

6.20.3

CCAMP is also plagued by the fact that the DOE, in our opinion, has not explored the highest "state of the art" technical alternatives which could be applied to the Durango site. The CCAMP, in the attached comments, has brought to the DOE's attention, two different technical alternatives which clearly should have been examined prior to issuance of the DEIS: the concept of using a tram, which has seen great success by metallurgical industries in the past, instead of trucks for the transport of the tailings; and the use of a concrete mesh form which has been used for shore line erosion control and stabilization and which can accommodate both drainage problems and stabilization of the pile at the bank of the river. The concrete can be used in conjunction with an erosion control/revegetation mat applied to the slope as it currently exists, on top of a clay layer if chosen. This PVC mat can be mulched, seeded and fertilized for a more "aesthetic pile".

6.3

It appears to CCAMP that there may be more technical alternatives available to solving our "pile problem" and that the DOE should consider either reassigning the project to a more creative and objective engineering firm which can rise to the "highest state of the art" or redirect the current contractor to modernize its thinking beyond the "rip-rap" approach.

The Citizens Concerned About Moving the Pile (CCAMP) has completed its survey of public opinion on the tailings pile. The door-to-door survey interviewed 506 local residents. Stabilization in place was the preferred alternative of 69% of the people and was chosen by a margin of more than six to one over any other alternative.

6.20.1

The survey also asked people to rank the importance of several concerns. Three where chosen as being the most important:

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U.S. Department of Energy

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- To minimize the release of radioactive dust and gases;
- To avoid contaminating another site or watershed; and
- To minimize contamination of ground water.

Five others were chosen as being important but secondary:

6.20.1

- To clean up all the vicinity properties;
- To minimize the effects on wildlife;
- To minimize heavy truck traffic on local roads;
- To minimize total project costs; and
- To protect the tailings against possible flooding.

Two of the concerns were ranked as not important:

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- To recover the residual uranium and vanadium; and
- To remove the tailings from the view of Durango and its tourists.

We have attached, for your information, a copy of the CCAMP Press Release and accompanying tables, as well as a compilation of the comments received from the survey.

6.20.1 Since there is a considerable amount of information essential to the decision making process which is missing from the DEIS, we are requesting that the DOE establish a "mid-way information process" (MWIP) to make this information available to CCAMP prior to any initiation of completing or undertaking the writing of the Final Environmental Impact Statement (FEIS) and within sixty days of the end of this comment period. This can be done via a Public Information Meeting during which the DOE presents its findings or in small workgroup sessions over a period of a week or two. Only after we have become informed can we disseminate this much needed information to the citizens of La Plata County so that they can assess and evaluate the alternatives in an educated manner. And only then can they begin to make one of the most important choices that they will be faced with, for decades to come.

Sincerely,

CITIZENS CONCERNED ABOUT
MOVING THE PILE (CCAMP)
Andrea J. Maynard (for)
(See attached signatures, please)

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TECHNICAL COMMENTS

I. VICINITY PROPERTY REMEDIAL ACTION (Appendix B)

A. Inclusion in DEIS:

6.18 6.2 CCAMP believes that by relegating the Vicinity Property Remedial Action (Appendix B) to Volume II - Appendices of the Draft Environmental Impact Statement, the DOE has, in fact, indicated its lack of commitment to deal effectively with Durango's Vicinity Properties. CCAMP believes that the Vicinity Properties issue is more urgent to the citizens of Durango than is the tailings pile remedial action and, therefore, should have been included as a formal part of the DEIS. Since Title I of the Uranium Mill Tailings Radiation Control Act of 1978 included remedial action on vicinity properties, Congress clearly intended that vicinity property clean up be considered a high priority. DOE has, however, arbitrarily assigned Appendix B a lesser importance, failing to perform a full evaluation and analysis as required by NEPA.

6.18 Appendix B is lacking critical information which should have been available prior to issuance of the DEIS. Appendix B is filled with contradictions or missing information and contains guesstimates, uncertainties, speculation, and no time line for remedial action. Without necessary radiological information, how can DOE calculate radiation doses to either the work force or the general population? Without detailed surveys of radiation levels or volumes of contaminated material, how can DOE assert any validity to the entire Appendix B section? CCAMP believes that Appendix B is entirely unacceptable to the citizens of Durango and that the Department of Energy should discard the existing Appendix B and reissue a new Appendix B in a Draft EIS form prior to the final EIS.

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B. Critical Information Required Prior to Decision-Making.

6.18 Appendix B indicates that DOE does not have sufficient information upon which to base a Vicinity Remedial Action Plan. For example, Appendix B, Section B.1.1. states that "Additional surveys will provide more detailed estimates of radiation levels and volumes of contaminated materials." In addition, DOE points out that "It should be noted that additional properties may well be identified in the future as potential clean up candidates in Durango." (Emphasis added)

6.18 Section B.4 "Environmental Consequences and Mitigation" admits that "detailed radiological measurements and engineering estimates have not been reported for any of the offsite properties." While Section B.3.5. "Radiological Environments" indicates that "Since all comprehensive on-site surveys are not yet completed, little detailed radiological information is currently available." (Emphasis added) These statements, made after four surveys were conducted by the Federal government since 1971, indicate a lack of knowledge about Durango's Vicinity Properties.

If the Department of Energy is unable to provide this vital information in Appendix B of the DEIS, CCAMP believes that a Final EIS should not be issued without accurate and current radiological information.

C. Other Inconsistencies.

6.18 1. Appendix B establishes a pattern of inconsistencies which begins in Section B.1.1. "Background of the Proposed Action." DOE states on one hand that "It should be noted that additional properties may well be identified in the future as potential cleanup candidates in Durango." In the same paragraph, DOE also asserts that "It is highly unlikely that the final number of Durango vicinity properties that ultimately are cleaned up will total 137." While Section B.5.1. "The Proposed Action" states that "Only 31 of the 137 properties located in Durango that may have been contaminated by uranium mill tailings have been included on an official DOE list for remedial action." (Emphasis added)

Clearly, the Department of Energy is uncertain as to the number of vicinity properties in Durango which will necessitate remedial action. If, at this date, DOE can provide only vague, contradictory information, when may we expect a coherent, well-thought out plan for remedial action?

6.18 2. Section B.4.2. "Impacts on Transportation Networks and of Accidents" states that "No interruption of public services is expected during the clean-up activities." However, in Section B.4.3. "Impacts on Population, Land Use and Economics", DOE again contradicts itself by saying that "some commercial establishments may have to be closed temporarily during remedial actions." Since Table B1 includes La Plata County's "hospitals, schools, churches, hotels and commercial properties', can one assume that there will be no significant disruption to public services? No information is presented as to how hospitals and schools will function during remedial action. Are we, therefore, to assume that the contaminated hospitals and schools will not receive remedial action but will continue to emit radon gas and gamma particles?

6.18 3. Section B.1.3. "Proposed Action" estimates that "vicinity property cleanup at Durango should take from one to two years: one year if stabilization in place is selected for the Durango tailings and up to two years if a remote disposal alternative is selected." Since Appendix B, Section B.1.3. indicates

that "This (contaminated) material will have to be removed to the Durango tailings pile", why does DOE present two different time estimates to complete vicinity property remedial action? Is DOE, in fact, planning to transport these contaminated materials directly to either Bodo Canyon or Long Hollow? If, in fact, vicinity property remedial action can be completed in one year's time, CCAMP urges DOE to do so, since we agree with the DEIS that
6.18 "this analysis assumes that the local public and clean up workers would be exposed to elevated radiation levels for a one year period" and further that "their exposure will be further elevated during the remedial action by the disturbance of the contaminated material." DOE further confuses the time issue by then stating that "this one year period is a very conservative assumption since individual properties will take much less than a year to clean up."

Section B.4.6. "Mitigation Measures" also states that "In order to mitigate socioeconomic impacts, it could be better, in some cases, to spread remedial actions out over a longer period of time." DOE presents no explanation as to what
6.18 constitutes a "longer period of time", when such a decision will be made, and what factors will contribute to a decision lengthening remedial action.

These inconsistencies are further indication that DOE has very little idea as to how it will implement a remedial action plan for the vicinity properties. Such inconsistencies raise serious questions as to the effectiveness of DOE's decision-making and information gathering as well as its ability to carry out a project of this magnitude.

4. At the January 30th meeting, a Jacobs Engineering health physicist representative who presented the slides on health effects, indicated that the Greenmont Cemetery, which has radiation readings, is a natural anamoly and that radiation levels at areas south of the pile were due to wind blown dust. Our information indicates that the cemetery, in fact, contains
6.18 tailings from the pile and that the contaminated areas south of the pile are from the existing raffinate ponds. This discrepancy questions DOE's ability and procedures for identifying radiation sources found in vicinity properties as originating from the tailings pile. What criteria will DOE use to identify contaminated vicinity properties caused by the tailings pile? What proof does a resident have to provide to DOE to qualify as a vicinity site?

D. True Clean-up or Cosmetic Surgery?

According to Section B.1.3. "The Proposed Action", DOE plans to only bring contaminated vicinity properties into com-
6.18 pliance with EPA standards. "After all of the work is finished, final radiation measurements will be evaluated and the property will be certified as meeting the EPA standards." In other words,

a contaminated site identified as a vicinity property will not be radiation-free but merely within EPA's limits. Since radiation exposure has a cumulative effect on the human body and, therefore, there is no safe level of radiation, CCAMP believes that all vicinity properties should be totally cleaned of traces of
6.18 tailings. Does DOE believe that properties which attain EPA standards will be safe for occupancy? Will commercial establishments lose business because of public doubt and concern over how safe remaining radiation levels are?

Section B.1.2. "Need for the Action" cites that "radon gas is of particular concern because it can build up in enclosed structures until potentially hazardous levels are reached." Further, "The U.S. EPA's standards for clean-up of tailings requires clean-up of contamination only when the amount and location of the tailings exceed given levels of contamination and pose a clear, present and future hazard."

According to the Uranium Mill Tailings Act of 1978, Findings and Purposes, Section 2 "(b) 1. The purposes of this Act are to provide . . . in order to stabilize and control such tailings in a safe and environmentally sound manner and to minimize or eliminate radiation health hazards to the public." (emphasis added) The EPA standards (40 CFR Part 192) Federal
6.10.2 Register Notice January 5, 1983, agrees when it reiterates that "These standards are established to satisfy the purposes of the Act to ". . . stabilize and control . . . tailings in a safe and environmentally sound manner and to minimize or eliminate radiation health hazards to the public." (emphasis added)

In addition, Appendix B does not address the difference between indoor and outdoor levels of exposure as identified in the EPA standards. DOE needs to specifically differentiate between indoor, outdoor, buried and surface levels of contamination and exposure.

E. Missing Information.

1. Section B.1.3. "Proposed Action" cites that "an estimated 13,700 tons of low-level radioactive material from about 137 vicinity properties" and "removal of about 13,000 cubic yards of soil contaminated by windblown tailings from areas
6.18 adjacent to" will constitute remedial action. However, without accurate radiological information, this figures cannot be considered an accurate measure of the quantity of materials to be removed during remedial action, nor can it be a true indication of the magnitude of remedial action activities in Durango.

6.4.5 2. Section B.4.6.: Who will order work stoppages and under what conditions?

3. "In order to mitigate socioeconomic impacts, it
6.18
6.4.5 would be better, in some cases, to spread remedial actions out

6.18 over a longer period of time." Under what circumstances does DOE anticipate remedial action taking a longer period of time? When does that decision get made?

6.18 4. "Consultation, cooperation, and coordination with local authorities and concerned citizens throughout the action, including regular meetings and designation of someone to provide on-site public information." What will be the vehicle for such communication? Who will be "someone designated"? Will that individual be separate from the tailings clean up action? Will that person serve strictly a Public Relations function or will that individual be able to make decisions relating to work stoppage or other emergency decisions? CCAMP would like to suggest that DOE set up a Citizens Advisory Committee consisting, in part, of affected homeowners and merchants.

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5. What will be the status of vicinity properties remedial action on weekends, holidays, during storms? Who is authorized to make decisions?

6.18 6. "The transport of contaminated materials to the Durango site would be made using inspected trucks covered with canvas shrouds and tightly fitted tailgates." "These and other precautions would be formulated into a set of guidelines <u>before</u> any work proceeds." When will such guidelines be issued? Will such guidelines be applicable to the remedial action at the tailings pile?

6.18 7. Section B.4.3. If clean up of 137 vicinity properties at Durango is estimated to cost a total of $11,896,000, what will clean up of the designated 31 sites cost?

6.18 8. Section B.4.3. "Impacts on Population, Land Use and Economics" states that "It is also possible that some residents may have to be temporarily relocated." The FEIS should address the procedures to be implemented, when relocation will be decided and how it will be carried out.

F. <u>Accidents</u>.

6.18 B.4.1.2. "Radiation Doses from Hypothetical Accidents" fails to address a realistic transport accident scenario. For instance, if the plastic "diapers" around the tailgate leak, the tailgate pops open, if the canvas shroud flies off or loosens-- all leaving a radioactive residue on our city streets, what mitigation will DOE employ to deal with these more common transport occurrences? DOE assures us that in the event of an accident, "Simple steps, taken immediately, would effectively reduce the exposure." Does DOE seriously expect us to believe that "ribbons, flags, and radiation signs would be used at the accident scene" is an effective means of protecting the public? Will radon gas and gamma particles honor "ribbons, flags and radiation signs" and cease their cancer-producing effects?

The DEIS goes on to say that "The clean up crews would stop their activity, go to the accident scene, and reload the spilled material." The DEIS fails to let us know how all this will happen. Who will contact the clean-up crew? Who will coordinate and be responsible for decision making in the event of an accident? How will the clean-up crews' current project be left if they are suddenly pulled off of their work to assist in an emergency?

6.18 How can DOE possibly predict radiation doses for either a hypothetical accident or during routine remedial action if "detailed radiological measurements" and "little detailed radiological information is currently available"? Such calculations are virtually meaningless and have little value or basis in fact.

II. <u>TOURIST INDUSTRY</u>

Beginning on page 123 of the DEIS, the DOE proceeds to portray the socioeconomic climate of La Plata County. On page 127, the DEIS states that "tourism is important to the La Plata County economy" and indicates that there are approximately 750,000-1,200,000 annual visitors to Durango. Yet the DEIS blatantly omits any economic analysis of this most critical industry to La Plata County.

6.17 It is encumbent upon the DOE to assess this impact on the tourist industry from every single alternative being considered for the tailings pile as well as for the vicinity site activities. This would require a mathematical modelling of the entire industry to include the financial impacts to the County, City and State, impacts on specific services such as restaurants, hotels, motels, and recreational interests such as Mesa Verde, campgrounds, the San Juan National Forest, rafting, ranches, hunting, etc. The economic impact assessment should also identify what measures need to be taken to minimize the impacts on our primary industry, tourism.

III. <u>PROCEDURES FOR ACCOMPLISHING REMEDIAL ACTION</u>

There are many areas that remain partially or completely omitted in the DEIS concerning the actual procedures for accomplishing remedial action. The following are questions and comments addressed to these issues:

5.4.1 A. What steps will be taken to control windblown tailings at the remedial sites during non-construction times, <u>i.e.</u>, nights, weekends, periods of high winds, and October through May?

6.10.1 B. How often will "periodic" inspections occur at the remedial site and will these be unannounced or planned?

6.4.5 C. It is still unclear as to whether the months estimated for project completion for all four action alternatives are consecutive months, including October through May, or only the number of actual working months.

6.4.1 D. Since the stability and actual make-up of the large tailings pile has not been determined, how can plans be made to construct the first haul road to "extend from the top of the large tailings pile" to the south edge of the raffinate ponds area and ensure the stability of the road? What method will be taken to insure the stability of the haul road?

5.4.1 E. If contaminated material beneath the pile is found to go deeper than four feet, will said material be removed until EPA standards are met? If so, how will this effect cost and time estimates?

6.18 F. Exactly how (in detail) will the typical work day progress? Please show the inter-relationship between vicinity site activities and the actual pile activities.

6.18 G. Who is in charge of making daily decisions and emergency decisions? What will be NRC's role during Remedial Action? What will be DOE's role during Remedial Action?.

6.10.1 H. CCAMP would like to be provided with a timetable and schedule for the monitoring. Reference by Bob Myers has been made "about weekly" but we feel a specific commitment must be made.

6.10.1 I. Will the results of monitoring and inspections be available to the public? How frequently?

IV. HEALTH RISKS INCONSISTENCIES

6.10.2 We know, because we've been told, that exposure to low levels of radioactivity are presumed to be dangerous. The data that appears to be dictating the actions by DOE, however, do not seem to substantiate that the tailings pile poses a health risk to the populace of Durango. The levels that were presented in the DEIS for the Town of Durango were much lower than the EPA standards.

Four different organizations have reported very diverse information on the potential health risks. It is imperative that the FEIS reconcile this contradictory information.

The following section highlights issues that we feel must be addressed in the FEIS:

A. The DEIS provided tables for expected incidents of lung cancer deaths. No information is provided for other potentially fatal diseases, other cancers (leukemia), birth defects, non-fatal chronic diseases, etc. Please provide.

6.10.2 B. The DEIS did not address the potential genetic effects due to exposure to elevated levels of radon gas (i.e., during excavation of the pile). Elevated levels may not significantly affect the incidence of lung cancers, but what about higher incidence of birth defects, etc.?

6.10.2 C. How do the health impacts compare when one receives high levels of exposure over a short period of time to low level dosages over a long period of time?

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6.10.1 D. CCAMP questions the ability of the State Health Department to do an adequate job of monitoring the health of the Durango Community. Do they have the money and man power to follow through effectively, correctly and efficiently? What is their experience at Nucla?

6.18 E. Since the health effects have been determined to be of such great importance in this process, why was so little attention given to the vicinity sites which appear to be a much greater threat to Durango and the community's health than the tailings pile itself?

6.10.4 F. Documentation on our current health situation with respect to leaving the tailings pile alone or moving it seems to be inconclusive. The estimates of potential cancer deaths vary drastically from one expert to the next. In the scientific community there seems to be little agreement except that radiation is dangerous. Before any decision is made that requires an unnecessary action on the part of DOE it should provide reliable health data to substantiate its recommendations.

6.2 G. The many uncertainties with regard to the health risks throughout the DEIS suggest that DOE's Alternatives may not comply with EPA's 1,000 year standard.

V. MISCELLANEOUS ISSUES NEEDING CLARIFICATION

A. Content and Stability of the Pile

6.4.3 CCAMP was advised during the January 30th meeting that the pile is unstable and that additional borings are needed prior to any action being taken. There are inconsistencies with respect to the stability of the pile. We have heard that Hecla has, in fact, done the borings and has the data but that they won't release it to DOE for financial reasons. The validity of Hecla's data is also uncertain. Since this information is not readily accessible, how can DOE proceed with technical recommendations for either Stabilization in Place (SIP) or moving the tailings to other sites?

The unknowns and implications related to moving the pile must be presented in a clear and concise manner so that the community will know what it can expect and it can determine if the risk is worth it. DOE must use whatever legal or financial options are available to it to obtain the information on the Hecla borings prior to any decision making affecting the FEIS.

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B. Moving the Pile.

6.20.3 Since the DOE has only actively been involved in moving vicinity sites in Cannonsburg and has not yet begun Stabilization in Place at the Cannonsburg site nor any place else, and has never had any experience in moving a tailings pile of the magnitude as exists in Durango, why does DOE believe it has the technical and/or engineering expertise to accomplish remedial action since this type of project has never been done before? DOE has no practical experience to demonstrate that it can, in fact, complete remedial action, and verbal assurances are not satisfactory. CCAMP requires documented references from previous projects (timetables, amounts of materials moved, cost overruns, documentation of mishaps, inspection records, numbers and descriptions of variances from EPA and NRC standards, etc.).

C. 1990 Deadline

6.20.3 Because the authorization for UMTRCA officially ends in 1990, how will the extension of this law be guaranteed to complete the project if it were to go beyond the authorization date? We need concrete specific guarantees and not just promises, as were received in the January 30th meeting. If Congress does not reauthorize UMTRCA by January 1990, how does DOE proceed?

D. Costing

6.9 The DEIS provides costs for the remedial action alone. It states on page 23 that the estimated costs do not include costs for site acquisition, rights of way, legal and administration, finance and interest charges, vicinity property clean up or

6.9 long term maintenance. It is obvious that these additional costs will significantly increase both the overall project costs and the time associated with implementing these added actions which should have a considerable impact on the time it will take to see the project through to conclusion. The DOE must identify each of the above costs for each of the alternatives and it must integrate into the FEIS, the actual time it will take to perform the entire remedial action from the time the land purchase activities begin all the way through the entire project.

E. Durango, the Experiment

6.20.3 Why has the DOE selected to move the Durango site when all of the others will be stabilized in place? What are the unique or not-so-unique characteristics which make the Durango site so "appropriate" for moving? Please provide the justification for Alternatives 3, 4 and 5 as we are still not certain that there is sufficient information to justify moving it, nor is there proof that the City of Durango will be better off if it is moved. The radon gas and radiation levels in Durango do not exceed EPA standards. The levels at the pile do. Since we know the problem of the pile as it sits, has DOE considered leaving it where it is, moving as little as possible and stabilizing it as best as can be accomplished with the "highest state of the art?"

F. Eminent Domain

6.20.3 DOE has stated that land for the Long Hollow alternative will be taken under eminent domain. Why cannot the current Durango site be taken under this same authority, immediately, so that DOE can begin to perform borings and identify exactly what is in the pile and where? These are pieces of information that are sorely needed by the citizens of Durango, so that they can determine what risks they will be willing to take and what alternative they should select.

G. A Preferred Alternative

6.3 In two (2) separate memos, dated August 23, 1982 and September 28, 1982, from Chris Timm to Dan Phoenix, it was stated that the DOE was not going to select a "preferred alternative". Why then did DOE select a preferred alternative in the DEIS, without working with the county and local constituents first?

H. Health vs. Economic

6.20.3 It appears that the primary force of the DEIS is economic rather than health risks. Continual reference is made to the economic advantages of the Preferred Alternative No. 5, while it is the second worst as far as health risks are concerned next to the "no action" alternative, and it is the worst among the other four alternatives that would meet EPA standards. If the health risks do exist, then we want them to be the first priority in determining which alternative is the best for Durango and not the economic considerations.

I. Animas La Plata Project

There is still great concern as to the particular inter-relationship between the physical location of the Animas La Plata Project and the Long Hollow alternatives. We are not satisfied with the answers that were provided at the January 30th meeting and would like to emphasize that a specific section for each alternative must be added to the FEIS to show the time frames, operational and physical location inter-relationships.

The pipeline is supposed to run through the Long Hollow
6.13 tunnel which is approximately 100 yards from the Long Hollow tailings site. If money is allocated for the Animas La Plata Project, what action will keep the construction from running into the Long Hollow site? If the Animas La Plata Project is funded and either of the Long Hollow sites or Bodo is selected by DOE, it is encumbent upon the DOE to assess, address and discuss the inter-relationship of the potential impacts resulting from population influx (due to the Animas La Plata Project) and radiological impacts (due to UMTRCA).

J. Contingency Costs

The contingency costs are 10-20% lower than industry standards. Why? How will this effect the true costs and the
6.9 ability of the citizens to understand the real costs associated with each alternative? Won't these lower figures result in cost overruns and inadequate design?

K. Exposure Charts

The FEIS should present one exposure chart which represents both the radon and radiological emissions from both
6.10.2 the vicinity sites and the tailings pile. The combined values must be presented as one value for a true representation of population exposure from both aspects of the project.

L. Transportation Guidelines

Reference to transportation guidelines for the vicinity sites for remedial action will be issued according to Appendix B.
6.18 Will those same guidelines be applicable to the tailings pile or will other guidelines be issued?

VI. THE ALTERNATIVES

A. Alternative No. 2: Stabilization in Place (SIP)

The Draft Environmental Impact Statement refers to Alternative 2 as "Stabilization in Place". SIP means that contaminated matter from both piles will be combined and recontoured into a single pile thereby necessitating significant movement of tailings. Table 1-2, "Estimated Volumes of materials, manpower, duration and cost of each alternative", shows that 488,000 cubic yards (30% of the total volume of contaminated material) will be excavated and placed in the reshaped pile. Therefore, while SIP may appear, on the surface, to be a relatively benign method of remedial action, it actually represents a significant amount of movement of the tailings pile.

The DEIS presents only one possible scenario for SIP. The DEIS fails to identify additional engineering options other than what was presented in Alternative 2. In the short time that
6.5.1 CCAMP has been organized (since January 5, 1985), we have discovered two possible options (the use of trams and the application of concrete) which merit further consideration by the Department of Energy. If, with our extremely limited resources, a citizen's committee could compile this additional information, we must believe that the U.S. Department of Energy, with its vast network and capabilities, should be able to identify engineering alternatives which represent the true state of the art. CCAMP believes that DOE has failed to provide the citizens of Durango with truly viable alternatives that represent the best options available today. CCAMP requests that the DOE re-assess Alternative 2 and provide a choice that would work to resolve excessive emissions currently at the pile without the inherent hazards that massive movement would entail.

Further, the DEIS fails to identify alternatives that were considered for SIP but discarded. Appendix C "Alternatives That Were Considered But Rejected" only includes sites that were considered and ultimately rejected. Appendix C, contrary to its name, does not include engineering, technical or procedural
6.3 alternatives. Are we to believe that the DOE considered only what was presented by Jacobs Engineering and sought no other methods for the SIP Alternative? If so, DOE, as the public's alleged agent, failed in its charge to present a full and thorough analysis of the issue.

The DEIS also fails to adequately describe the details and procedures to be followed if Alternative 2 is selected. The DEIS offers little or no specific information as to how the
6.4.1 procedures to accomplish SIP will be carried out. The DEIS offers no examples of how and where DOE or its subcontractors have successfully accomplished a remedial action program similar to the proposed project at Durango.

6.20.2 Section 5.8. "Impacts on Land Use" states that if Alternative 3, 4 or 5 is selected, "long term (after remedial action) release of the entire 126 acre Durango site for further development" would certainly be advantageous to commercial enterprises wishing to build condominiums or a shopping center. If Alternative 2 is chosen, "it can be expected that the remainder of the Durango site (88 acres) would be available for development and would likely be annexed eventually to the City of Durango." Selection of Alternatives 3, 4 or 5 would serve the interests of private developers who would want to develop the 126 acre site.

6.4.3 Section 4.2.1. indicates that DOE does not know, with any certainty, the exact contents of the tailings pile. The DEIS states that the pile "most probably" contains "other rubble and debris deposited in the piles during the life of the ore-processing operations." Prior to any decision on the status of the pile, DOE must, using any legal means available, obtain information as a result of Helca's borehole drillings. Such information is vital to determining not only a more accurate picture of the contents of the pile but also vital information regarding the tailings pile's stability.

6.4.4 Section 1.5. "Environmental Impacts" alleges that Alternative 2 would "require a much greater level of maintenance . . . because of the potential for meandering of the Animas River channel, the design's dependence on grouted riprap for erosion protection, and the use of surface-water diversion channels to direct surface-water flow." The DEIS, however, fails to provide details as to how routine maintenance will be done, what emergency procedures would be implemented, if necessary, and what preventative maintenance would be instituted. The DEIS, in fact, does not indicate whether preventative maintenance would preclude long-term maintenance.

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6.5.1 There has been continual reference, throughout the DEIS, to the potential impacts which may arise due to the maximum probable flood (MPF) if SIP were selected. The current SIP plan requires moving 480,000 cubic yards of the tailings (30%) to recontour the pile. The DEIS addresses this specific problem by suggesting that the pile would have to be moved and then stabilized and protected from stream bank erosion by placement of a five foot thick grouted rip rap erosion barrier.

6.5.1 It has been brought to our attention that possibly another technical option to control drainage and erosion may exist--the use of a biodegradeable concrete mesh form (like Fabriform) which can be used both for drainage [for runoff during construction as well as in handling probable maximum precipitation (PMP)] and for channelization and stabilization of the pile at the river bank and wherever else is needed. An erosion control/revegetation mat could be used in concert with this concrete mesh and could be applied over the slope as it currently

6.5.1 exists or with a clay layer. This mat can be mulched, seeded and fertilized and will hold the dirt in place until the vegetation regenerates. A contact person for more information is Donald C. Domiske of CONTECH, 404-762-9616.

6.11 Another area of concern to CCAMP is The Nature Conservancy release of land to the DOE for borrow soils if the tailings were to be stabilized in place. How would DOE go about obtaining the release of this land?

6.5.1 Section 1.3.2. "Alternative 2: Stabilization on the Durango Site" states that "The tailings and other contaminated material would be covered by a five foot thick layer of compacted clay that would reduce the release of radon into the air above the pile to EPA standards." (Emphasis added) Does in fact the phrase "into the air above the pile" mean that radon emissions at the pile will not meet EPA standards after remedial action is taken? CCAMP believes that the five foot cover is an insufficient depth to effectively reduce radon and gamma emissions. If, for example, the Shiprock pile, with a lesser uranium and vanadium content, will receive seven feet of soil and 1.5 feet of rocks, it is reasonable to expect the Durango pile to require a cover of greater depth. In addition, CCAMP would urge the use of a multilayer cover rather than a single layer barrier because of its attenuating effect on radon diffusion. CCAMP also urges the DOE to use compacted clay that is 95% density to avoid cracking.

B. Alternative No. 3: Bodo Canyon

6.11 1. How would the DOE go about getting The Nature Conservancy to release the 41 restricted areas for their use for deposition of the mill tailings? What is the process involved? How can this be justified particularly with respect to the critical winter range for deer and elk that would be taken out of use? This precise piece of land was set aside for a wildlife sanctuary. How can this action be condoned by the DOE and the State of Colorado? What are the details of the wildlife mitigation plan (page 11) which the DOE has said it will implement?

6.16 2. Thirty prehistoric sites and artifacts of early-American cultures have been identified in the vicinity of Bodo Canyon site. How will these be preserved and maintained if Alternative No. 3 is selected? What are the specific mitigation measures that will be taken?

6.3 3. A member of CCAMP and Commissioner R. T. Scott recently met with officials of the POMA Corporation at a visit to the site to explore the possibility of utilizing a tram instead of trucks to transport the tailings to Bodo. POMA, which is primarily known for its ski lifts, has a division which provides services to mineral/metallurgical industries. The representative indicated that the use of a tram could significantly reduce the

6.3 project time and would also be considerably less expensive than trucking. The use of a tram would most certainly minimize health risks which could be incurred by truck mishaps and transport. The contact person from the POMA Corporation is Mr. John Jennings, of the Grand Junction office. He can be reached at (303) 241-4442.

6.4.1 4. On page 220, the DEIS states that the <u>specific engineering details to prevent erosion</u> of the <u>stabilized piles from the advancement and migration to existing drainage channels have not been developed</u>, and that whatever these measures are <u>determined to be, they will increase the estimated costs of Alternative No. 3</u>. <u>This technical information and additional costs need to be provided</u> not only in the FEIS but as part of the "midway information process".

C. <u>Alternative No. 4: Long Hollow</u>

6.8.2 1. Has the source for uncontaminated water for use at the Long Hollow site been determined? Because this water would be trucked to the site, how does this affect the estimated number of truck trips for Alternatives 4 and 5?

6.15 2. Due to inaccessibility of the Long Hollow site, the following data has been assumed to be the same as the Bodo Canyon site, eight miles away: wind speed and direction, air stability, water quality, probable maximum precipitation, existing radionuclides, total suspended particulates. This information must be provided in the FEIS based on "site specific data" for the Long Hollow site.

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6.20.3 3. The duration of time needed to truck the tailings to this location is too long and would result in greater health risks, potential for trucking mishaps, and would impact the local community in the area.

D. <u>Alternative No. 5: Long Hollow/Reprocessing</u>

6.20.3 1. If work on Alternative No. 5 is to occur during only five months of the year, then the amount of time to be devoted to this alternative is far too long considering the health risks, which are highest in this alternative, and potential for transportation problems and related highway hazards, greater costs and local population affected.

6.7.1 2. There is a considerable amount of data lacking with respect to the ground water situation at Long Hollow. The FEIS must address all of the deficient sections of the DEIS, particularly with respect to the ability of the interception ditch and underdrains to meet the longevity requirements of UMTRCA.

6.20.3 3. If the main reason for selecting this alternative as the preferred alternative is to obtain an economic return, then the government should pay the owners of the pile and allow the project to proceed in the least costly and most safe and efficient manner.

6.20.3 4. From the selection of this as the preferred alternative, one could easily find it quite obvious that the DOE and NRC do not care about Durango, its citizens, their health or the costs, as this preferred alternative has the greatest impacts associated with it and is the most costly.

6.14 5. The economic viability of reprocessing the vanadium and uranium is questionable and to date we are under the impression that no corporations have come forth to claim an interest in this boondoggle. Why then has the DOE made this a primary concern and why did it select this as a preferred alternative?

6.8.1 6. The reprocessing will involve using already contaminated equipment from Naturita as well as the transportation of thousands of gallons of acids and hazardous chemicals. What provisions will DOE take (please specify in detail) to insure that the local population will not be affected by the transport and use of these materials?

6.15 7. There is a considerable amount of data missing with respect to this alternative, <u>i.e.</u>, wind speed and direction, existing radionuclides, existing vegetation, air stability, probable maximum precipitation event, engineering costs and total suspended particulates. Please provide detailed information in the FEIS on all of the above mentioned items, for this specific site.

PRESS RELEASE

The Citizens Concerned About Moving the Pile (CCAMP) has completed their survey of pulic opinion on the tailings pile. The door-to-door survey interviewed 506 local residents. Stabilization in place was the prefered alternative of 69% of the people and was chosen by a margin of more than six to one over any other alternative.

The survey also asked people to rank the importance of several concerns. Three were chosen as being the most important:
> To minimize the release of radioactive dust and gasses;
> To avoid contaminating another site or watershed; and
> To minimize contamination of ground water.
Five others were chosen as being important but secondary:
> To clean up all the vicinity properties;
> To minimize the effects on wildlife;
> To Minimize heavy truck traffic on local roads;
> To minimize total project costs; and
> To protect the tailing against possible flooding.
Two of the concerns were ranked as not important:
> To recover the residual uranium and vanadium: and
> To remove the tailings from the view of Durango and its tourists.

People had difficulty ranking two concerns. They felt they were not sufficiently well informed about the vicinity properties to make a good judgement; in particular they wanted more information on the extent of contamination and the methods which would be used for the clean up. Many people also felt that the current location of the pile is not in any significant danger of flooding and that, while flood protection may be important in the abstract, it should not be a concern for this project.

About 74% of the people interviewed were familiar with the five proposed alternatives. Those who were not were given a brief description before being asked to chose a best alternative. The results for this group were tallied seperately and showed 67% favoring stabilization in place. This shows that the description did not introduce a significant bais into the survey.

The preferred alternative was correlated against occupation, length of residence in the county, whether or not there were children in the home, and general location of residence. For all groups, stabilization in place was the prefered alternative by a margin of at least three to one.

A complete list of comments is being compiled and will be sent to the Department of Energy. Some that were heard frequently included:
> Length of project should be minimized, one summer of dust is tolerable, but year after year is not. Several people would leave town if the pile is to be moved.
> Concern was expressed for the safety of the workers.
> Stabilization in place should be done by moving as little of the pile as possible, perhaps by using clean dirt to recontour the pile.

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> Ranchers' Exploration and Devolopement should have been allowed to reprocess several years ago.

The statistical error for the survey is about 5 percentage points.

For more information call: Dr. Paul Bendt, 598-3473.

CCAMP Survey on the Durango Uranium Mill Tailings Pile.

This is a list of some concerns which have been expressed by local residents. Please rank the importance of each one on a scale of 1-6.

1 = should not even be considered.
2 = not important.
3 = should be considered.
4 = important.
5 = very important.
6 = the most important one or two.

How important is it to ...

1. [ ] Minimize the release of radioactive dust and gasses.
2. [ ] Clean up all the vicinity sites.
3. [ ] Minimize the effects on wildlife.
4. [ ] Recover the residual uranium and vanadium.
5. [ ] Avoid contaminating another site or watershed.
6. [ ] Remove the tailings from the view of Durango and its tourists.
7. [ ] Minimize heavy truck traffic on local roads.
8. [ ] Minimize contamination of ground water.
9. [ ] Minimize total project costs.
10. [ ] Protect the tailings against possible flooding.

11. What other concerns do you feel need to be considered?

12. Are you familiar with the five alternatives the Department of Energy has presented for dealing with the tailings? [] Yes. [] No. (If not, the surveyor will give a short decription of each one.)

13. Which alternative do you feel would be best?
[] #1 No action.
[] #2 "Stabilization in place" (reshape and bury where it is).
[] #3 "Stabilization at Bodo Canyon" (truck to Bodo and bury there).
[] #4 "Stabilization at Long Hollow" (truck to LH and bury there).
[] #5 "Reprocess at Long Hollow" (truck to LH, process, and bury).

14. Which alternative do you feel would be worst?
[] #1. [] #2. [] #3. [] #4. [] #5.

15. What action do you feel would be better than any of the Department of Energy's alternatives?

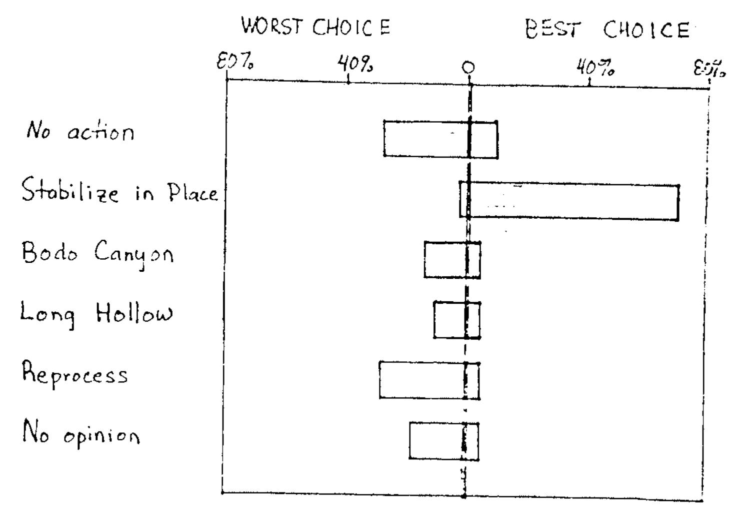
The following optional information would be useful to us.

16. What is your occupation?
[] 1. Tourism, including motels, resturants, gift shops.
[] 2. Retail trade.
[] 3. Professional services.
[] 4. Student.
[] 5. Goverment (local, state, federal, FLC).
[] 6. Agriculture.
[] 7. Investor.
[] 8. Care of home, children, or elderly.
[] 9. Retired.
[] 10. Other.

17. How many years have you lived in La Plata County?

18. Do you have young children living with you? [] Yes. [] No.

19. Do you have any comments you would like to pass on to the



Choice of alternatives

	Best alternative #	Best alternative %	Worst alternative #	Worst alternative %
No action	53	10	142	28
SIP	348	69	9	2
Bodo Canyon	24	5	73	14
Long Hollow	27	5	50	10
Reprocess	27	5	143	28
No opinion	27	5	89	18

Importance of Concerns (by number of respondents)

Question	no opinion*	should not be considered	not important	should be considered	important	very important	most important
1	65	2	25	34	59	172	149
2	80	5	37	84	115	145	40
3	72	10	39	71	117	155	42
4	79	96	143	104	43	35	6
5	72	3	15	12	68	219	117
6	73	144	154	78	29	22	6
7	72	19	65	111	111	116	12
8	90**	0	9	22	57	180	148
9	70	20	46	111	139	105	15
10	75	12	50	51	98	195	25

* Includes 61 people who did not have time for the full survey.
** Includes 28 people surveyed with a preliminary version not having question 8.

Importance of Concerns (by percent of those expressing an opinion)

Question	should not be considered	not important	should be considered	important	very important	most important
1	<1	6	8	13	39	34
2	1	9	20	27	34	9
3	2	9	16	27	36	10
4	22	33	24	10	8	1
5	<1	3	3	16	50	27
6	33	36	18	7	5	1
7	4	15	26	26	27	3
8	0	2	5	14	43	36
9	5	11	25	32	24	3
10	3	12	12	23	45	6

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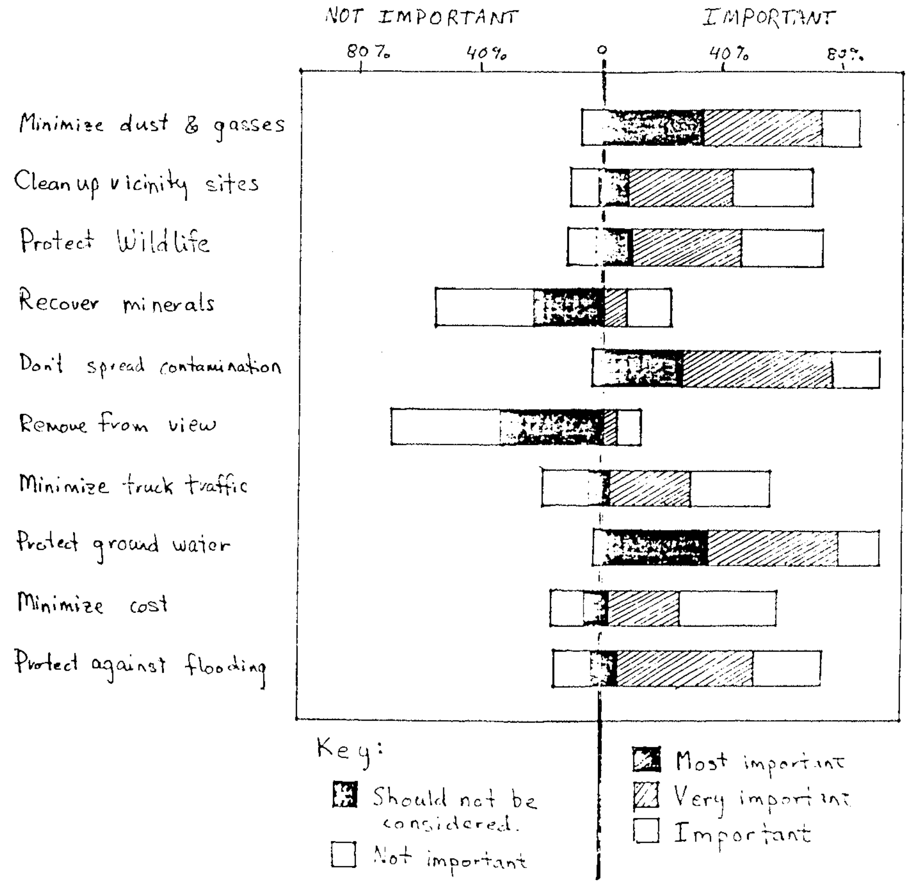

This is a list of comments received while conducting the CCAMP survey. They do not necessarily reflect the position of CCAMP nor the opinions of its members. The number of people making a comment is shown in parentheses.

Question 11: Additional concerns.

(6) Concern over health effects.
(5) Concern over the length of time we will have to put up with the process of moving the pile.
(4) Concern for the radiological and industrial safety of the workers.
(3) Concern over the dangers of moving it.
(3) Concern that no dust be released during moving the pile.
(2) Concern that the pile not be forgotten and misused in distant future.
(2) Concern about safety.
Concern that people living near Bodo and Long Hollow don't want it.
Concern that Long Hollow will recieve many more people as Durango grows.
Concern for people downstream of the sites.
Concern that we do not offend The Nature Concervancy.
Concern over surface erosion caused by heavy rain.
Concern over economic impacts.
Concern regarding transportation method, esp. the radioactive dust generated by loading/unloading trucks.
Concern re. alt. 5 that Ranchers' plan used excessive ground water.
Concern that tourists won't stop in Durango if they see the pile being moved.
Concern for the interests of the pile owners.
Concern about airborne contamination in downtown area.
We should be equally concerned about other radiation sources.
Concern that land be reclaimed after remedial action.
Infusion of funds should not be considered as a benifit.
Concern over vicinity site effects on children.
Concern that doing anything will only make it worse.
Concern over long term maintenance problems.

Question 15: Better alternatives.

(22) SIP without disturbing the pile at all.
(21) SIP with vegatation.
(7) Store in old mineshafts.
(7) Use a conveyor if going to Bodo.
(6) Transport by slurry pipeline.
(5) SIP and divert the river to prevent erosion.
(4) Short term: SIP, long term: wait for safer technology.
(4) Use thicker earth cover.
(4) Reprocess without moving the piles.
(3) SIP with some flood-proof barrier.
(3) Should be moved, but not sure where to.
(3) Send pile into space.
(3) A version of SIP which is cheaper and less extensive than #2.
(3) Wait for a safer technology.
(2) Cover with concrete as it is.
(2) Make it into a monument for tourists to admire.
(2) Find a more geologically stable site than those under consideration.

Move to Washington DC (6);
a desert out of Colorado (3);
out of area completely (3);
Arizona;
Texas;
Utah;
DOE office in Denver;
a national repository.
SIP with erosion protection.
SIP with clay underneath.
Put pilings in river to deflect water away from site.
Stabilize at raffinate ponds site.
The pile should never have been allowed to be made.
Completely decontaminate the tailings.
Plant more grass, but no other action.
Wish we could just make the piles evaporate.
Leave the decision to experts.
Mix with water and lime before trucking to reduce dust.
Cover by blasting Smelter mountain down over the pile.
Let 5 tons per day wash down the river to New Mexico.
Wait till its is economical to reprocess.

Question 19: Comments.

(62) Moving the pile (anywhere) is unacceptable.
(14) Pile has been there too long already, get clean up done quickly.
(9) Local input should determine final decision.
(8) Do it right the first time.
(7) Ranchers' should have been allowed to reprocess.
(7) Disposal problems should have been considered before making pile.
(6) I would leave Durango if the pile is to be moved.
(6) Conduct extensive studies of the health effects, esp vicinity sites.
(5) The pile is not hurting anybody and needs no attention.
(4) The exsisting grass cover helps a lot and should not be distrubed.
(4) We want better information through the local media.
(4) Quit lying, tell us the truth about what's going on.
(4) Trucking should not be used to transport the pile.
(3) I believe people are seriously affected by the piles.
(3) Do not use CR 141, build a parallel road if going to Long Hollow.
(3) We need more information re. vicinity properties. Make list public.
(2) Too much money is being spent on the project.
(2) Less government involvement is best.
"You can't just put it somewhere and feel good about it."
Dust generated by moving it is unacceptable.
Don't make the contamination worse than it already is.
It is stupid to move the pile.
DOE has overestimated flood hazard, underestimated hazards of moving.
Don't open Pandora's box by trying to move pile.
If SIP can be made to work, it would be best (from person who chose #3).
None of the alternatives are acceptable.
There is no acceptable place to move it to.
Which experts do we listen to?
Would favor reprocessing by private industry but not by government.
Get rid of nuclear energy and bombs completely.
Don't move until we have complete studies on WHO gets the dust.

Many VCA workers say there is very dangerous stuff inside the piles.
The money would be better spent reducing the national debt.
If it is just buried, it will come back to haunt us in 200 years.
It will benefit Durango to have the existing site cleaned up.
The pile should be reprocessed only if profitable.
The pile is good for keeping new people from moving into the area.
Tell the world about the tailings pile and let it become a lesson.
I believe it is possible to do SIP right.
Don't do anything, more dust would be inevitable.
Land value is less important than hazards of moving.
My grandparent have already paid with health effects, don't make my children pay too.
We have plenty of elk and Bodo is not a major wintering ground.
Move it anywhere and shut up about it.
Save it for its historic value.
PMF is too rare to worry about at current site.
We trust DOE to make the right choice.
Don't put it where there will be future development.
Watch the cost!
Be careful!
Should not use wildlife refuge or private land.
Don't rush into it; do more research.
We need independent monitoring of radiation.
What good does it do to bring in outside experts?
In the long run, moving does not help.
If moved, it should go somewhere which is already contaminated.
What ever dirt they bring in will be just as radioactive.
DOE should consider long term solution as more important the immediate local interests.

February 22, 1985

San Juan Audubon Society
James G. Erickson, President
400 Oakcrest Drive
Durango, Colorado 81301

John G. Themelis, Project Manager
Uranium Mill Tailings Project Office
U.S. Department of Energy
5301 Central Avenue, NE, Suite 1700
Albuquerque, NM 87108

Dear Mr. Themelis:

Following are the comments of the San Juan Audubon Society on the Draft Environmental Impact Statement (DEIS) on remedial actions for the uranium mill tailings at Durango. The San Juan Audubon Society is the local chapter of the National Audubon Society for the Durango area. Our primary concern is the conservation of wildlife and wildlife habitat, and the following comments are addressed to this issue.

6.11 On pages 72-74 of Volume I of the DEIS, mention is made of a wildlife mitigation plan to be developed which may include land replacement, food replacement, and fencing. The text implies that such a wildlife mitigation plan would be implemented only if alternative 3, burial at Bodo, is chosen. Since all four of the alternatives 2, 3, 4, and 5 have impacts on the Bodo Canyon Wildlife Area we feel it is imperative that there be wildlife mitigation plans for all of these alternatives spelled out in the final E.I.S. We would like to see specific details of these wildlife mitigation plans as part of the final E.I.S. We strongly advocate land replacement as the means of mitigating any loss, short-term or long-term, of wildlife habitat. If by food replacement some type of artificial feeding program is meant, we point out that this is highly inappropriate from a wildlife biologist's perspective.

6.11 We would like to point out that, due to the development of residential real estate, the area available to both game and non-game wildlife species in La Plata County is threatened with severe shrinkage. Particularly acute is the loss of winter range for deer and elk which is precisely the type of habitat disturbed by all of the proposed tailings pile alternatives.

6.11 In assessing the impact on wildlife of any of the tailings pile action alternatives, we feel that the effects of road construction and truck traffic need to be considered as much as activity at the burial or borrow sites. Wildlife will be disturbed throughout the area within sight of the County Road 211 transportation corridor. The areas impacted may be hundreds of acres, particularly with continuous truck traffic to and from Long Hollow. Our group took a tour of the Bodo Canyon borrow area and the proposed Bodo Area E disposal site on February 9th. Thirteen elk were observed on a ridge within a few hundred yards of the Area E site. The presence of our vehicles on the road a quarter mile from the elk disturbed them so that they moved away. Repeated stress of this nature on elk, and on mule deer which are present in the area year-round, could cause reduced survival of young or complete abandonment of impacted areas.

6.17 Much of the B.L.M. and U.S. Forest Service land in southwestern Colorado is managed under the "multiple use" policy which does not necessarily give priority to the conservation of wildlife. Therefore the relatively limited areas which we have which are dedicated to wildlife conservation are all the more valuable. The wildlife and the natural beauty of southwestern Colorado are national resources which are heavily utilized by tourists and hunters from all over the United States. This is a vital element in the economy of Durango and the surrounding area.

6.17 The local manager for the Colorado Division of Wildlife has stated that he expects the necessity for reduction of deer and elk herds--by means of harvesting through hunting--to arise in the near future due to loss of winter range to real estate development in previously unpopulated areas. Therefore the urgency of full and appropriate mitigation of any impact on wildlife from the tailings actions increases. The fact that all the land in the Bodo Canyon Wildlife Area was given to the state with the legal restriction (by the Nature Conservancy) that it be used exclusively for wildlife habitat is also significant. This will certainly be a factor in the land acquisition process, and development of suitable wildlife mitigation plans will be necessary.

Sincerely,

James G. Erickson

James G. Erickson, PhD., President
San Juan Audubon Society

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Feb. 23, 1985
Box 650
Boulder Co 80306

To: UMTRAR

From: Citizens for Safe Tailings Management

Regarding DEIS - Durango Mill Tailings Pile

There are two areas that are unclear:

6.4.1 (1) Will the dust dispersal from the mill tailings site be watered?

6.10.3 (2) Worker radiation exposure - What equipment will be used to reduce worker radiation exposure?

Sincerely,
[illegible]
CSTM

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Tamara G. Wiggans
P.O. Box 3086
Durango, CO 81301

Feb. 21, 1985

Mr. James A. Morley
Project Manager
Uranium Mill Tailings
Remedial Action Project
U.S. Dept. of Energy
Albuquerque Operations Office
5301 Central Ave. N.E.
Suite 1700
Albuquerque, New Mexico 87108

Dear Mr. Morley:

6.20.3 I would like to support the "Stabilize In Place" Alternative in regards to DOE's proposed remedial action on Durango's Uranium Tailings Pile.

We locals don't enjoy looking at the pile, and our tourists probably consider it an eyesore as well, but moving or reprocessing it is likely to release more excess radon gas than stabilizing in place, and that's what we're all trying to avoid.

6.20.3 I understand that the two Long Hollow alternatives have met with overwhelming public opposition but I would like to express my opposition to the

- over -

Bodo Canyon alternative since it is a Wildlife Area. The Wildlife in La Plata County is already suffering from loss of habitat, especially wintering
6.11 grounds, due to rural development and construction. We need to give as much space as possible to these animals, which are valuable natural resources.

Stabilizing in Place is cheaper, quicker,
6.20.3 would require less water, would release less fugitive dust, and would seemingly result in
598 fewer excess cancers from radon gas.

If precautions can be taken to ensure that in the future, the Animas River won't be contaminated by a freak flood that might reach the pile, then I don't see why DOE doesn't go with Stabilizing in Place.

One complaint: it irks me that taxpayers have to pay millions of dollars to move this pile or stabilize it now, when the government has known for years how dangerous radon gas is, yet continued to mine and pile up the waste near towns across the Western Slope and Four Corners states in general.

It would've been a lot cheaper and safer to have dealt with the problem at the time of mining and smelting, than now.

- over -

I hope DOE will learn from the past's "sweeping under the rug" mentality, and apply it to our present high level nuclear waste problem. Until you find a way to diffuse the devastatingly dangerous radiation present in waste from nuclear power plants (and defence operations), I suggest you find and promote energy alternatives like many of us here in Durango are actively using, such as conservation and renewable energy sources, which are cheaper, simpler, less dangerous and less vulnerable to sabotage and human error.

Even though a lot of money has already been spent on research and study, I don't feel like all the homework has been done. Please make sure your department is thorough. We love Durango and don't want to see it ruined by an accident or mistake in judgement caused by cutting corners.

Thank you For the Chance To Comment.

Sincerely,

Tamara Wiggans

Tim LaFrance
ATTORNEY AT LAW

February 21, 1985

Mr. John Themelis, Manager
Uranium Mill Tailings Project
United States Department of Energy
5302 Central Avenue N.E., Suite 1700
Albuquerque, New Mexico 87108

Re: DEIS - Task Force Comments

Dear Mr. Themelis:

In addition to the official comments of the Durango Uranium Mill Tailings Task Force that were submitted to you by letter dated January 7, 1985 and the oral comments submitted on behalf of the Task Force by Mr. Harold Steinhoff on December 18, 1984, the Task Force has the following supplemental comments and questions on the DEIS which should be addressed in the final EIS:

1. Radon Monitoring.

6.10.1 Page 218 of the DEIS sets forth standards for off-site radon levels that will be monitored during remedial action. On January 30 at a public meeting it was stated by the DOE or one of its contractors that the remedial action contractor must comply with a weekly radon emission standard (as opposed to a 26-week or 52-week standard) of 3 pico curies per liter. Please confirm this more stringent standard in the final EIS, and please state whether the Task Force or its designee can be advised, on a daily basis, of the radon levels as detected by the monitoring program.

2. Decontamination of Site.

6.2 With respect to decontaminating the present site of the tailings and the raffinate ponds area in the event that the tailings are moved, please advise the Task Force of the amount of additional cost and additional cover that would be required by using the more stringent state radiation standards for remedial action at the reclaimed pile site.

3. Inside Smelter Mountain.

6.3 Is there room inside Smelter Mountain (which has been mined and is adjacent to the pile) for disposal of the tailings and other contaminated material? Please specifically describe all feasibility studies addressing the

possibility of disposal inside Smelter Mountain. If no such studies have been performed, please perform and report on same in the final EIS.

4. Stream-Fishery.

6.4.2 What additional mitigation measures can be taken to avoid or decrease siltation and stream loading which adversely affect the fishery downstream from the pile (DEIS, Page 209)?

5. Amount of Tailings/Alluvium.

6.6.1 Will the Bodo Site accommodate increased quantities of tailings and contaminated material in the event that DOE has underestimated the amount of tailings in the pile (e.g. a lower alluvium line) by 25% or 50%?

6. Cultural Resource Sites.

6.16 What specific mitigation measures will be taken with respect to affected cultural resource sites at Bodo?

7. Ridges Basin Fault.

6.6.3 Is there any possibility of any contaminants reaching the proposed Animas-LaPlata Ridges Basin Reservoir through the Ridges Basin Fault or any other faults in the event of seismic activity? Is it possible for contaminated ground water from the Bodo Site to leach into the proposed Ridges Basin Reservoir with or without seismic activity?

8. Leaching From Landscaped Surface.

6.5.2 In the event that the tailings are stabilized in place by using an alternative engineering design which permits landscaping and beautifying the pile, please describe any possible dangers to ground water contamination by virtue of precipitation or watering of the landscaped surface which may result in the leaching of contaminated materials into the water table.

9. Governmental Permit Process.

6.20.3 What is the time frame for any required permit from the Corps of Engineers or any other state or federal agency which must approve any aspect of the tailings disposal?

10. Responsiveness Summary/Governmental Comments.

6.20.1 The Tailings Task Force would like to have access to and copies of the "Responsiveness Summary" for both the DEIS and the FEIS as soon as they are prepared. In addition, we would like to receive copies of the comments submitted by all federal, state and local agencies/departments.

11. Transportation Alternatives.

6.3 The DEIS states that various transportation alternatives were rejected (such as transportation of the contaminated materials by conveyors or slurry pipeline) because of high environmental and economic impacts. The Task Force is aware of the availability of some alternative transportation methods, such as the tram concept set out by the POMA of America , Inc. in a letter to Mr. Themelis dated February 14, 1985, which may be both environmentally and economically competitive with the truck transport method currently proposed. The Task Force thus requests that the DOE seriously and thoroughly investigate the variety of alternative transport technologies that appear to be practical and available, including the tram concept.

12. Erosion Control/Revegetation Issues.

6.3 The Task Force is aware that there may be a variety of options available with respect to alternative technologies concerning the "Stabilization in Place" alternative. Specifcally, we have been informed that there are a variety of alternatives to grouted rip rap and concrete that might be able to be utilized with this alternative. There do exist biodegradable concrete mesh forms which can be used in conjunction with an erosion control/revegetation mat. Examples of these products include Fabriform and Enkamat. While we ourselves are not familiar with the details of these alternative technologies (such as their life span, maintenance methods, etc.), we believe they do exist as viable areas for DOE to investigate in its effort to come up with acceptable well-thought-out means of stabilization in place, even if they are "state of the art" technologies which your staff may not as yet be aware of.

13. Vicinity Properties Issues.

6.18 The Task Force believes that the information provided in the DEIS, specifically in Appendix B, is insufficient. There exists a great deal of confusion and misinformation

6.18 within the community about the vicinity properties, and we believe that such confusion exists because there has not been enough emphasis placed upon the issue by DOE.

Specifically, we believe that the following information ought to be provided:

6.18 a. A description of the problem of radon gas in society in general;

6.18 b. What the problem is with radon gas at the Durango community's vicinity properties;

6.18 c. A list and description of the historical radiation surveys that have been conducted in this community, what level of efficacy they achieved, and how their results were utilized;

6.18 d. A description of the process that will be used in addressing the vicinity property question (i.e. describe the various steps that a vicinity property goes through from initial survey to completed remedial action);

6.18 e. How the DOE intends to guarantee that all contaminated properties in the community will be identified and addressed (e.g. if, as is evidently the case, there are properties such as the swimming pol that are not on the list of vicinity properties, at what point in time can the Task Force be guaranteed that the area has been thoroughly surveyed and that no properties not on the list are contaminated?);

6.18 f. An identification of all the actors (e.g. federal agencies, state agencies, private sub-contractors, local entities if applicable) who are or will be involved in the vicinity properties clean-up and what their respective roles are to be;

6.18 g. A thorough description of what the time-frame involved is (or should be) for the various steps in the vicinity properties program--this could be best addressed through use of a Critical Path Method (CPM) exposition.

We are aware of the Colorado Department of Health's participatory role in the vicinity properties issue and the local Task Force, in conjunction with City of Durango staff and San Juan Basin Health Unit staff, intends to work closely with the State staff to clarify the process and identify

February 21, 1985
Mr. John Themelis, Manager
Urnaium Mill Tailings Project
United States Department of Energy
Page 5

the steps needed to insure that the vicinity properties program proceeds with as great an understanding and emphasis as possible. Nonetheless, we believe the DOE has many answers to the questions above that will prove beneficial to the overall understanding of the issue and to the successful resolution of the problem. We therefore ask that you address each of the above points as part of the EIS process and that you provide the responses in a timely fashion.

6.18 Also, we re-emphasize our position that the vicinity properties program shall be concluded prior to or simultaneous with the conclusion of the remedial action on the tailings pile.

14. Compensation to Owner.

6.17 Attached to these comments is a letter from Hecla Mining Company dated February 14, 1985. We expect that the owners of the pile will be treated fairly.

15. Community Comments.

We have received the attached comment from James C. Bruvold, Mechanical Engineer, and we urge that you address his concerns as well as the other concerns of the overall Durango community.

Finally, it is the strong desire of the Task Force that it receive information on all of its comments and questions as that information is developed - that is, prior to the official publication of the final EIS.

Very truly yours,

Timothy LaFrance

Timothy A. LaFrance
Chairman of the Task Force

TAL/eb

Hecla Mining Company

February 14, 1985

FEB 19 1985

Mr. Tim LaFrance, Chairman
Uranium Mill Tailings Task Force
P. O. Box 2624
Durango, Colorado 81302

Dear Tim:

It was a pleasure to be included in the activities of the task force last week. I appreciated the time you took to introduce me to the task force members and to inform me of the current status of things.

As I mentioned earlier, Hecla Mining Company, as a task force member, is concerned that its interests are represented in the comments that the task force submits to the U.S. Department of Energy regarding the remedial action to be taken on Hecla's tailings. I have drafted the following statement to this end and suggest the task force include it in our comments to the DOE.

> "The task force acknowledges that it is imperative that the property owners involved in the DOE remedial action are treated fairly regardless of the alternative chosen for the Durango tailings. The task force expects the property owners involved to be adequately compensation for lost business opportunities which will include the payment of market value for any property that is acquired by the state or federal governments during the stabilization process."

I appreciate the opportunity to provide this input and look forward to meeting with you again.

Very truly yours,

John J. Valiquette

John J. Valiquette
Administrative Assistant
to the President

JJV sk
cc: W. A. Griffith
M. B. White

602

13 Feb., 1985

John G. Themelis, Project Mgr.
D.O.E.
Uranium Mill Tailings Project Office
5301 Central Ave. N.E.
Albuquerque, N.M. 87108

Dear Mr. Themelis:

6.20.1 As a professional civil engineer & concerned citizen of Durango, Colorado; I wish to make it known that my assessment of the Durango mill tailing project would be to stabilize in place. This method would disrupt our community for the least amount of time & would incur the least amount of total deaths (radiation & construction related).

6.20.3 There has been concern from some people in regards to the P.M.F. storm on the Animas River. If that flood would ever occur at the flows stated in the E.I.S., the least worry would be the tailings pile. Durango would be destroyed.

Thank you, Bruce A. Honisch
Bruce Honisch.

Numbers 521 - 548 are assigned to statements given at the Public Hearing in Durango December 18, 1984

Tim LaFrance
ATTORNEY AT LAW

January 10, 1985

Mr. John Themelis, Manager
Uranium Mill Tailings Project Office
U. S. Department of Energy
5301 Central Avenue NE, Suite 1700
Albuquerque, New Mexico 87108

Re: DEIS, Comments and Questions

Dear Mr. Themelis:

I have the following individual comments and questions concerning the DEIS treatment of the mill tailings pile in Durango. Since these comments and questions were formulated after the last Task Force meeting, they have not been presented to or approved by the Task Force and they remain at this point my individual comments and questions.

1. In terms of monitoring off-site radon levels during remedial action (see Page 218 of DEIS), please advise: (1) what is the lowest possible radon level that can be imposed upon the RAC for a one week period (as opposed to 26 and 52 weeks), and (2) whether the Task Force or its designee can be advised, on a daily basis, of the radon levels as detected by the monitoring program.

2. With respect to the use of state radiation standards which are more stringent than DOE standards by a factor of 10, please advise the Task Force of what implementation of the state standards would mean in terms of: (a) increased financial costs; (b) the amount of additional cover; and (c) long term health benefits for Alternatives 2 and 3. What are the costs and benefits of using state standards only at the reclaimed pile site?

3. What additional mitigation measures can be taken to avoid or decrease siltation and stream loading which adversely affect the fishery downstream from the pile (DEIS, p. 209)?

The following questions and comments pertain to Alternative 3 only the Bodo Canyon Alternative.

6.6.3 4. Is there any possibility of any contaminants reaching the proposed Animas-La Plata Ridges Basin Reservoir through the Ridges Basin Fault or any other fault in the event of seismic activity? Is it possible for contaminated groundwater from the Bodo site to leach into the proposed Ridges Basin Reservoir with or without seismic activity?

6.6.1 5. Will the Bodo site accommodate increased quantities of tailings in the event that DOE has underestimated the amount of tailings in the pile (e.g. a lower alluvium line) by 25% or 50%?

6.16 6. What specific mitigation measures will be taken with regard to affected cultural resource sites at Bodo?

Thank you for your consideration of the foregoing comments and questions. I look forward to receiving your answers to same.

Very truly yours,

Tim LaFrance

Tim LaFrance

TAL/mn

RICK LANE & CO.

Real Estate Brokerage

2051 Main Avenue Durango, Colorado 81301

Bus. (303) 259-1786

February 14, 1985

U.S. Dept. of Energy
Albuquerque Operation Office
Office of Public Affairs
Post Office Box 5400
Albuquerque, New Mexico 87115

Dear Sirs,

I'm concerned about the planned remedial action in regard to the clean up of the radioactive mill tailings from the uranium mill tailings site in Durango, Colorado.

My concerns are both health and economic in nature.

6.20.3 It is obvious the least amount of dust and disturbance created will be best for residents of Durango and our guests who visit Durango throughout the year. Also the shortest time possible which is necessary to mitigate the danger of the piles is highly desired.

Congress has mandated the D.O.E. to act and to take into consideration "cost effectiveness."

6.17 I am concerned that what might appear to be cost effective as far as the project itself is concerned may be detrimental to our tourist industry.

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Clean up of the radioactive mill tailings

550 25 Ton truck trips per day as an example; (Alternative #3) well within view of our train depot, restaurants, hotels, and new Chamber of Commerce building and park, will undoubtedly have a significant negative impact to our trade.

6.17 I've enclosed graphs, published by the Durango Herald 2-10-85, reflecting the significant amount of tourists visiting our area, which is the vital life blood for our community's economic well being.

I feel more study is necessary for engineering alternatives other than the five represented in the Draft E.I.S. in order to be as protective as possible of the health and welfare of our community both physical and economic.

As an example; a broader and more far reaching approach to actual stabilization on site is demanded by all of Durango I'm sure.

6.3 A recent visit by Poma Corp's Grand Junction Engineer John Jennings, indicates that a Tram application deserves great consideration for the following reasons:

1. Most environmentally compatible technology available for transporting material such as the tailings
2. Less dust
3. No need for building a new 35' wide road
4. No truck trips between mill site and burial site
5. No exposure to truck drivers to material
6. No risk of vehicle accidents

550

Page III

Clean up of the radioactive mill tailings

7. No emissions from diesel trucks

8. Two operators are necessary to operate a tram vs. many truck drivers

9. Tram can operate 24 hours a day, year round, consequently less time would be needed for completion.

10. Could be shut down during tourist season.

11. Tram can be dismantled with no damage left to the terrain

12. Potential resale or re-application to other sites possible

13. Far less disturbance and negative impact to our tourist trade

14. Probable less costs

15. Most sophisticated technology available which is what the Durango community should expect and deserve

Gentlemen, I'm sure the D.O.E. is concerned with Durango's unique problems and will serve us well in their approach to a matter that is of great concern to all.

Sincere Regards,

Rick Lane

Rick ~~Lane~~

RL/sj

enclosures

cc: Durango Tailing Task Force, C.C.A.M.P., Durango Herald, and the Today Paper

-8-

MONOCABLE AERIAL TRAMWAY CHARACTERIC :

Design Capacity :	400 Ton/Hr (800,000 LBS/HR) 8300 CFT/Hr
Design speed :	980 FT/Min (5 M/Second)
Nominal Capacity :	360 Ton/Hr 7200 CFT/Hr
Nominal Speed :	885 FT/Min (4,5 M/Second)
Material to be hauled :	Coal refuse (103 LB/CF)
Length of line :	3900 FT (1200 M)
Vertical rise :	1030 FT (314 M)
Max rope slope (cord) :	50 %
Max terrain slope :	49 %
Wire rope	
- construction :	LANG LAY WARRINGTON SEAL (6 x [illegible]
- diameter :	5/8 (42 mm)
- Breaking strength :	246,000 LBS (112 Tons)
Drive (top terminal) :	Direct Current S.C.R Controlled Variable speed
Gear reducer :	Kissling, Simetra Flender or equivalent
Electric power installed :	600 KW
Power required	
- At 395 Tons/Hr	505 KW
- At 360 TOns/Hr	455 KW
Back-up engine :	Detroit Diesel (transmission-torque converter)
Back-up fully loaded line speed :	350 -450 FT/min. (1,75 to [illegible] M/Second)
Tension (bottom terminal)	
- Two hydraulic rams :	32 Tons (64000 LBS)
Conveyor chains	
- Downhill terminal :	Carrier transfer = spacer [illegible]
- Drive :	By the bullwheel
- Uphill terminal :	Carrier transfer
- Drive	By main drive unit

6.3 605

Colorado Wildlife Federation

25 February 1985

Mr. John G. Themelis
Project Manager
Uranium Mill Tailings Project Office
Department of Energy
5301 Central Avenue, NE, Suite 1700
Albuquerque, New Mexico 87108

Dear Mr. Themelis:

The Colorado Wildlife Federation (CWF) is a broad based conservation organization representing 16,000 individual and affiliated members. Our goal is to conserve and defend from waste our natural resources by protecting habitat, soil and water, fostering wise management and enhancing the status of wildlife. We are the Colorado affiliate of the National Wildlife Federation.

6.11 Regarding the draft environmental impact statement on Remedial Actions at the former Vanadium Corporation of America site, Durango, Colorado, our organization has serious concern about the outlook of the Department of Energy (DOE) towards wildlife impacts and related issues. It appears that DOE regards these impacts as unimportant or trivial. Before the subject EIS can be finalized, DOE must take a serious look at the impacts on wildlife from alternatives 2,3,4 and 5. The United States government and, therefore, its taxpaying citizens, many of whom are our members, are investing a great deal of time and money into removing these tailings piles and others because the citizenry is concerned about the quality of its living environment. Wildlife and wildlife habitat are important components of that environment and its quality.

6.11 All the alternatives discussed in the EIS, except number 1, have substantial new impacts on the environment and wildlife of the Bodo Canyon area. The discussion on page 73 of Volume I of the draft EIS indicates that a mitigation plan will be prepared at some point in the future. The failure to prepare such a plan as a part of the EIS itself is indicative of DOE's apparent belief that the necessary mitigation is trivial even though one of the alternatives calls for fencing off and transferring to DOE some 41 acres of the Bodo Canyon area. Considering any meaningful mitigation for significant wildlife values as trivial is not an appropriate approach. This is a critical wildlife area and deserves full attention in a completed EIS. The EIS should include individual mitigation plans for the impacts on the Bodo Wildlife Area associated with each of the alternatives 2 through 5. Such plans should be completed in full cooperation with the Colorado Division of Wildlife.

P.O. Box 18887 Denver, CO 80218 (303) 830-2557

Letter to Mr. John G. Themelis
25 February 1985
page two

6.2 Without the suggested mitigation plans, the operations plan for the project, as well as the EIS, is incomplete. Cost estimates in the operations plan obviously cannot include costs for mitigation plans that do not exist. It appears, therefore, that DOE planners have assumed that the costs involved in the mitigation effort are small enough to be ignored. Without knowing exactly
6.9 what mitigation or enhancement will be necessary, it is unsound to make such an assumption. CWF urges DOE to immediately develop plans to mitigate and enhance the habitat in Bodo Canyon for losses incurred by the implementation of project alternatives, and include an analysis of these plans and their relative costs in the evaluation of alternatives provided by the Final EIS. The Colorado Department of Natural Resources and the public must be involved in the formation of such mitigation plans.

We sincerely appreciate your careful consideration of these comments and the opportunity to provide them to you.

Sincerely,

Reed Kelley for
Wayne Sandfort
President

607

552

2932 Holly Ave., #603
Durango, Colorado 81301
January 23, 1985

Project Manager
Uranium Mill Tailings Project Office
U.S. Department of Energy
5301 Central Ave., NE
Suite 170
Albuquerque, New Mexico 87108

Re: Tailings Disposal

Gentlemen:

6.20.1 I have been a resident of Durango, Colorado, for my entire life, fifty years, and it is with utmost urgency that I recommend to you that the tailings deposits be left where they are and not moved. I feel the damage and danger involved will far exceed the benefit of the removal of the tailings.

When hearings were held here in Durango, comments from the residents, environmentalests, etc. I spent many hours in the La Plata County Commissioners office transcribing tapes from these hearings. Apparently, no one listened. I believe that the true natives of this area are very much against the removal of these tailings. It has taken over twenty years to stabilize the pile, to at last have some sort of growth which has contained the dust, and it in the best interest of all to leave well enough alone.

Both my husband and I have had cancer, friends who have lived in the area all of their lives have had cancer, and not one of us contribute this fact to the tailings deposit here in Durango.

Please, reconsider your actions on the removal of this pile, think of the damage that will be done to the area you have selected for the new deposit site. How many years will it be before the pile is again stabilized, the damage that will be done to that area. Gentlemen, leave it alone. Thank you.

Sincerely,

Barbara L. Duncan

Barbara L. Duncan

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553

Dear Sirs:

We citizens of Durango, Colorado would like to express to you our opinions.

6.20.1 We are deeply concerned about our environment. As you know, located in the southern portion of town there is a radio active, tailing's pile. We know you have plans to clean up the pile. Also, we know you would like to reprocess the uranium. We feel this is a bad choice, moving the tailing's pile over this rough mountain road would cause many more problems than would be appreciated by the people of Durango.

6.20.1 We feel a better choice would be to stabilize the ~~pile~~ pile where it is, the reasons being that it would cost less, cause less chance of accidents, and take less time.

We feel the job should be done in the most economical, and safest way possible. We thank you for your time, and hope you will reconsider your choices in this matter.

Sincerely,

T. Zink

John Dunmore

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

FEB 13 1985

Mr. John Themelis, Project Manager
U. S. Department of Energy
Albuquerque Operations Office
Post Office Box 5400
Albuquerque, New Mexico 87115

Dear Mr. Themelis:

As mentioned in my January 11, 1985 letter to you regarding our comments on the Durango Draft Environment Impact Statement, our Denver office has also reviewed this document. Enclosed are additional NRC comments on the Durango DEIS. These additional comments continue to support our general contention that more detailed information is needed in order to adequately assess the alternatives.

If you have any questions regarding these comments, please contact me or Mark Haisfield of my staff. Mark is replacing Roger Pennifill (who has left the NRC), as project manager for the Durango site.

Sincerely,

Leo B. Higginbotham, Chief
Low-Level Waste and Uranium
Recovery Projects Branch
Division of Waste Management

Enclosure:
As stated

cc: John E. Baublitz, w/encl.

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FEB 13 1985

General Comments on the Durango DEIS

6.3

1. The objective of the DEIS is to provide a decision-making document to analyze the remedial action alternatives for the Durango site. The information provided in the DEIS should enable the reader to compare alternatives and based on that information determine the best alternative. Because different levels of data are presented for each alternative in the DEIS, it makes evaluation and decision making more difficult. Every reasonable effort should be made to provide detailed and comparable data so that comparison of alternatives is meaningful.

2. Earlier NRC comments provided on the DEIS have not been incorporated nor addressed in the DEIS. It is not clear why DOE chose not to address our past comments. If the enclosed comments, as well as those transmitted on January 11, 1985, are not seriously considered, the NRC may not be able to adequately assess whether DOE has complied with the intent of NEPA. Furthermore, this course of action can only complicate the NRC review of the RAP and could lead to significant questions at the time of licensing.

6.2

3. The appendices to the DEIS should clearly provide the technical support for the assessment of environmental impacts reached in the main body of the DEIS. The appendices, as written, provide incomplete, inaccurate, and often contradictory technical data, which prevents a clear assessment of environmental impacts. As a partial example, the following areas are deficient for all alternative sites:

   a. Technical data for surface water and ground-water hydrology.
   b. Site-specific geology, including lithology and structures.
   c. Evaluation of the impact on surface and ground-water of contamination at present or in future.
   d. Source and cost estimates for reclamation topsoil.

554

Detailed Comments on the Durango DEIS

Comments on Volume I

1) Page 88, Section 4.5.2.1:

6.5.3 What is the basis for concluding that the fault underlying the raffinate ponds is inactive?

2) Page 90, Section 4.5.2.2:

6.6.3 The "Ridges Basin Fault" is described by the authors as a "major fault" within the Bodo Canyon area. They state that it apparently dies out south of the proposed site. No data is presented to support this claim.

3) Page 98, Section 4.6.2.1:

6.5.2 The statement is made that the raffinate ponds contents are migrating downward through the fault zone towards the Point Lookout Sandstone. What is the extent of the contamination and what actions are planned to mitigate this contamination?

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4) Page 100, Section 4.6.2.3:

6.7.2 Inference made here is that contaminants could migrate through the fractured portion of the Lewis Shale; yet the data presented (10^{-9} to 10^{-6} cm/sec) indicates permeabilities similar to what would be found in unfractured and unweathered shales and claystones.

5) Page 108-9, Sections 4.8.1 and 4.8.2:

6.10.1 The DEIS states that the effect of snow cover and frozen ground would decrease the ambient Radon-222 concentration for the Bodo Canyon baseline characterization of Radon-222 levels. This statement requires documentation.

6) Page 111, Section 4.8.3:

6.10.1 Radiological monitoring data for the Long Hollow site should include airborne particulate and radon monitoring and surface soil and vegetation sampling. Particulates and radon should be monitored in at least three locations; background, onsite and downwind. Soil and vegetation should be sampled at a background and downwind location.

7) Page 208:

6.10.3 Truck Driver daily whole body exposure of 10.8 mR/d seems high as does the corresponding whole body exposure of 2.6 R/y. It is not apparent if allowances for self-absorption by the tailings materials or shielding by the truck cab were made. Provide the bases for this data.

Comments on Volume II
Appendix A

8) Page A-16, Figure A-6:
Page A-17, Figure A-7:

6.5.2 The depth to bedrock and the depth of the phreatic surface should be established, based on field observations if possible.

9) Page A-22:

6.5.3 Failure surfaces shown on Figure A-6 are both extremely shallow. Were deeper failure surfaces through the Mancos Shale evaluated?

10) Page A-31:

6.11 It is stated that the entire Bodo Canyon area has been deeded to the State of Colorado by The Nature Conservancy. In this deed has the Nature Conservancy placed any restrictions on the use of the land which could affect the reclamation of the relocated tailings?

11) Page A-39:

6.6.1 What is the basis for the 3-feet riprap layers on the perimeter embankments?

610

12) Page A-42:

6.6.1 Calculations and assumptions used in estimating PMF velocities and determining drainage channel sizing should be provided.

13) Page A-43:

6.6.1 It is stated that 3H:1V slopes were selected over flatter slopes "to avoid blocking adjacent drainages which would have required extensive diversion and/or armoring of the toes of the embankment

slopes." Discuss the specific slopes that were considered, the specific erosion protection that would be required, and the specific alignment and size of diversion channels needed.

14) Page A-43:

6.6.1 The calculation of the required cover thickness should include consideration of long term erosional processes (sheet plus wind erosion). The proposed depth of cover should consist of the thickness required to attenuate radon plus the thickness expected to be eroded over 1,000 years with an appropriate factor of safety.

15) Page A-43:

6.4.2 The discussion in Section A5.2.4 appears to be in error. Although it is true that annual evapotranspiration greatly exceeds precipitation, it is not true that the potential for infiltration is small. It is well known that in areas such as this, significant infiltration may occur during spring snow melt and periods of heavy rainfall. Therefore, the potential for the formation of leachate is much greater than is presented here. A water balance should be performed based on shorter time periods to obtain a more accurate estimate of infiltration and the formation of leachate. This comment is also applicable to the other alternative sites.

16) Page A-44:

6.6.1 Calculations and assumptions used in sizing the riprap protection should be provided.

17) Page A-44:

6.6.1 Shear strength and unit weight parameters for all materials should be specified, along with the bases for selection of the parameters. In addition, the location of critical failure surfaces should be shown on Figure A-18.

18) Page A-65:

6.4.1 Flow velocities in the diversion channels are said to be limited to 10 feet per second during PMF, and that the side slopes and channel bottoms will be vegetated to reduce the potential for erosion. Although there is insufficient data to verify the calculated velocities, it is clear that erosion will occur during a PMF and, most likely, for even lesser floods. Vegetation will help reduce erosion, but not for velocities of this order. Also, there is no evidence to support the contention that vegetation will grow in the channels. Riprap will probably be required for both the side slopes and channel bottoms.

Appendix B

19) Page B-8, paragraph 1:

6.10.2 Although a statement is presented, it is not clear how incremental doses were estimated. Also, it is not clear if the incremental doses have been added to the doses resulting from the radiological assessments made of the Durango site alternative.

20) Page B-8:

6.19 The appendix states 2 chances in 10^6 of lung cancer from whole body gamma exposure and 5.1 chances in 10^5 of cancer due to radon daughter inhalation. The text contradicts the Table B-2 (i.e., type of cancer is reversed in the text).

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Appendix D

21) General Comment:

6.10.2 Presentation of final tables of joint relative frequency distribution for each of six Pasquill stability classes to be used as input for a MILDOS run would assure the reader that a composite of Tables D-4 and D-6 were actually used.

Appendix E

22) Page E-6, Section E.1.3:

6.7.3 Other than to say that "Arbole" soils, which have limited occurrences, have characteristics that severely limit their suitability as topsoil for revegetation, there is no discussion as to the suitability of other sub-surface soils for use as topsoil. If they are not suitable, then a discussion as to the source and costs for obtaining topsoil for reclamation should be provided.

23) Page E-9, Section E.2.1:

6.4.3 The geology section has utilized regional geologic studies in order to draw conclusions on the site specific geology and provides no supporting data for those conclusions. This is inadequate. Detailed site specific studies and the specific data supporting conclusions on the geology are essential to an adequate assessment of the proposed sites.

24) Page E-10, Section E.2.1.2, third paragraph:

6.6.3 The Cliff House Sandstone is described in the beginning of the paragraph as interbedded calcareous sandstones, siltstones and silty shales. Later in the paragraph, it is discribed as a sandy shale, siltstone and shaley sandstone with the sandstone beds. An accurate description of the lithology should be provided.

25) Page E-17, Section E.2.1.3, first paragraph:

6.4.3 The northwest-trending faults between the Uncompahgre uplift and Paradox Basin are stated to have neogene displacement and are located 75 miles from Durango. This section provides no discussion of the fault parameters, the basis for stating that the faults are 75 miles from Durango, the basis for the neogene displacement or maps showing the faults' locations in relation to the site.

26) Page E-17, Section 2.1.3, second paragraph:

6.4.3 What is the basis for stating the closest approach of Rio Grande Rift is 100 miles? From Figure E-7, it appears that normal faults related to the west side of the Rio Grande uplift come as close as 50 miles from Durango.

27) Page E-17, Section 2.1.3, third paragraph:

6.4.3 What is the age of last movement on normal faults in the Durango area? Where are these faults located in relation to the site?

28) Page E-17, Section 2.1.3, fourth paragraph:

6.4.3 What is the age of last movement on Ridges Basin Fault? What is meant by "no measurable displacement" of the Cliff House Sandstone? The basis for saying the fault dies out before reaching the site is weak, the DEIS should provide additional supporting data.

29) Page E-17, Section 2.1.3, paragraph 6:

6.4.3 Where in relation to the three sites are the faults described as north of the electrical substation? What is the basis for the statement that "The faults appear to be tight, and the possibility of ground-water movement along these faults is believed to be slight."?

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30) Page E-18:

6.14 It is stated that the Bodo Canyon site is underlain by as much as 400,000 tons of potentially recoverable coal. Provide information concerning ownership of mineral rights at the site.

31) Page E-18, Section E.2.2:

6.14 This section discusses the mineral resources near the Durango, Bodo Canyon and Long Hollow sites, but does not provide maps showing the

locations of the coal mines near the Bodo Canyon site or other mineral sources.

32) Page E-23, Section 2.3.2:

6.4.3 In estimating the maximum acceleration for events on potential earthquake sources (i.e., Uncompahgre boundary fault), Schnabal and Seed, 1972 curves were used. What makes Schabal and Seed's maximum acceleration vs. distance curves superior over other available curves?

33) Page E-23, Section 2.3.2:

6.4.3 No fault parameter data is provided to support the distances used to determine the maximum acceleration.

34) Page E-23, Section E 2.3.2:

6.4.3 Docekal, 1970, discusses a seismic trend along a line from Wichita to Amarillo to the West Mountains. What impact does this seismic trend have on the analysis of seismic potential for the three sites.

35) Page E-24, Section E 2.3.3:

6.19 In the last sentence of the last paragraph, ground motion in the Range of .08 to .10 g are stated to be equivalent to a MMI VI event using Trifunic and Brady, 1975. Using Trifunac and Brady intensity vs. acceleration curves, an acceleration of .10 g is comparable to a MMI VII event rather than a MMI VI.

36) Page E-24, Section E 2.3.3:

6.4.3 This section discusses potential seismic events due to tectonic structures and regional seismicity. This section does not provide a discussion of site specific seismicity conclusions as to the maximum ground motion to be used in site design or the impact of the maximum ground motion on site design.

Appendix F

37) General Comment:

6.4.1 The estimates presented for the Bodo Canyon and Long Hollow probable maximum flood do not describe the locations of the estimates.

38) Page F-3:

6.4.1 Median soil moisture conditions were used for the calculation of PMF flows. Current NRC guidance (Staff Technical Position WM-8201, dated January 1983) states that soils over the watershed area should be assumed to be saturated, or that conditions which would reduce surface runoff should be fully justified and documented. The analysis should therefore be performed assuming saturated conditions or justification provided for the degree of saturation assumed in calculating runoff values.

39) Page F-69, F 2.2.1:

6.5.2 The statement is made that sandstone interbeds present in the Mancos Shale could provide preferential pathways for contaminant migration. At what depth do the interbeds occur? How thick are they? What are their hydraulic properties? What is the composition?

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40) Page F-69, F 2.2.1:

6.5.3 The Point Lookout Sandstone is described in this section as a shale, silty shale, and sandy shale. What are its hydraulic properties? A more detailed lithologic description should be provided.

41) Page F-83, F 2.3.1:

6.6.2 What are the intervals of the different formations from which packer tests were performed? Are these hydraulic conductivities indicative of the entire formation or, of sub-units of a larger unit? Where are the wells located that the tests were performed in?

42) Page F-70, F 2.2.3:

6.4.2 The DEIS makes inference that many of the ground-water parameters were elevated above background? What was background? How far above background were they elevated? Were State or Federal standards exceeded?

43) Page F-83, F 2.3.1:

6.6.2 Bodo Canyon unconsolidated alluvium/colluvium is stated to have hydraulic conductivities ranging from 10^{-8} to 10^{-7} cm/sec. These are low conductivities for unconsolidated materials. The bases for these values should be presented.

44) Page F-126:

6.6.2 The hydraulic conductivity for fractured shale selected for use in ground-water flow analyses is not conservative. While the value of 1 ft/yr selected is consistent with measured values for the fractured shale underlying the Long Hollow site (p. A-59), it is not consistent with the mean value of 579 ft/yr measured for fractured shales underlying the Bodo Canyon site (p. A-37). Further, hydraulic conductivities measured for the unfractured shale at the Bodo Canyon site ranged up to 160 ft/yr, with a mean value of 18 ft/yr (p. A-37). The analyses for the Bodo Canyon site should be redone utilizing a hydraulic conductivity for fractured shale which is consistent with measured values.

45) Page F-127:

6.7.2 The determination of dilution factors based on specified inflow rates does not appear correct. Calculations should be provided to show how the dilution factors were derived.

46) Table F-21 thru F-25:

6.5.2 For these tables to be meaningful, characteristics of the monitoring wells are needed. A summary table should include information such as; location, ground and measuring point elevation, diameter and type of well, depth, screened interval, bentonite seal interval, and gravel pack interval. Although this detailed information is in the April 1983 BFEC appendices, the DEIS should provide a summary table.

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Appendix H

47) Page H-2, last line of last paragraph:

6.10.2 Although acknowledged, performing radon flux calculations based on a one-time sample for tailings moisture content is weak. Perhaps including the depth at which the sample was taken could add a little information. An average of several samples from both piles at different depths would be the best approach.

48) Page H-3, Section H.1.1.2:

6.10.1 There is no reason to assume secular equilibrium of stated radionuclides in the tailings piles. Data elsewhere in the draft EIS do not support this statement.

49) Page H-5, paragraph 2:

6.10.1 The assumption of secular equilibrium of Th-230 and Ra-226 cannot be made due to a lack of information regarding the error limits.

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50) Page H-5, paragraph 3:

6.10.1 A natural uranium concentration of 206 pCi/g should be used in the calculations for determining health effects, not 103 pCi/g, as stated in the last paragraph on this page.

51) Page H-12, top paragraph:

6.10.1 It should be stated why no Pb-210 concentrations were determined.

52) Page H-38:

6.19 The reference given for the source term calculation is incorrect. The GEIS or the NRC draft Regulatory Guide on Source Term Calculations should be referenced in order to better explain how Q is determined.

53) Page H-42, last paragraph:

6.10.2 Provide a reference for the MAD of transportable particulates.

54) Page H-71, Alternate 5, second sentence:

6.10.2 Assuming a zero radon daughter dose for scooping up, transporting and dumping of tailings into leach tanks is not appropriate unless the entire process is automated with no people in residence.

55) Page H-72, top:

6.10.2 The relative contribution to dose from Pb-210 in the tailings should be addressed.

56) Page H-73:

6.10.2 Reference the 3 meter mixing height or explain it since meteorological mixing heights are usually much higher, even in SW Colorado.

57) Page H-76:

6.19 Table H-25 could be enhanced by adding comparative information on permissible dose levels as discussed on page H-75 in the last paragraph.

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P.O. Box 1484
Durango, CO 81302-1484
February 25, 1985

Mr. John T. Themelis
U.S. Department of Energy
UMTRA Project Office
Durango DEIS Comments
5301 Central Avenue, N.E., Suite 1700
Albuquerque, New Mexico 87108

Dear Mr. Themelis,

6.5 My formal comments have been submitted as part of CCAMP's testimony. In those comments we referred to a technical alternative—concrete mesh form and revegetation mat. I have enclosed, as a private citizen, for the record and for your information, a brochure on each. Please note that I am not endorsing these products, but I am endorsing the idea that you and your staff give the people of Durango the best technical alternatives that are available and that you explore these concepts as well as the many others that certainly "must be out there".

We in Durango will not accept anything less than the "highest state of the art" and we question that "rip-rap" and "trucking" are.

Please do your part. We in Durango have done ours. We have submitted extensive technical comments to you and have identified the many deficiencies in the Draft Environmental Impact Statement.

6.20.3 We are prepared to work closely with you throughout this process. I strongly urge that you adopt CCAMP's proposal for a mid-way information process (MWIP) that would allow for an information exchange of the numerous technical concerns we raised within the next 60 days and prior to the DOE's initiating any work on the FINAL Environmental Impact Statement.

This community seeks active input into the entire decision-making process. To wait until after the Final Environmental Impact Statement is completed is not responsible or reasonable. Work with us throughout these next months and let us tell you what we want! In that way the final selection of an alternative and the actual implementation will proceed smoothly for all involved.

Sincerely,

Andrea J. Maynard
Andrea J. Maynard
as a private citizen

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Colorado Department of Health Testimony

Durango UMTRAP DEIS Public Hearing

December 18, 1984

My name is Albert J. Hazle. I am the Director of the Radiation Control Division, Colorado Department of Health. I wish to make a brief statement at this hearing.

6.20.1 The State and the US Department of Energy had agreed that for the purposes of the DEIS, that the preferred alternative remedial action would be reprocessing of the tailings for uranium and possibly other minerals with disposal of the residues at the Long Hollow site, with transport of the residues, etc., being made via the Bodo Canyon road. If reprocessing was not viable, then the disposal options would be reevaluated.

Stabilization-In-Place (SIP) with relocation and recontouring of the pile is possible, but it will not meet the EPA UMTRAP standard of 1,000 years without the extensive expenditure of funds. The SIP proposal in the DEIS is designed to meet a 200 year criteria. The other options were designed to meet the 1,000 year criteria. Entombment in concrete of the tailings on the town side of Smelter Mountain will not provide an esthetic solution to the removal of the stigma of radioactive tailings from the community.

6.20.1 The State intends to listen to local input at this public hearing in Durango, and then in its formal written statement for the record include the salient comments of the community. As there are ongoing studies at the Bodo Canyon and Long Hollow sites, this additional data and the local input may well determine what option is ultimately selected.

The State will continue to work with the Durango Task Force in addressing the community's needs during this project.

Attached to my statement is a Simplified Fact Sheet which the Department has prepared and made available at this hearing.

Thank you.

SIMPLIFIED DURANGO UMTRAP DEIS FACT SHEET

* The Uranium Mill Tailings Radiation Control Act of 1978 (PL 95-604) Title I requires reclamation to EPA standards. Since the present Durango millsite conditions do not meet the EPA standards, doing nothing is not a viable option.

* Stabilization-In-Place (SIP) can only be approved if it can meet the EPA longevity standard for 200-1,000 years. SIP would require relocation of the tailings on-site, and the importation of other materials in a combined quantity about equal to the present tailings pile. The Bodo Canyon road would need as much reconstruction in order to import borrow materials as would be needed to relocate the tailings to the Bodo Canyon or Long Hollow sites. The total dust loading and other community impact might be greater with SIP than with pile relocation to the Bodo Canyon or Long Hollow sites.

* Disposal at the Bodo Canyon site may require large additional costs not presently identified in the DEIS for preventing gully erosion. A geologic fault presently under study could require additional design and engineering costs. Additional geotechnical, wildlife mitigation, and archaeological studies remain to be done at the Bodo site.

* The implications of groundwater at the Long Hollow site have not been completely identified. Additional hydrological studies are presently under way at Long Hollow to see if the tailings can be disposed of outside of the groundwater discharge area.

* An evaluation of the feasibility of reprocessing the tailings for minerals is required by law. Since the start of the preparation of the Draft Environmental Impact Statement (DEIS), the price of uranium has been steadily decreasing from $24 to $16 per pound. It does not appear that reprocessing would be economic at this time. The government cannot guarrantee a fixed price nor subsidize a profit for reprocessing.

* Health effects information is provided in the DEIS, not to justify doing remedial action, but to be used along with other parameters to indicate the relative merit of the proposed alternatives.

* There remain a number of unanswered questions with all of the options. The DEIS contains presently available information which should be sufficient to allow the public to make a preliminary evaluation of the options, and to come forth with facts and issues that might have been overlooked and which can still be addressed in the preparation of the Final Environmental Impact Statement (FEIS).

12/13/84 Provided by the Colorado Department of Health

December 6, 1984

Dear Mr. Themelis:

I/We wish to express concern over the use of Wilcat Canyon Road (County Road 141) from County Road 211 to the Long Hollow site for tailings material transport, should either Alternative 4 or 5 be used.

6.12 Many of us that live in the Rafter J Subdivision have school children travelling the above mentioned section of road on school buses three times a day to Ft. Lewis Mesa Elementary School in Kline, Colorado. We are worried about their health and safety. In addition, many of us use that road on a daily or weekly basis and are concerned over the large number of trucks that would use this two-mile stretch of road in the relocation of the uranium tailings, should the Long Hollow site be chosen.

We support the construction of a gravel road to run parallel with the section of road at issue so that no tailings truck traffic would be on any part of County Road 141.

Signed Karen Preston

Signed Edward Preston

Address 401 Cty Rd 142
Dgo Colo 81301

Other Comments: – If it has to be move we

6.20.1 prefer Bodo Canyon.

Christopher J. Meyer
101 Alamo Dr.
Durango, Co. 81301

John Themelis, Project Manager
Uranium Mill Tailings Project Office
U. S. Department of Energy
5301 Central Avenue, N.E. Suite 1700
Albuquerque, N. M. 87108

January 9, 1985

Mr. Themelis,

6.20.1 I wish to express my opposition to the Department of Energy's choice of the Long Hollow Site as the preferred disposal site for the Durango uranium mill tailings pile. I think the expense and problems relative to using the Long Hollow Site, e.g. traffic through Wildcat Canyon, potential spill and traffic accidents, tailings dispersal by the wind, etc., make this an undesirable plan. I personally have always preferred the option of on-site stabalization.

6.3 Enclosed please find a novel idea taken from last nights paper. I dont know how feasible this idea is, but it is worth looking into.

I appreciate this opportunity to express my concern about the pile, a matter which has interested me throughout the nine years I have lived here.

Sincerely,
Christopher J. Meyer
Christopher J. Meyer

Christopher Ryan
P.O. Box 2036
Durango, CO 81302

March 16, 1985

John Themelis, Manager
Uranium Mill Tailings Project
US Department of Energy
5302 Central Ave., NE, Suite 1700
Albuquerque, NM 87108

Dear Mr. Themelis:

6.20.1 I am writing to urge you to stick to your guns on the matter of removing the Durango tailings from town. I was present at the meeting held in the La Plata Co. Fairgrounds last month and was appalled at the ignorance and selfserving myopia displayed by the citizens' panel and most of the crowd. The in-town site is so geologically unstable that to include it as an alternative in the first place was, it seems to me, a mistake.

6.4.3 If your goal is permanent burial without long-term maintenance problems (who expects DOE to be around for 1000 years?), as I think it is, then I urge you to use the most geologically stable site that you can find, despite the immediate self-interest of current residents and of politicians such as Senator Hart.

My own feeling is that the strata under the burial site should be as level as possible, as perhaps on Florida Mesa, but certainly either Bodo Canyon or Long Hollow is preferable by far to the site by the Animas River.

I would like to help if there is any way to do so.

Sincerely yours
Christopher Ryan

39571 Hwy 160
Bayfield, Co 81122
Feb. 4, 1985

Dear Sir:

6.20.3 I feel that you will only make a new contaminated area if you move the tailings pile.

Moving it won't get rid of the contamination that is in that location.

6.20.1 Bury it where it is, save money and save lives.

Sincerely,
Ethel Purcell

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GLOSSARY

absorbed dose, radiological	Radiation energy absorbed per unit mass, usually given in units of rads.
alluvium	Detrital deposits resulting from operations of modern rivers.
alpha particle	A positively charged particle emitted from certain radionuclides. It is composed of two protons and two neutrons, and is identical to the helium nucleus.
anticline	A convex fold in rock layers.
aquifer	A subsurface formation containing sufficient saturated permeable material to yield significant quantities of water.
aquitard	A confining bed that retards but does not prevent the flow of water to or from an aquifer.
arenaceous	A term that applies to rocks that have been derived from sand or contain sand.
atom	A unit of matter; the smallest unit of an element consisting of a dense, central, positively charged nucleus surrounded by electrons.
A-weighted sound levels	A method of measuring sound intensity that simulates an individual's sound perception.
argilaceous	A term applied to all rocks or substances composed of clay, or having a notable proportion of clay in their composition.
background radiation	Radiation arising from radioactive material other than that under consideration. Background radiation due to cosmic rays and natural radioactivity is always present, and there may also be background radiation due to the presence of radioactive substances in building materials, etc.
beta particle	Charged particle emitted from the nucleus of an atom, with mass and charge equal to those of an electron.
colluvium	Rock fragments, sand, and soil that accumulate on steep slopes or at the foot of hills.
confined aquifer	An aquifer bounded above and below by relatively impermeable beds.
contamination	In this report, the presence of radioactive material in concentrations above natural levels.

curie (Ci)	A unit of radioactive disintegration; 3.7×10^{10} disintegrations per second.
daughter product(s)	A nuclide resulting from radioactive disintegration of a radionuclide, formed either directly or as a result of successive transformations in a radioactive series; it may be either radioactive or stable.
decibel (dB)	A unit used to express power or intensity ratios in electrical and acoustical technology.
day-night sound level (L_{dn})	A U.S. EPA description of environmental sound; it is the average of daytime and nighttime A-weighted sound levels, measured in decibels, with nighttime sound given a penalty of 10 decibels.
decontamination	The reduction of radioactive contamination from an area to a predetermined level set by a standards-setting body such as the EPA, by removing the contaminated material.
disintegrations per minute or second	The number of radioactive decay events occurring per minute or second.
disposal	The planned, safe, permanent placement of radioactive waste.
dose	A general term denoting the quantity of radiation or energy absorbed; for special purposes, it must be qualified; if unqualified, it refers to absorbed dose.
dose, absorbed	The amount of energy imparted to matter by ionizing radiation per unit mass of irradiated material at the point of interest; given in units of rads.
dose commitment	The cumulative dose equivalent that results and will result from exposure to radioactive materials over a discrete time period; given in units of rems.
dose equivalent	The quantity that expresses all kinds of radiation on a common scale for calculating the effective absorbed dose; defined as the product of the absorbed dose in rads and modifying factors, especially the qualifying factors; given in terms of rems. Often abbreviated "dose."
electron	A negatively charged particle found either free or surrounding the nucleus of an atom.
equivalent sound level (L_{eq})	A-weighted sound level that is equivalent to an actual time-varying sound level, in the sense that it has the total energy for the duration of the sound.
excess lifetime cancer deaths	The number of cancer deaths occurring in the lifetime of a particular population that is in excess of the number normally expected.

exfiltration	The seepage of a fluid of a medium; the opposite of infiltration.
exposure	The presence of radiation that may deposit energy in an individual; given in units of roentgens.
external dose	The absorbed dose or dose commitment that is due to a radioactive source external to the individual as opposed to radiation emitted by inhaled or ingested sources.
fault	A surface or zone of rock fracture along which there has been movement.
Fickian diffusion	Movement (diffusion) of material from a higher to a lower concentration.
floodplain	Lowland or relatively flat areas that are subject to a 1 percent or greater probability of flooding in any given year (i.e., a 100-year or more common flood).
gamma dose	Radiation dose caused by gamma radiation.
gamma ray or radiation	High energy electromagnetic radiation emitted from some radionuclides. The energy levels are specific for different radionuclides.
ground water	Water below the land surface, generally in a zone of saturation.
grout	In this report, a slurry of cement and sand poured into the spaces between the rock fragments and thereby filling the voids and bonding the rock fragments together.
half-life	The time it takes for 50 percent of the quantity of a radionuclide to decay into its daughters.
hogback	A sharp-crested ridge produced by steeply inclined sedimentary rocks.
hydraulic transmissivity	A measure of the ability of an aquifer to transmit water equal to the product of the permeability and the thickness of the aquifer, expressed in gallons per day.
in-situ	In the natural or original position.
internal dose	The absorbed dose or dose commitment resulting from inhaled or ingested radioactivity.
isotopes	Nuclides having the same number of protons in their nuclei, but differing in the number of neutrons: the chemical properties of isotopes of a particular element are almost identical.

licensing	In this report, the process by which the NRC will, after the remedial actions are completed, approve the final disposition and controls over a disposal site. It will include a finding that the site does not and will not constitute a danger to the public health and safety.
lineament	Any line on the ground or on an aerial photograph, that is structurally controlled.
longitudinal dispersion	Dispersion along the length, i.e., in direction of motion of the slug.
man-rem (person rem)	Unit of population exposure obtained by summing individual dose-equivalent values for all people in the population. Thus, the number of man-rems attributed to 1 person exposed to 100 rems is equal to that attributed to 100 people each exposed to 1 rem.
Maximum Credible Earthquake (MCE)	The largest magnitude earthquake that a given fault is judged to be capable of producing, independent of return period.
mho	The practical unit of conductance equal to the reciprocal of the ohm.
micro	A prefix meaning one millionth (x 1/1,000,000 or 10^{-6}).
milli	A prefix meaning one thousandth (x 1/1000 or 10^{-3}).
Modified Mercalli (scale)	A standard scale for the evaluation of the local intensity of earthquakes based on observed phenomena such as the resulting level of damage. Not to be confused with magnitude, such as measured by the Richter scale, which is a measure of the comparative strength of earthquakes at their sources.
monocline	Rock strata that slope in one direction for an indefinite or unknown distance.
normal fault	A fault in which the hanging wall, or mass of rock above the fault plane, has been depressed relative to the foot wall.
nucleus	The positively charged center of an atom.
nuclide	A kind of atom characterized by the constitution of its nucleus. It is specified by the number of protons and the number of neutrons in the nucleus.
off-site property	(See vicinity property).
permeability	The ease with which liquids or gases penetrate or pass through a solid material. Technically, it is the volume of fluid that will flow through a unit area under a unit hydraulic gradient, measured in centimeters per second or equivalent units.

permissible dose	That dose of ionizing radiation that is considered acceptable by standards-setting bodies such as the EPA. Also, the dose of radiation that may be received by an individual within a specified period with the expectation of no substantially harmful result.
person-rem	Same as man-rem.
pico	A prefix meaning one trillionth (x 1/1,000,000,000,000 or 10^{-12}).
picocurie	A unit of radioactivity defined as 0.037 disintegrations per second.
piezometric surface	That surface represented by the static water level in wells tapping a confined aquifer.
population dose (exposure)	The sum of individual radiation doses received by all of those exposed to the source of interest.
Probable Maximum Flood (PMF)	The hypothetical flood (peak discharge, volume, and hydrograph shape) that is considered to be the most severe reasonably possible, based on comprehensive hydrometeorological application factors favorable for maximum flood runoff such as sequential storms and snowmelt.
Probable Maximum Precipitation (PMP)	The estimated depth for a given duration, drainage area, and time of year for which there is virtually no risk of exceedence.
proton	An electrically positive elementary particle found in the nucleus of an atom. Also, the nucleus of a hydrogen atom.
quality factor (QF)	The principal modifying factor by which absorbed doses are multiplied to obtain dose equivalents for radiation-protection purposes and thus express the effectiveness of absorbed doses on a common scale for all kinds of ionizing radiation. The quality factor depends on the type and the energy of the radiation being considered.
rad	A unit of measure for the absorbed dose of radiation. It is equivalent to 100 ergs per gram of material.
radioactive decay	Disintegration of the nucleus of an unstable nuclide by spontaneous emission of charged particles, photons, or both.
radioactivity (radioactive decay)	The property of some nuclides of spontaneously emitting particles or gamma radiation or of spontaneous fission.
radioisotope	A radioactive isotope of an element with which it shares almost identical chemical properties.

radionuclide	A radioactive nuclide.
radium-226	A radioactive daughter product of uranium-238. Radium is present in all uranium-bearing ores; it has a half-life of 1620 years.
radon-222	The gaseous radioactive daughter product of radium-226; it has a half-life of 3.8 days.
radon-daughter product	One of several short-lived radioactive daughter products of radon-222. All are solids.
radon, flux	The emission of radon gas from the earth, usually measured in units of picocuries per square meter per second.
raffinate	An aqueous solution remaining after uranium has been removed from the solvent. It is the liquid tailing of the solvent-extraction system.
rem	A unit of dose equivalent equal to the absorbed dose in rads times quality factor times any other necessary modifying factor. It represents the quantity of radiation that is equivalent in biological damage to 1 rad of x-rays.
Richter magnitude	A measure of the total energy released by an earthquake.
roentgen	A unit of measure of ionizing radiation in air; 1 roentgen in air is approximately equal to 1 rad and 1 rem in tissue.
sands	In this report, relatively coarse-grained waste products of uranium-ore processing.
secular equilibrium	The condition of a radionuclide decay chain in which the rate of decay of any radioactive product is just equal to its production from the previous member of the chain.
seismotectonic feature	A regional structure or deformational feature.
seismogenic feature	A specific fault or other geologic structure capable of movement and producing earthquakes.
slimes	In this report, fine-grained waste materials from uranium-ore processing that are mixed with small amounts of water.
syncline	A concave fold in rock layers.
thorium-230	A radioactive-daughter product of uranium-238; it has a half-life of 80,000 years and is the parent of radium-226.
unconfined aquifer	An aquifer that is not confined by impermeable beds. The upper surface is called the water table.

underdrain	In this report, a blanket of sand and gravel that intercepts upward-moving ground water beneath an embankment and allows the ground water to flow to the surface under the influence of gravity.
uranium-238	A naturally occurring radioisotope with a half-life of 4.5 billion years; it is the parent of uranium-234, thorium-230, radium-226, radon-222, and others.
uranium-mill tailings	The wastes remaining after most of the uranium has been extracted from uranium ore.
vicinity property	A property in the vicinity of the Durango site which is determined by the DOE, in consultation with the NRC, to be contaminated with residual radioactive material derived from the Durango site, and which is determined by the DOE to require remedial action.
vitrified	A term given to manufactured clay pipe after it has been subjected to very high temperatures, which is a process similar to that in manufacturing chinaware and pottery.
water table	The upper surface of an unconfined aquifer.
working level (WL)	A measure of radon-daughter-product concentrations. Technically, it is any combination of short-lived radon decay products in 1 liter of air that will result in the ultimate emission of alpha particles with a total energy of 130,000 MeV.
working level month (WLM)	Exposure resulting from inhalation of air with a concentration of 1 WL of radon daughters for 170 working hours. Continuous exposure of a member of the general public to 1 WL for one year results in approximately 50 WLM of exposure; 1 WLM is approximately equal to 5 rem.

ABBREVIATIONS AND ACRONYMS

ACHP	U.S. Advisory Council on Historic Preservation
ADT	Average Daily Traffic
AEC	U.S. Atomic Energy Commission
ANL	Argonne National Laboratory, Argonne, Illinois
ANS	American Nuclear Society
AQCR	Air Quality Control Region
BEIR	Advisory Committee on the Biological Effects of Ionizing Radiation of the National Academy of Sciences (also their report)
BFEC	Bendix Field Engineering Corporation, Grand Junction, Colorado
BLM	Bureau of Land Management, U.S. Department of Interior
BOD	Biological oxygen demand
Btu	British thermal unit
CASA	Complete Archaeological Services Associates
CDW	Colorado Division of Wildlife
CFR	Code of Federal Regulations
CGS	Colorado Geological Survey
CNHI	Colorado Natural Heritage Inventory
CO	Carbon monoxide
COE	U.S. Army Corps of Engineers
CWC	Colorado Wildlife Commission
dBA	Decibels on the A scale; a logarithmically based unit of sound intensity weighted to account for human auditory responses
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EA	Environmental assessment
EGR	External gamma radiation
EIS	Environmental impact statement
EPA	U.S. Environmental Protection Agency
FBDU	Ford, Bacon, and Davis, Utah, Inc.
FEMA	Federal Emergency Management Agency
FMFA	F.M. Fox and Associates, Inc., Denver, Colorado
FOCERI	Four Corners Environmental Research Institute, Durango, Colorado
FR	Federal Register
g	Grams; a unit of weight = 0.035 ounce; also a measure of acceleration; 1 g = 32 feet per square second
gpm	gallons per minute
HC	Hydrocarbon
HEW	U.S. Department of Health, Education, and Welfare
HUD	U.S. Department of Housing and Urban Development
ICBO	International Conference of Building Officials
JEG	Jacobs Engineering Group Inc.

km	Kilometer
kw	Kilowatt
kwh	Kilowatt hours
l	Liter; a unit of volume = 1.057 quarts
LASL	Los Alamos Scientific Laboratory, Los Alamos, New Mexico
LLD	Lower limit of detection
L_{dn}	Day-night sound level, measured in decibels
L_{eq}	Equivalent sound level, measured in decibels
m	Meter; a unit of length = 3.28 feet; also milli, a prefix meaning one-thousandth (10^{-3})
MeV	Million electron volts
mg	Milligrams; a thousandth of a gram
mgd	Million gallons per day
MILDOS	A computer code used to calculate both the spread of radon and particulates in the atmosphere and the consequent radiation doses
MMI	Modified Mercalli Intensity; a measure of earthquake intensity
MPC	Maximum permissible concentration
MCE	Maximum Credible Earthquake
mR/hr	Milliroentgens per hour
MSE	Mountain States Engineers, A Division of Mountain States Mineral Enterprises, Inc., Tucson, Arizona
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act of 1969 (PL91-190)
NOAA	National Oceanic and Atmospheric Administration
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NRHP	National Register of Historic Places
O_3	Ozone
ORNL	Oak Ridge National Laboratory, Oak Ridge, Tennessee
p	Pico, a prefix meaning one trillionth (10^{-12})
Pb	Lead
pCi/g	Picocuries per gram
pCi/l	Picocuries per liter
pH	A logarithmic scale of hydrogen-ion concentration, and hence, an indication of acidity or alkalinity: pH = 7 is neutral; pH less than 7 is acidic; pH greater than 7 is alkaline
PMF	Probable Maximum Flood
PMOA	Programmatic Memorandum of Agreement
PMP	Probable Maximum Precipitation
RA	Remedial action
Ra-226	Radium-226
RDC	Radon-daughter concentration
Rn-222	Radon-222
Sandia	Sandia National Laboratories, Albuquerque, New Mexico
SCS	Soil Conservation Service, U.S. Department of Agriculture
SHPO	State Historic Preservation Officer
SMSA	Standard Metropolitan Statistical Area

SO_2	Sulfur dioxide
SSC	Site Selection Committee
TLD	Thermoluminescent dosimeters; a device for measuring radiation
TOC	Total organic carbon
TSP	Total suspended particulates
TSS	Total suspended solids
UBC	Uniform Building Code
U-234	Uranium-234
U-235	Uranium-235
U-238	Uranium-238
U_3O_8	Uranium oxide, also called yellowcake
UMTRA	Uranium Mill Tailings Remedial Action
UMTRCA	Uranium Mill Tailings Radiation Control Act of 1978 (PL95-604)
USBR	Bureau of Reclamation, U.S. Department of the Interior
USDA	U.S. Department of Agriculture
USDC	U.S. Department of Commerce
USF&WS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WDEQ	Wyoming Department of Environmental Quality
WL	Working level (a measure of radon-daughter-product concentration)
WLM	Working-level month (exposure to 1 WL for 170 hours)
$\bar{X}$	Mean (average value of the variable)

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