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Lise Young

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WHAT PRICE PROGRESS? URANIUM PRODUCTION ON INDIAN LANDS IN THE SAN JUAN BASIN

Lise Young*

Introduction

In the wake of the Three Mile Island nuclear incident, new public scepticism has been generated toward the national policy of nuclear power development. Attention has focused primarily on the most visible parts of the nuclear fuel cycle: the safety of the nuclear reactors and to a lesser degree, adequate disposal of the nuclear wastes generated by them. There has been surprisingly little discussion concerning the *production* of the radioactive raw material used in the reactors themselves, although this stage of the fuel cycle affects the economic and physical environments of dozens of American communities. Most of these communities are located in the West, on or near Indian lands.

Uranium production in these areas proceeds unabated, despite increased public scrutiny of other aspects of nuclear power, including the proliferation of nuclear weapons. Fueled in part by the explosive rise in the cost of uranium oxide—the raw stuff of reactor fuel rods—since the termination of the old Atomic Energy Commission's (AEC) procurement program in the early 1960s,¹ in part by new, improved exploration, mining, and processing technologies,² and in part by growth projections for the

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* B.A., 1975, Lewis & Clark College; J.D., 1981, San Diego School of Law. The author gratefully acknowledges the assistance she received from the following persons in preparing this article: Professor Charles B. Wiggins, University of San Diego; Alan Taradash, DNA-People's Legal Services, Inc.; Tom Berning, National Lawyers Guild; and Ron Zee, Council of Energy Resource Tribes.

1. The price of a pound of yellowcake soared from \$8 in 1973 (shortly after the demise of the Atomic Energy Commission's procurement program) to \$43 in 1978. Root, *Environmental Law Aspects of Extracting and Processing Uranium*, 11 NAT. RESOURCES LAW 419 (1978) [hereinafter cited as Root]. Current prices are running about \$51.45 per pound and are expected to continue to rise. U.S. DEPT. OF INTERIOR, OFFICE OF THE SECRETARY, SOUTHWEST REGION, STATUS REPORT: URANIUM DEVELOPMENT ON FEDERAL AND INDIAN LANDS, NORTHWEST NEW MEXICO AREA (Sept. 1976) [hereinafter cited as STATUS REPORT].

2. Uranium production technology is discussed in Part I, *infra*.

3. Fuel requirements for reactors projected to be on line by 1988 have been estimated at 60,000 tons of uranium oxide yellowcake per year; by the year 2000 these requirements are expected to more than double. Navajo Nation Environmental Protection Comm'n, "An Evaluation of Navajo Nation Uranium Reserves and the Residual Impacts Associated with Reserves Development," 6 (May 1, 1978) [hereinafter cited as Navajo

nuclear power industry,³ uranium production is expected to continue to accelerate.⁴

Currently the highest concentration of uranium mining and milling activity occurs in the Southwest, particularly in the San Juan River Basin of northern New Mexico and southern Colorado. (Figure 1) There are now 34 operating uranium mines in that area with at least 16 more under development and 7 in the planning stage.⁵ By 1982, 12 mills are expected to be in operation, 7 more than are presently operational.⁶

According to one study, to meet the *lowest* projected uranium demand for the year 2000, mining and milling capacity in the San Juan region will have to more than double.⁷ A narrow band of land, some 20 miles wide by 100 miles long, lying between Albuquerque and Gallup, New Mexico, and within the geographical confines of the San Juan Basin, is estimated to contain more than one-half of the remaining United States uranium reserves, although it comprises only about 10% of the total land area in the San Juan Basin.⁸

Almost half of this strip, the Grants Mineral Belt, lies on lands belonging to the Navajo Nation, Laguna Pueblo, Acoma Pueblo, and Canoncito Pueblo.⁹ Uranium production on Indian lands in the Grants Mineral Belt and elsewhere in New Mexico accounted

EPC Evaluation]. Fifty-five nuclear power plants presently operate in the United States. An additional 182 plants are in various stages of development. At least 63 of these have already acquired the requisite permits and 16 are "firmly planned." STATUS REPORT, *supra* note 1, at 1.

4. If nuclear power expands within the parameters of industry projections, production in the San Juan Basin area alone is expected to reach from four to six times its 1977 levels by 1990 and from six to eight times its 1977 levels by the turn of the century. U.S. Dep't of Interior, San Juan Basin Regional Uranium Study, Environmental Issues and Uranium Development in the San Juan Basin Region, I-8 through I-12 (rough draft, 1978) [hereinafter cited as Draft San Juan Study].

5. N.M. Energy & Mineral Dep't, An Overview of the New Mexico Uranium Industry, at 72-74, 78, 82-83 (Jan. 1979) [hereinafter cited as N.M. Uranium Overview]; U.S. Dep't of Interior, Final Environmental Impact Statement, Star Lake-Bisti Regional Coal, I-22 [hereinafter cited as EIS, Star Lake-Bisti].

6. N.M. Environmental Div., Uranium Mining and Milling; Environmental Effects, Program Plan, 38 (June 1978).

7. Gibson, Uranium Operations and Employment in the San Juan Basin: 1977-2000, San Juan Basin Regional Uranium Study Working Paper No. 5, at 33, 56, 80, 109 (1978) [hereinafter cited as Draft San Juan Study, Uranium Projections].

8. Draft San Juan Study, *supra* note 4, at I-20. Tribal lands in other areas of the country are undergoing similar "development" including the massive Sherwood Project production and processing facilities on the Spokane Reservation in Washington State, the Wind River Reservation in Wyoming, and the Ute Mountain Reservation in the southwestern corner of Colorado.

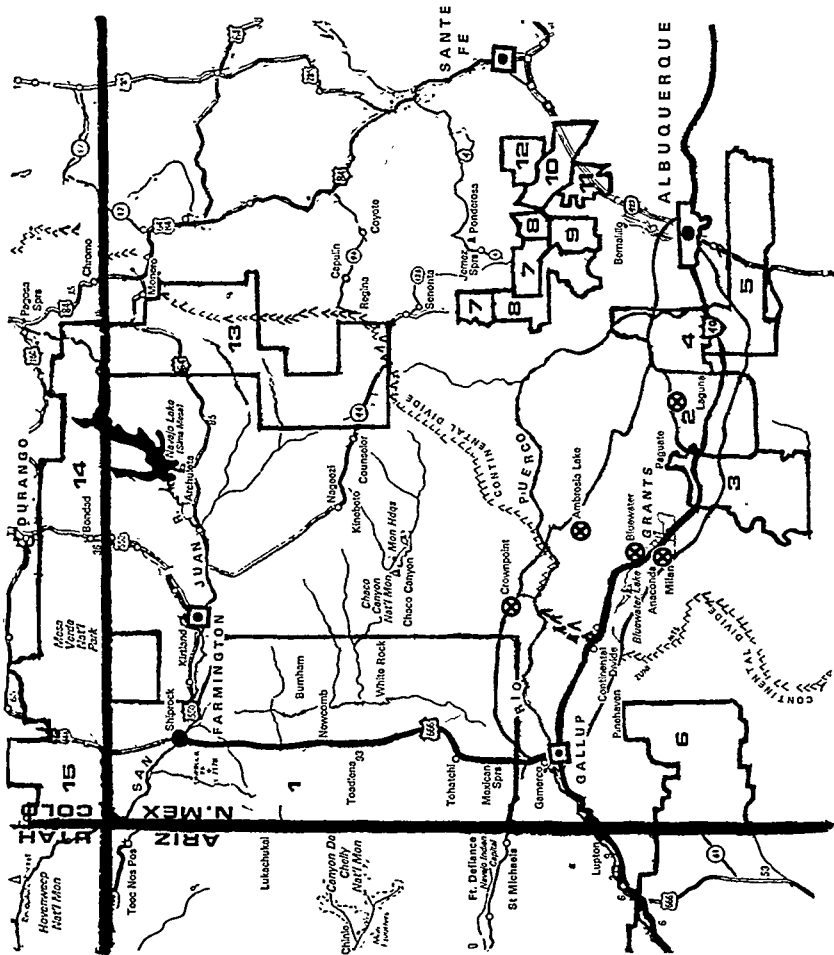
9. STATUS REPORT, *supra* note 1, at 1.

FIG. 1

1. Navajo
2. Laguna Pueblo
3. Acoma Pueblo
4. Canonicito Pueblo
5. Isleta Pueblo
6. Zuni
7. Jemez Pueblo
8. Zia Pueblo
9. Santa Ana Pueblo
10. Santo Domingo Pueblo
11. San Felip Pueblo
12. Cochiti
13. Jicarilla Apache
14. Southern Ute
15. Ute Mountain

Area covered by the
Grants Mineral Belt

⊗ Major uranium
production facilities



for almost half of New Mexico's uranium production in 1974.¹⁰ New Mexico, in turn, has supplied nearly 50% of the total uranium oxide mined in the United States since 1977.¹¹ A single people, the Navajo Nation, contribute the bulk of this figure, although production from the huge open-pit uranium mine on the Laguna Pueblo Reservation is also significant.¹² More than 600,000 acres of Navajo land are presently under lease for uranium exploration and production,¹³ and thousands of acres more have been suggested for leasing but to date have not yet been leased.¹⁴ Leased Navajo lands in the Grants Mineral Belt account for 15% of the total land area in that strip.¹⁵

The impacts of massive injections of high technology into remote areas may go unnoticed by the rest of America; however, they are not lost on the Indian residents of these areas who must deal with poisoned livestock, boomtown economies, and invasion of their holy places by insensitive outsiders. Part I of this article seeks to describe the sociocultural, economic, environmental, and health impacts uranium production activities have on Indian lands and culture. Part II describes some of the obstacles confronting tribes who wish to control the pace of uranium production on their lands.¹⁶

I. *Impacts of Uranium Production on Indian Lands and Society*

Environmental Impacts

The uranium reserves of the southwestern United States have

10. *Id.*

11. *Id.*

12. Since its discovery by Anaconda Corporation in 1951, this mine and the associated processing mill have produced a total of 80 million pounds of uranium concentrate. The mine itself has swallowed up some 2,800 acres of the reservation, with contiguous pits 3 miles long, 500 feet wide, and not more than 300 feet deep. *Mine Development on United States Indian Lands*, ENGINEERING & MINING J. (Jan. 1980 reprint) [hereinafter cited as E & MJ reprint].

13. This figure represents some 240,000 acres of land leased by 1976, plus an additional 400,000 acres (625 square miles) leased to Exxon in 1977.

14. For example, as the price of uranium rises, it can be expected that lands previously leased and dropped again may have potential for development. STATUS REPORT, *supra* note 1, at 10. In addition, at least two mills to accommodate production from the 400,000-acre Navajo-Exxon lease mines are expected to be built on Navajo lands. *Id.* at 12.

15. Supplemental Memorandum of Points and Authorities in support of plaintiff's motion for partial summary judgment relating to Regional EIS, *Peshlakai v. Duncan*, 476 F. Supp. 1247 (D.D.C. 1979) [hereinafter cited as *Peshlakai* Points and Authorities].

16. Because of research resource limitations, discussion is for the most part limited to the Navajo Nation.

been deposited over the millennia by the slow movement of uranium-bearing groundwater through sandstone rock formations. Uranium atoms combine with oxygen in the water, precipitating out as insoluble uranium oxide.¹⁷ Because of the slow movement of the groundwater, uranium deposits likewise "travel," leaving traces of radioactivity and other chemical changes in the host rock upstream from such deposits. These chemical tracks provide clues to locating uranium during exploration of promising rock formations.¹⁸

Significant environmental impacts attend each phase of uranium production, from the preliminary exploration of these roll-front uranium deposits to the final packaging of uranium oxide as "yellowcake" at the mill.

1. *Exploration*

The first step in locating uranium reserves is identifying favorable host rock. This is accomplished by taking numerous soil, water, and rock samples, conducting aerial photography of favorable areas, and mapping the location of the results obtained from test sites.¹⁹ Such activities usually entail minimal disturbance of the surrounding environment.

Once promising rock formations have been identified, exploratory boreholes are drilled every one to five miles to confirm the presence of the right sort of rock.²⁰ If the results of these preliminary boreholes are positive, further, more intensive drilling follows with holes being sunk progressively closer together. Eventually, drill holes 6 inches in diameter and from 400-2,000 feet deep²¹ may be spaced as closely as 12½ feet apart.²² Even after a deposit has been located and mining has commenced, exploratory drilling may continue throughout the life of a mine to verify and project ore trends.²³

17. Deffeyes & MacGregor, *World Uranium Resources*, 242 SCIENTIFIC AM. 50, 55-57 (Jan. 1980).

18. Davis, *Methods of Uranium Exploration*, ROCKY MTN. MIN. L. FDN. INST. ON URANIUM EXPLORATION AND DEVELOPMENT, at 6-4 (1976).

19. *Id.* at 6-6.

20. *Id.* at 6-7.

21. Forest Service, U.S. Dep't of Agriculture, *Anatomy of a Mine from Prospect to Production*, 1-25 (June 1977) [hereinafter cited as *Anatomy of a Mine*]. As superficial layers of uranium have been mined out, increasingly deeper deposits have had to be explored. The average depth of most exploratory drill holes is presently from 550 to 800 feet. 196 SCIENCE 606 (1979).

22. N.M. Uranium Overview, *supra* note 5, at 40.

23. *Anatomy of a Mine*, *supra* note 21.

Drilling activities require moving heavy drill rigs across the land from one site to another.²⁴ Constant movement of heavy equipment, in addition to water trucks and other support vehicles, often requires bulldozing access roads across fields or other terrain.²⁵ Where terrain is flat and sparsely vegetated, the disturbance may be relatively slight; however, where the topography is rougher, disturbance from road construction and the movement of drill rigs may be substantial.²⁶

Once a site is reached, it must be flattened and denuded to facilitate drilling operations.²⁷ Each site measures from one to one and one-third acres in size.²⁸ Given the extensiveness of exploratory drilling, the cumulative impacts on surface lands are substantial: in 1977 alone, some 6,413 exploratory boreholes were drilled in New Mexico,²⁹ resulting in at least 2,000 acres of highly disturbed land.³⁰ In a four-year period, a single oil company, Mobil Oil, drilled 124 exploratory boreholes on a 160-acre parcel of Indian land, averaging almost one hole per acre.³¹ Not surprisingly, one author has concluded that land disturbance is one of the most serious problems of drilling.³²

Although companies often agree to reclaim lands marred by exploratory activities, the history of such reclamation efforts is at best uneven.³³ Given the arid climate of the San Juan Basin, even conscientious reclamation efforts will most likely result in long-term destruction of forage grasses.³⁴ This could be particularly devastating to Navajo residents, who depend on local vegetation for grazing their livestock.³⁵

Exploratory drilling also impacts both the air above and the water below the disturbed surface area of the drill site. Like mine shafts, drill holes often pass through water-bearing rock layers which may lie above, below, or within the uranium-bearing

24. N.M. Uranium Overview, *supra* note 5, at 47.

25. Anatomy of a Mine, *supra* note 21.

26. N.M. Uranium Overview, *supra* note 5, at 47.

27. *Id.*

28. Anatomy of a Mine, *supra* note 21.

29. N.M. Uranium Overview, *supra* note 5, at 41-43.

30. *Id.* at 47-48.

31. Plaintiff's Statement of Material Facts Which Are Not in Dispute, *Peshlakai v. Duncan*, 476 F. Supp. 1247 (D.D.C. 1979) [hereinafter cited as *Peshlakai Facts*].

32. N.M. Uranium Overview, *supra* note 5, at 47.

33. *Id.*

34. *Id.*

35. U.S. Dep't of Interior, Final Environmental Impact Statement: Navajo-Exxon Uranium Development, II-130 (Nov. 1976) [hereinafter cited as *Navajo-Exxon EIS*].

layers. If boreholes are not immediately and securely plugged after exploration activities are completed, the gap created by the hole may cause water in high-pressure aquifers (water-bearing rock strata) to travel up or down the hole to lower-pressure aquifers. Where the water in these high-pressure aquifers is a local water source, well levels may drop as the water escapes to new levels. If a low-pressure aquifer supplies local water wells, then the influx of high-pressure water may contaminate the low-pressure aquifer with uranium, radium, selenium, and other toxic metals.³⁶

According to the investigations of at least one group, companies have been derelict in capping exploratory boreholes.³⁷ In addition to playing havoc with underground water supplies, uncapped boreholes also vent radioactive radon gas wherever a uranium-bearing ore has been pierced.³⁸ Any drill cuttings left alongside the hole may also give off radon gas.³⁹

2. Mining

Until recently, uranium was extracted from the earth by the two techniques that are used in mining other hard minerals: surface (open-pit) and underground mining. In the last ten years or so, however, a new technology has been developed called *in situ* or *solution* mining. Moreover, with increases in the price of yellowcake, quantities of uranium that heretofore would have been economically infeasible to mine have been recovered as an incident to the processing of other minerals, notably copper and phosphate.⁴⁰ Each of the processes and its attendant environmental impacts will be discussed in turn.

Open-Pit (Surface) Mining

Open-pit mining is familiar to anyone who has seen pictures of the famous Anaconda open-pit copper mine in Utah. Ore-bearing rock is exposed by stripping off the material overlying it (the *overburden*), which is hauled away in trucks. Ore is blasted loose

36. Report of the Energy Delegation of the National Lawyers Guild, *The Front of the Nuclear Fuel Cycle*, 5 (rough draft, July 1980) (statement of Paul Robinson, environmental expert) [hereinafter cited as *Guild Study*].

37. *Id.* at 4.

38. *Id.*

39. *Id.*

40. Lootens, *Uranium: Production Methods and Economic Considerations*, ROCKY MTN. MIN. L. FDN. INST. ON URANIUM EXPLORATION AND DEVELOPMENT 10-10, 10-11 (1976) [hereinafter cited as *Lootens*].

and taken to processing plants. The average waste-to-ore ratio in uranium open-pit mining operations is 40 tons to 1 ton;⁴¹ thus the logistics of overburden removal are staggering. In fact, because of the costs involved in removal and disposal of overburden, it is generally not economically worthwhile to surface mine uranium at depths of more than 500 feet.⁴²

Surface mining presents the most conspicuous example of land damage of any of the uranium mining technologies. The Jackpile-Paguate Mine on the Laguna Pueblo Reservation—the world's largest open-pit uranium mine—covers some 2,000 acres and is as much as 300 feet deep.⁴³ Huge piles of overburden and waste rock are piled near the mine, which is located only a few hundred yards away from the village of Paguate.⁴⁴

In addition to monumental land disturbance, open-pit mining contributes significant amounts of radioactive substances to ambient air and water. The exposed ore surfaces in the mine, amounting to several hundreds of thousands of square feet, emit radon, a radioactive gas released when uranium-bearing rock is exposed to the atmosphere. Radon is heavier than air, and concentrations of it are probably higher in the deeper parts of the mine than near ground level. Radon emitted from open-pit mines may even be trapped in nearby buildings, thereby posing a health threat to residents. Runoff water traveling across radioactive mine surfaces and waste piles becomes contaminated surface water; when it seeps back into underground sources, it carries the radioactive pollutants with it, causing some radioactive contamination of groundwater supplies in the area. A 1975 Environmental Protection Agency (EPA) study confirmed that rainfall and runoff are eroding uranium- and selenium-rich materials into the Rio Paguate, which flows near the Jackpile-Paguate Mine.⁴⁵

Because of the depletion of superficial uranium deposits in the Southwest, it is highly unlikely that any new open-pit uranium mines will be opened in the San Juan Basin in the foreseeable future.⁴⁶

41. *Id.* at 10-3.

42. *Id.* at 10-2.

43. E & MJ reprint, *supra* note 12.

44. Guild Study, *supra* note 36, at 10.

45. U.S. Environmental Protection Agency, *Water Quality Impacts of Uranium Mining and Milling Activities in the Grants Mineral Belt, New Mexico* (Sept. 1975).

46. Lootens, *supra* note 40, at 10-4.

Underground Mining

Despite its name, underground mining necessitates extensive above-ground facilities, covering anywhere from 100 to 250 acres.⁴⁷ A 10- to 20-foot vertical production shaft connecting the ore-bearing layers with the surface is sunk by drilling or blasting. Once the ore body has been reached by this main shaft, a network of horizontal tunnels (drifts) is blasted into and adjacent to the ore zone.⁴⁸ Ore is exposed on several faces at once because production from any single area is limited.⁴⁹ It is then blasted loose with explosives, loaded into haulage carts, and transported to a central receiving point where it is hoisted to the surface. Unusable ore or waste rock is either dumped outside the mine into a spoils pile or is used as fill material in previously worked sections. It may even be used in road and dam construction.⁵⁰

Uranium deposits in the Southwest are usually located beneath (and sometimes within) water-bearing rock formations or aquifers. Consequently, these aquifers are usually pierced by the sinking of mine shafts, causing continual seepage of groundwater from the aquifer into the mine. For production to continue, this water must be pumped to the surface and discharged. This dewatering continues for the life of a mine at a pumping rate of anywhere from 1,000 to 10,000 gallons per minute.⁵¹ Massive mine dewatering, with its effects on both water quantity and water quality in the Southwest, constitutes the major environmental threat of underground uranium mining operations. In the San Juan Basin region, the major uranium ore bodies lie within the Morrison Formation sandstone (specifically, in the Westwater Canyon Member of that formation), which is the principal aquifer for the region.⁵²

47. For example, the mines planned for the Dalton Pass area would impact 250 acres of land directly. Tennessee Valley Authority and U.S. Dep't of Interior, Final Environmental Impact Statement: Dalton Pass Uranium Mines, 37 [hereinafter cited as Dalton Pass Uranium Mines]. Those at Crownpoint would directly affect about 100 acres. Tennessee Valley Authority and U.S. Dep't of the Interior, Draft Environmental Impact Statement: Crownpoint Uranium Mining Project, 44 (June 1978).

48. Lootens, *supra* note 40, at 10-4.

49. *Id.*

50. Anatomy of a Mine, *supra* note 21, at 55-59.

51. Brief of Mobil Oil Corp., *Peshlakai* Facts, *supra* note 31, at 13.

52. Lyford, Modeled Effects of Uranium Mine Dewatering on Water Resources in Northwestern New Mexico, San Juan Basin Regional Uranium Study, Working Paper No. 37, at 8 (Jan. 1979) [hereinafter cited as Draft San Juan Study, Mine Dewatering Effects].

Because of the high volume of water in the Westwater Canyon aquifer, dewatering rates at San Juan Basin area mines are quite high, ranging from 4,500 gallons per minute at two mines located at Churchrock, New Mexico,⁵³ to 8,500 gallons per minute at the Gulf Mine at Grants, New Mexico.⁵⁴ The annual withdrawal from a single Churchrock-type mine amounts to more than 7,000 acre-feet of water.⁵⁵ If uranium development in the region proceeds as projected, "moderate" development (72 mines) will result in the withdrawal of about 1.2 million acre feet of water by the year 2000; if development proceeds at a "high" rate (105 mines), withdrawal will almost double to a total of 2.025 million acre-feet in the same period.⁵⁶

The net result of this immense pumping operation will be a reduction (drawdown) in the water pressure (head) of the Westwater Canyon aquifer.⁵⁷ These drawdowns are projected to be anywhere from 1,300 feet to 4,000 feet, depending upon mine depth and the extent of uranium development that occurs in the next twenty years.⁵⁸ In the arid lands of the region, this dewatering can have catastrophic consequences for water supplies already overtaxed by domestic, industrial, and agricultural demands.⁵⁹

Even industry has recognized the severity of the problem: United Nuclear Corporation's reclamation plans for its Dalton

53. Guyton & Assoc., Production of Water from Westwater Canyon Aquifer Near Crownpoint, New Mexico by Phillips Uranium Corporation for Uranium Mining, at 15-16 (July 1978) [hereinafter cited as Phillips Water Study].

54. Navajo EPC Evaluation, *supra* note 3, at 11.

55. Phillips Water Study, *supra* note 53, at 15-16.

56. Draft San Juan Study, Mine Dewatering Effects, *supra* note 52, at 6-7.

57. *Id.*

58. For example, pumping from the Phillips mines in the Crownpoint area would result in a drawdown of 1,300 feet after thirty-one years, and even twenty years after mining has stopped, the drawdown would still be more than 500 feet. The cumulative impacts of mine dewatering at only "moderate" development rates would result in drawdowns of 4,000 feet in some places with drawdowns of 1,000 feet in a 40-mile-wide by 70-mile-long strip by the turn of the century. If only those mines currently planned or announced are constructed, drawdowns of more than 2,000 feet are expected by 1985. *Id.*

59. Water supplies at Crownpoint are already inadequate to meet fire protection needs. If development continues as planned, "storage and distribution systems [will be taxed] to the point that system pressures will be practically nil; . . . and either some sort of rationing, denial of connection privileges to new developments or both, will have to be instituted to ensure any supply at all to present customer." Environmental Protection Agency and Economic Development Administration, Draft Environmental Impact Statement: Waste-Water Treatment Facilities, Water Supply Facilities, Crownpoint, New Mexico, at 13, 16 (Mar. 1979) [hereinafter cited as EPA-EDA, Crownpoint Water Supply DEIS].

Pass mines recommended that “[d]ependence for new (water) supplies should not be placed on the Westwater . . . because of the large effects which will be caused by mine pumping . . . in the area.”⁶⁰ Studies of the area have revealed that pumping rates are already exceeding natural replacement rates in some places.⁶¹

The water that is pumped from the mines is discharged into dry arroyos or ditches on the surface of the mine area. Some intermittent streams have become constant-flowing streams as a result of mine water discharge.⁶²

Because this water has been pumped upward through uranium-bearing strata, it is radioactive and may be contaminated with significant traces of other toxic elements.⁶³ A 1975 EPA study of the Grants Mineral Belt found the Rio Puerco—a stream used for mine discharges—so polluted with radium, selenium, and vanadium that the concentration of each element alone would have been high enough to render the water unfit for livestock, irrigation, or drinking water.⁶⁴ Thus, contamination of surface waters has already occurred as a result of present mining operations’ dewatering practices.

Contamination is not confined to surface waters. Like exploration boreholes, mine shafts penetrate uranium-bearing and water-bearing rock formations. As areas are mined out beneath these layers, the overlying layers collapse into the resulting cavity (unless large portions of the ore have been left in place or expensive permanent support systems are built), creating vertical fractures.⁶⁵ These fractures create hydraulic connections between the

60. United Nuclear Corp., Mining and Reclamation Plans: Dalton Pass Uranium Mines, McKinley County, New Mexico, at 9.3-19 (Jan. 1977) [hereinafter cited as Dalton Pass EIS].

61. U.S. Dep’t of Interior, Final Environmental Impact Statement: Federal Coal Management Program, 4-44 (Apr. 1979).

62. One investigation observed a continuous 10-foot-wide flow in a streambed that was previously dry during summer months. Guild Study, *supra* note 36, at 9. The author worked on a case involving a similar situation: a Navajo landowner objected to excessive radioactive water discharges into a dry gully that bordered his land because his livestock were using the new “river” as a watering hole and he was worried that they might become ill.

63. Kunkler, Impacts of the Uranium Industry on Water Quality, San Juan Basin Regional Uranium Study, Working Paper No. 22, at 23 (Oct. 1978) [hereinafter cited as Draft San Juan Study, Water Quality Impacts].

64. See note 45, *supra*. The same EPA study revealed levels as much as 30 times the suggested EPA standards for radium in drinking water supplies and 38 times the natural groundwater concentration.

65. Navajo-Exxon EIS, *supra* note 35, at III-33.

inferior-quality water of overlying Dakota sandstone and the high-quality Westwater Canyon aquifer water.⁶⁶ Under normal conditions, the higher-pressure Westwater layer might still purge itself of contamination from the lower-pressure Dakota sandstone aquifer, but because mine dewatering draws enormous quantities of water from the Westwater the pressure has been reduced, permitting an influx of inferior-quality water into the Westwater.⁶⁷ This flow of inferior water into potable water sources will continue until pressure can be restored in the Westwater aquifer.⁶⁸

Here again, as with surface water contamination, observations have confirmed predictions:

1. Marked deterioration of water quality in the Westwater aquifer in the Ambrosia Lake area has already occurred because of a suspected connection between that layer and the local Dakota sandstone.⁶⁹

2. Groundwater in the domestic water supply downgradient⁷⁰ from the United Nuclear-Homestake Partners Mill was contaminated with selenium, a toxic metal, in concentrations 340 times normal background and recommended drinking water levels.⁷¹

3. San Mateo, a village less than 100 yards from a Gulf uranium mine, experienced a gray, greasy discharge from its main water well in June of 1979. Ironically, this well had been drilled at Gulf's expense after the water level in the first well dropped more than 60 feet, shortly after Gulf's mining operation first began.⁷²

Groundwater pollution is also caused when contaminated discharge water, pumped to the surface and left to evaporate from ponds, seeps back into the groundwater whence it originated.⁷³ This process has been documented by the Environmental Impact Statement (EIS) prepared for the Dalton Pass uranium mines.⁷⁴ Although 200,000 kilograms of uranium have been introduced to

66. *Id.*

67. *Peshlakai* Points and Authorities, *supra* note 15, at 31.

68. *Id.*

69. *Id.* at 32.

70. Downgradient is to groundwater as downstream is to surface flow.

71. Navajo EPC Evaluation, *supra* note 3, at 14.

72. Guild Study, *supra* note 36, at 4.

73. Discharge water is contaminated when water dissolves the uranium out of the rock. Seepage of this contaminated water back into underground water thus carries the dissolved uranium with it.

74. Dalton Pass Uranium Mines, *supra* note 47, at 195.

the surface by mine dewatering,⁷⁵ companies have yet to perfect methods for either purification of the carrier water for reuse or for recovery of the dissolved uranium.⁷⁶

Finally, a distinctive feature of underground uranium mines is the presence of ventilation shafts and fans to force "bad air" containing radioactive gases out of the mine and to pull "good air" from the outside into the shafts and drifts. Although such measures no doubt improve the quality of the air inside the mine, they necessarily degrade the air quality outside the mines to some extent. The magnitude of this deterioration has not been carefully monitored; however, an EPA study conducted in 1978 revealed that Santa Fe, New Mexico, although 100 miles from the nearest uranium mine, had the nation's third highest concentration of uranium-238 in its air.⁷⁷ Of course, other factors may be responsible for this phenomenon, but the possibility remains that underground mining may pollute aboveground air at considerable distances from the mines themselves.

In Situ (Solution) Mining

Similar to the water injection method used in the oil industry for several years, in situ solution mining of uranium basically involves pumping uranium in solution from its host rock rather than using physical means to remove the solid ore. Since this greatly simplifies extraction, solution mining operations are being scrutinized with great interest by industry giants looking for ways to cut costs.⁷⁸ Mobil Oil has recently instituted an in situ operation on an experimental basis near Crownpoint, New Mexico.⁷⁹

Solution mining entails the drilling of three distinct types of wells. (Figure 2) Strongly acidic or alkaline solution is pumped into an injection well (sunk by conventional means) at a controlled pressure. This leach solution migrates through the permeable, ore-bearing sandstone and dissolves uranium particles in the rock in a process essentially the reverse of that which first deposited the uranium in the rock. This leachate is drawn from the rock by pumping it back out of a production well or wells at a higher rate

75. Navajo EPC Evaluation, *supra* note 3, at 15.

76. EPA-EDA, Crownpoint Water Supply DEIS, *supra* note 59, at 35.

77. Cited in Peterson, *Lung Cancer Rate Among Uranium Miners Five Times Higher than National Average*, NAT'L HEALTH FED'N BULL., at 29 (Mar. 1980).

78. Lootens, *supra* note 40, at 10-6, 10-8.

79. This operation was in part the subject of the *Peshlakai* suit. *Peshlakai* Facts, *supra* note 31.

than the injection well pumps leach solution in.⁸⁰ Thus, the pressure gradient results in a net withdrawal of fluids instead of a net injection, as is the case in oil operations.⁸¹ The leach zone is cased to prevent seepage of the toxic leach solution into adjacent strata and monitoring wells are drilled around the leach area and above the ore zone to detect escapes of any leachate into contiguous rock layers.⁸² These escapes are called *excursions*. After being pumped to the surface, leachate is shipped to a conventional mill for final processing into yellowcake.⁸³

Initially, one should note that as with all uranium mining activities, significant land impacts attend in situ operations. The

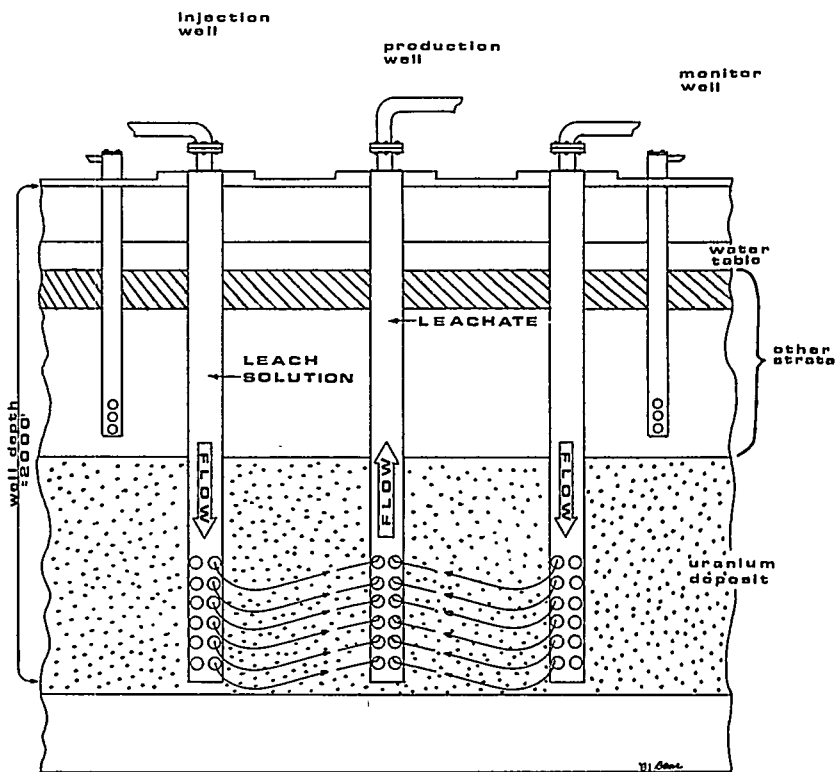


FIG. 2

80. Lootens, *supra* note 40, at 10-5. See Figure 2.

81. Friedman, *Environmental Problems Relating to Uranium Mining and Milling*, 11 NAT. RESOURCES LAW. 277, 289-90 (1978) [hereinafter cited as Friedman].

82. *Id.*

83. Lootens, *supra* note 40, at 10-5.

Mobil in situ operation at Crownpoint occupies a 6-acre area and includes 13 wells (9 injection and 4 production) sunk to depths of as much as 2,000 feet. Only one monitor well has been sunk. There is also a large waste disposal pond on the site in addition to trailers, tanks, pumps, and storage space.⁸⁴ In the course of setting up the operation, the site was totally denuded, substantial earthmoving occurred, and evidence of extensive off-road travel was visible.⁸⁵ A ranching and range management specialist called the condition of the land a disaster area.⁸⁶

The most serious effects of the in situ technique, however, concern the water quality impacts of such operations. The Mobil project is located quite close to water wells for the town of Crownpoint.⁸⁷ Consequently, once injection of leach chemicals into the formation begins, it can be expected that the levels of several toxic and radioactive pollutants in nearby parts of the aquifer will rise significantly.⁸⁸ Excursions of leachate vertically into other formations or horizontally into other areas of the Westwater Canyon aquifer are likely to occur: the United States Geological Service (USGS) has stated that "there is a significant possibility of vertical migration of the in situ leachate."⁸⁹

Although Mobil has attempted to assuage fears by referring to its past record of in situ mining in Texas, serious criticisms of this comparison have been leveled by the USGS, as well as by independent hydrology experts. For instance:

1. The USGS has stated that it is invalid to correlate the leaching proposed in New Mexico with that done in Texas because:

(a) the Texas fields are only 700 feet deep; Crownpoint wells reach up to 2,000 feet;

84. *Peshlakai Facts*, *supra* note 31, at 46.

85. *Id.* at 47.

86. *Id.*

87. A mining engineer for the Bureau of Indian Affairs noted that the project is only four miles from Crownpoint and that the Westwater aquifer, the town's main source of water, was the formation to be leached. Mobil Oil Corp., Interim Mining and Reclamation Plans for Pilot Testing of In Situ Uranium Leaching: Crownpoint Project, McKinley County, New Mexico, at 113-15 (May 1978) [hereinafter cited as Mobil In Situ Mining Plan].

88. U.S. Geological Survey, Environmental Analysis: Mobil Oil Corporation Proposed Pilot Testing of In Situ Uranium Leaching, Crownpoint Project, Lease No. N00-C-14-20-4938, McKinley County, New Mexico, at 107.

89. U.S. Dep't of Interior, Letter of comments on the Draft Environmental Impact Statement for Mobil's Crownpoint Uranium Project (Feb. 17, 1978).

(b) the Texas fields are capped by a homogenous layer of shale impervious to excursions; the Crownpoint field is capped by shale with sand and silt "stringers" through which excursions could travel;

(c) the Texas fields are not being dewatered; the Mobil site will receive extensive dewatering.⁹⁰

2. An independent hydrologist has confirmed the USGS predictions and has also rejected comparisons drawn by the industry between water flooding in oil extraction operations and leachate injection in uranium operations.⁹¹ According to this authority, oil-bearing formations are more homogenous than uranium-bearing layers; therefore, fluid movements in oil-bearing formations can be more consistently predicted than those occurring in uranium-rich strata.

Furthermore, the expert found that two monitor wells proposed by Mobil would not be adequate to assure detection of excursions. In fact, Mobil had completed only one monitor well as of the summer of 1979. That single well reaches levels below those in which some residents' wells are located, so that a vertical excursion into layers above the well might not be detected.⁹²

Although Mobil points to its "excellent record" in its Texas operations, closer examination reveals that the record is not so excellent after all. On August 21 and 22, 1978, Mobil detected an excursion in its Texas operation. The excursion apparently was the result of fluid escape through the cracked casing of an injection well. Leachate was detected in an overlying aquifer, not by any monitor well, but as a result of monitoring injection rates. Although cleanup was promptly initiated, complete restoration had still not been achieved almost one full year later.⁹³ Likewise, present in situ operations in Wyoming have experienced several moderately severe incidents of leakage. In March of 1979, for example, the Wyoming Mining Corporation detected an excursion of leachate in two of its five in situ well fields. In April it detected another excursion in a third well. The company halted operations in two of its well fields as a result of the excursions. No improvement was noted until almost two months later after the company

90. *Id.*

91. Letter from John R. Meadows to James F. Burger, Sept. 29, 1978; *Peshlakai* Facts, *supra* note 31, at 41-42.

92. *Peshlakai* Facts at 43.

93. Letters from Mobil to Texas Department of Water Resources, Aug. 24, 1978, in *id.* at 42.

had initiated a new corrective technique.⁹⁴ These descriptions are in stark contrast to optimistic industry-oriented articles which underreport the cleanup time (36 days for the Texas excursion) and overestimate the state of the art of reclamation.⁹⁵

Neither expert opinion nor laboratory pilot testing supports industry assertions that water quality in affected aquifers can be reclaimed to substantially preoperational levels.⁹⁶ In fact, even Mobil retreated from early assertions that it would restore water quality to baseline values over the course of project development, eventually agreeing only to restore water quality to New Mexico state standards, which would permit 500% increases in concentrations of barium, cadmium, chromium, selenium, silver, lead, and cobalt; 1,000% increases in arsenic, sulphates, and aluminum; 300 times original uranium concentrations, and at least 300 times original copper and zinc concentrations. Radium concentrations would be allowed to double.⁹⁷

Finally, in situ operations generate excess production fluids that must be disposed of. The Mobil operation apparently disposes of its waste in a large pond; other operations may inject their wastes back into subsurface disposal wells.⁹⁸ Obviously, pollution problems here are similar to those encountered in the discharge and runoff of contaminated water from underground

94. *Id.*

95. Friedman, *supra* note 81, at 290, states unequivocally that, "Restoration of the uranium ore zone is not expected to materially affect ground water reserves" He also paints a glowing picture of the in situ method and minimizes the incidents of "escapes" from such operations. *Id.* at 289-90.

96. Officials of the U.S. Bureau of Mines have stated that "restoration involves greater uncertainties than any other aspect of leaching." Tweeton, Anderson & Englemann, Bureau of Mines Research in Injection Well Construction and Environmental Aspects of In Situ Uranium Leach (paper presented at the 1978 Annual Meeting of American Institute of Mining Engineering). The USGS has said that aquifer restoration is an "unanswered question." U.S. Geological Survey, Environmental Analysis: Proposed Canyon Uranium Mining and Reclamation Plan, at 16 (Mar. 7, 1979). The Nuclear Regulatory Commission has stated in a study that restoration of leach field water to original parameters "will be very difficult, if not impossible." Nuclear Regulatory Commission, Thompson *et al.*, Groundwater Elements of In Situ Leach Mining of Uranium, at 59 (Aug. 1978). A restoration test in Mobil's field in south Texas brought water quality up to Texas standards, but would have failed to meet New Mexico standards, which still allow substantial amounts of pollutants to remain in the water (see text accompanying note 97) *Peshlakai* Facts, *supra* note 31, at 45. Laboratory reclamation tests have failed to restore original values for 29 of the 40 substances measured. Mobil In Situ Mining Plan, *supra* note 87, at 28-31.

97. *Peshlakai* Facts, *supra* note 31, at 44.

98. Friedman, *supra* note 81, at 290.

mines and the injection of toxic leach chemicals into rock in the first instance.

Heap Leaching

Heap leaching, like solution mining, involves the leaching of uranium from its host rock. It is used primarily to recover uranium from low-grade ores produced from underground or surface mining activities or the mining of deposits containing other marketable minerals in addition to uranium (e.g., phosphate and copper).⁹⁹

Ore is piled on an impermeable pad of clay or other material and is doused thoroughly with a leach solution. The leachate is diverted away from the pile and shipped to a conventional processing mill for final concentration into yellowcake.

Heap leaching is employed on a limited scale and thus does not involve the same magnitude of environmental hazards as do other methods. However, if the leachate is not carefully contained, contamination of surface and groundwaters by runoff and seepage would parallel that experienced in conventional mining techniques. The problem could be particularly severe if the pad upon which the pile is placed is not absolutely impermeable to fluids, a standard that may be impossible to meet.

3. *Uranium Processing (Dressing, Milling)*

Crude ore produced from conventional mining methods is not the product eventually sold to the power industry; it must be refined and processed in order to concentrate the uranium oxide content. This is accomplished in two stages: first, the crude ore is pulverized until it is a uniform sand-like consistency.¹⁰⁰ This provides the maximum amount of surface area for chemical reactions involved in the second stage. Second, the crushed ore undergoes a series of leaching and precipitation processes that serve to concentrate and purify the uranium oxide into the final mill product, which is yellowcake, a yellowish-colored, sandy solid.¹⁰¹

Ore dressing requires the use of large quantities of harsh chemicals, such as sulfuric acid, sodium carbonate, ammonia, and ammonium hydroxide, as solvents and precipitating agents. Because uranium oxide accounts for only about 1-5% of the total volume of ore mined, the major part of these chemicals combined

99. Lootens, *supra* note 40, at 10-4.

100. Root, *supra* note 1, at 445.

101. Lootens, *supra* note 40, at 10-5.

with the waste ore comprise mill residues called *tailings*. This sludge-like material is piped as a liquid from the mill to tailings ponds where the liquids evaporate, leaving behind the monstrous piles of dried tails characteristic of uranium and other mineral mills. These tails are highly radioactive, containing 85% of all of the radiation in the raw uranium.¹⁰²

The state of New Mexico now supports at least 10 tailings piles, 5 or more of which are still in production. Together, these piles cover more than 1,000 acres and contain nearly 60 million tons of radioactive waste materials.¹⁰³ If growth in the uranium industry in the San Juan Basin region proceeds as projected, there will be up to 22 mills in the area by the year 2000 and nearly 300 million tons of tailings, a quantity sufficient to cover the city of Albuquerque to a depth of 22 inches.¹⁰⁴ The tailings disposal problem is especially acute in this area because most ores mined in the San Juan Basin contain less than one-quarter of 1% uranium oxide per ton.¹⁰⁵ Hence, proportionately more waste is produced per ton of ore than is the case with richer ores.

As these ore bodies are depleted, still lower ore grades will be mined, leading to further increases in the production of tailings per ton of ore. Therefore, if uranium oxide production doubles, tailings generation will more than double. Between 1966 and 1976, the ratio of tailings to yellowcake for all domestic uranium ores has in fact increased by one-third; thus, these projections have already been verified.¹⁰⁶

Because of the economics of hauling enormous amounts of ore to processing plants, mills are usually located close to the mines they serve. At least seven mining projects on Navajo lands have already been proposed.¹⁰⁷ If one mill is required for approximately every five mines,¹⁰⁸ these new projects alone will mandate the construction of at least one major mill on Navajo lands.

The impact of such mills with their associated tailings dumps is awesome. A typical mill site may cover 1,500 acres of land, with

102. Root, *supra* note 1, at 445.

103. New Mexico Uranium Overview, *supra* note 5, at 122-23.

104. *Id.*

105. FEDERAL ENERGY ADMIN., NEW MEXICO URANIUM 1950-2000, at 14 (Dec. 1976).

106. *Uranium Mill Tailings Radiation Control Act of 1978: Hearings on H.R. 1480 Before the Subcomm. on Energy & Power, Comm. on Interstate & Foreign Commerce, 95th Cong., 2d Sess., 1978 U.S. CODE CONG. & AD. NEWS 7433* (testimony of David M. Berick) [hereinafter cited as *Hearings, Mill Tailings Control Act*].

107. *Peshlakai* Facts, *supra* note 31, at 39.

108. Draft San Juan Study, Uranium Projections, *supra* note 7, at 109.

perhaps 900 acres set aside for the actual milling facilities, tailings disposal areas, and associated roads.¹⁰⁹ As the tails dry out, tailings dust is carried by the wind to points many miles distant from the mill. Until the enactment of the Uranium Mill Tailings Radiation Control Act in 1978,¹¹⁰ the massive radioactive tailings piles produced as a result of ore dressing were not subject to a cohesive system of regulation. While the Act and associated regulations have alleviated this source of contamination somewhat by requiring more careful tails management, site checks of four New Mexico uranium mills in 1979 by an official from the Nuclear Regulatory Commission (NRC) revealed substantial disparities in the condition of the respective tailings piles,¹¹¹ suggesting that airborne radioactivity from tailings has not been eradicated.

Substantial groundwater contamination from the seepage of leachate liquids and radioactive residues of the milling process has also been documented. Toxic substances from drying tailings piles seep into the ground beneath the ponds, contaminating local groundwater supplies. Surface waters from rainstorms that flow across the piles also pick up radioactive and toxic pollutants (such as uranium, thorium, radium, polonium, and bismuth), which likewise eventually seep back into groundwater sources. At Anacoda's Bluewater operations, for example, a 1975 EPA study found that seepage constituted 8% of the flow into the tailings ponds, causing some 12,000 cubic meters per year of toxic solutions to leach into the shallow drinking water aquifer beneath the area.¹¹² Kerr-McGee's Ambrosia Lake tailings pond had an even worse record: almost one-third (29%) of the total influents, or 496,400 cubic meters per year, were seeping into underground water supplies.¹¹³

Since passage of the Uranium Mill Tailings Radiation Control

109. N.M. Uranium Overview, *supra* note 5, at 119.

110. Regulations detailing compliance with the provisions of the Act were first published in the *Federal Register* on Aug. 24, 1979. 42 U.S.C. §§ 7901 *et seq.* (Supp. 1979); 44 Fed. Reg. 50,012, 50,015.

111. Inspections by J. Bazemore of the Nuclear Regulatory Commission in September of 1979 disclosed substantial windblown tailings at the Kerr-McGee mill and a lack of formal stabilization or reclamation plans at either this mill or the nearby United Nuclear-Homestake Partners mill. *Oversight Hearing on the Mill Tailing Dam Break at Church Rock, New Mexico, Before the Subcomm. on Energy & Environment of the Comm. on Interior & Insular Affairs*, 96th Cong., 1st Sess. (Oct. 22, 1979), at 113-16 [hereinafter cited as *Hearings, Dam Break*].

112. Environmental Protection Agency, *Water Quality Impacts of Uranium Mining and Milling Activities in the Grants Mineral Belt, New Mexico* (Sept. 1975).

113. *Id.*

Act, however, most companies have instituted monitoring programs and improved tailings management; but once again industrial compliance with federal regulations has in some instances been less than exemplary.¹¹⁴ Present regulations require tailings piles to be located on an impermeable base, sprayed with water or permitted to “crust over” to keep down dusting as residual liquids evaporate. Some piles are buried beneath one to several feet of dirt or clay.¹¹⁵ However, even extraordinary care will not control *all* radioactive and toxic emissions from tailings piles.¹¹⁶ And alternative disposal methods (such as deep well injection of wastes) could result in serious contamination of underground waters.¹¹⁷ Thus, despite the congressional mandate of the Uranium Mill Tailings Radiation Control Act, uranium tailings heaps remain a potent—and growing—threat to the physical environment and to human health.¹¹⁸

An ominous illustration of the hazards of mill tailings disposal occurred on July 16, 1979, at the United Nuclear Corporation processing facility at Church Rock, New Mexico. On that day, a massive crack cleaved an earthen dam, spilling more than 93 million gallons of contaminated liquids and 1,100 tons of radioactive solid wastes from the corporation's tailings pond into a dry arroyo that empties into the Rio Puerco. The Rio Puerco, a stream used by Navajo herdsmen as a watering hole for their livestock, carried the residues more than 100 miles.¹¹⁹

Ironically, this dam had been a new, improved design, using earth instead of tailings themselves to dam the tailings pond, recommended by the NRC itself.¹²⁰ Special design criteria had

114. Bazemore documented a significant groundwater contamination problem at the Kerr-McGee mill. *Hearings, Dam Break, supra* note 111, at 113-16.

115. *Hearings, Mill Tailings Control Act, supra* note 106, at 151 (statement of Maxie L. Anderson, Ranches Exploration and Development Corp.)

116. A General Accounting Office study released in June of 1977 reported that existing technology cannot fully control radioactive releases from tailings piles. *Hearings, Mill Tailings Control Act, supra* note 106, at 435. This conclusion was confirmed in the EIS prepared by Exxon in preparation for the approval of its 400,000-acre lease on Navajo lands. Navajo-Exxon EIS, *supra* note 35, at I-27.

117. Deep well injection of milling wastes was being used by the Anaconda Corporation at one of its processing sites as recently as 1978. Navajo EPC Evaluation, *supra* note 3, at 14.

118. If uranium development proceeds as projected in the San Juan Basin area, some 2,291 acres or more of land will be made permanently unusable for any purpose other than uranium tailings dumps. N.M. Uranium Overview, *supra* note 5, at 109.

119. *Hearings, Dam Break, supra* note 111, at 1 (testimony of Morris K. Udall).

120. *Id.* at 29 (testimony of Professor Lawrence A. Hansen).

been devised by the NRC prior to licensing of the dam. However, the corporation did not follow these criteria.¹²¹ Nor did it undertake regular inspections of the completed dam, although independent consultants hired by the firm had strongly recommended that it do so.¹²² Even after a consulting firm had observed and notified the corporation of a dangerously high settlement rate and the beginnings of small cracks in the dam as of 1977, it still took little or no preventive action.¹²³ At least three federal and state regulatory agencies overseeing the licensing and construction of the dam could have predicted that the dam would break, but failed to do so.¹²⁴

The spill immediately contaminated the waters of the Rio Puerco and Little Colorado rivers, rendering them unfit for consumption by humans or livestock. Navajo residents were instructed not to use the water or to eat livestock that had drunk the contaminated water,¹²⁵ but many Navajos could neither read the newspaper reports of the spill nor the signs posted by government officials in the affected areas.

Although contamination of the surface waters was transitory, elevated levels of radioactive contaminants—predominantly thorium and heavier metals involved in uranium processing—deposited by the waters in streambeds and in the areas flooded by the spill have been measured at points downstream from the dam.¹²⁶ Contaminants from the spill have also seeped into shallow groundwater sources near the site.¹²⁷ The potential health danger from these pollutants is the subject of vigorous debate. The corporation, the EPA, and NRC officials insist that near-background levels have been restored in surface and groundwater supplies, leaving only the solid “salts” deposited by the waters of the spill as a possible source of radioactivity. Independent consultants insist that the threat is much greater because the elements released are not as transitory as those released in the Three Mile Island incident.¹²⁸ Although cleanup began promptly and the corporation removed riverbed sediments contaminated by

121. *Id.* at 106.

122. *Id.* at 2.

123. *Id.* at 2, 3.

124. *Id.* at 2.

125. *Id.* at 14 (testimony of Helen George).

126. *Id.* at 36 (testimony of William Dircks, Nuclear Regulatory Commission).

127. *Id.* at 48 (testimony of Paul Robinson, Southwest Research and Information Center).

128. *Id.* at 40-47, 78-79.

the spill to its tailings dump over a period of more than three months,¹²⁹ the ultimate effects of the spill—if any—have yet to be determined.

Church Rock was by no means the first tailings spill in the history of the United States uranium processing industry: between 1959 and 1977, there were at least 15 spills of tailings, 7 of which involved dam failures.¹³⁰ Another United Nuclear Corporation facility experienced a tailings spill that completely covered the company's mill and mill yard with some 55 cubic yards of solids; yet another incident released 35,000 gallons of tailings slurry into the Colorado River.¹³¹ Given the present design of most tailings dams, future spills are a virtual certainty unless companies are held to strict design standards and continual monitoring of their tailings dams.

Health Impacts

Prior to the beginning of United States uranium mining operations in the late 1940s and early 1950s, Europe had already experienced firsthand the health hazards involved in the industry. For more than five centuries, one-third to one-half of the miners in the Schneeberg mining region of southern Germany and the Joachimsthal region of modern Czechoslovakia had regularly incurred a fatal respiratory disease, finally diagnosed as lung cancer in 1880.¹³² However, this bleak history went unnoticed by the United States Atomic Energy Commission (AEC) in the early days of uranium mining.

During the period of the AEC's monopoly over uranium production and distribution, miners were sent to work in uranium mines ("dog holes") without ventilation, where they were exposed to radiation levels 30 to 40 times the permissible rate today.¹³³ Miners were given no warnings concerning the dangers of radioactivity in the mines nor of the especially deadly effect

129. *Id.* at 37, 40-47.

130. *Id.* at 9 (testimony of Dr. Thomas Gesell).

131. *Id.* at 2.

132. *Radiation Exposure of Uranium Miners: Hearings Before the Subcomm. on Research & Development of the Comm. on Atomic Energy, 90th Cong., 1st Sess., pt. I at 140 (May 9, 10, 23; June 6-9; July 26, 27; Aug. 8, 10, 1967) [hereinafter cited as Hearings, Radiation].*

133. *Occupational Health Hazards of Older Workers in New Mexico: Hearings Before the Senate Special Comm. on Aging, 96th Cong., 1st Sess. (Aug. 30, 1979) (testimony of Harold Tso, Director, Navajo Environmental Protection Commission) [hereinafter cited as Hearings, Health Hazards].*

smoking cigarettes had on lung tissue when combined with a radon-rich environment.¹³⁴ Provided with no pure water source, they would drink the radioactive water that constantly seeped from the mine walls.¹³⁵

Federal recognition of the problems associated with uranium mining was painfully slow. The first federal "supervision" was initiated in the late 1960s, but it amounted to little more than a paper tiger: inspectors would sporadically poke their heads into the mines and then beat a hasty retreat from the smoke and dust, since they had no authority to do anything else.¹³⁶ Although it was understood by 1950 that the prime source of radioactivity in underground mines was the decay of radioactive radon gas—an unstable element—into more stable decay products called *radon daughters*, no federal standard for radon exposure was set until 1967.¹³⁷ In 1970 the first federal legislation with any teeth in it became effective;¹³⁸ however, application of its provisions for mandatory inspections was hampered by long compliance times and cumbersome enforcement procedures.¹³⁹ It was not until 1978, the effective date of the Federal Mine Safety and Health Act,¹⁴⁰ that uranium miners were finally assured some meaningful protection of their right to work in a reasonably safe environment.

This legislation came too late to help those miners who had started uranium mining under the AEC's stewardship.¹⁴¹ Beginning in 1950, the Public Health Service (PHS) had initiated a filed survey of the incidence of various diseases, particularly lung cancer, among uranium miners. By then it was known that radon

134. *Id.* at 3.

135. *Id.* at 34.

136. *Id.* at 3-9, 54.

137. *Id.* at 9.

138. Federal Metal and Nonmetallic Mine Safety Act, 30 U.S.C. §§ 721-741 (Supp. 1981).

139. *Hearings, Health Hazards, supra* note 133, at 55.

140. 30 U.S.C. §§ 801 *et seq.* (Supp. 1981)

141. Legislation to provide compensation to these miners, many of whom have never been able to qualify for state workers compensation, has been pending in Congress in one form or another for almost five years. The first bill, S. 3199, introduced in 1977 by Senator Peter Domenici of New Mexico, was subjected to severe criticism and eventually died. Senator Domenici's latest effort, S. 1827, was introduced in 1979 and has recently been combined with another bill aimed at compensating victims of the Nevada nuclear tests, S. 1865. *Joint Hearings on S. 1865 Before the Subcomm. on Health & Scientific Research of the Comm. on Labor & Human Resources and the Comm. on the Judiciary*, 96th Cong., 1st Sess. (June 10, 1980).

daughters from the decay of radon gas attach themselves to dust particles in the mine environment, which causes uneven irradiation of lung tissue when inhaled by miners.¹⁴² The results of the PHS survey showed a mortality rate from cancer from 2 to 40 times the expected rate, depending upon the total exposure received by miners.¹⁴³ The PHS findings also identified a 10- to 20-year delay in the onset of lung cancer and a markedly higher incidence of lung cancer in uranium miners who smoked cigarettes.¹⁴⁴

Due to this extended lag time, confirmed cases of uranium mining-related cancers are only now reaching epidemic proportions. The observed mortality rate is exceeding the expected rate by a factor of 5,¹⁴⁵ and even among nonsmoking Navajo miners, the lung cancer mortality rate has now been demonstrated to be significantly greater than expected.¹⁴⁶

Controls instituted by several western states in the early 1960s

142. *Hearings, Radiation, supra* note 132, at 140.

143. Government and industry have adopted the standard of a *working level* (WL) to measure exposure to the concentration of radon daughters. One WL is defined as the total radon daughter emissions in one liter of air that will total 1.3×10^5 million electron volts of potential alpha energy from the radioactive decay of the radon daughters. Exposure is measured in *working level months* (WLM). One WLM equals the level of exposure to radioactive daughters incurred by working in an environment of one WL for one month (170 hours). The correlation between exposure to radiation and increased incidence of death was found to be as follows:

<u>Exposure</u>	<u>Expected Mortality</u>	<u>Observed Mortality</u>	<u>Increased Incidence</u>
120-840 WLM	3.1*	4.9	1.2
840-1,799 WLM	3.9	18.2	4.7
1800-3,719 WLM	4.8	50.	10.
more than 3,720 WLM	4.3	171.	40. +

* per 10,000 man years

Hearings, Radiation, supra note 132, at 141. Experts have estimated that 45% of the uranium miners working in unventilated mines between 1940 and 1950 were exposed to WL concentrations in excess of 10 WL daily and 16% were exposed to more than 50 WL. *Hearings, Health Hazards, supra* note 133, at 60.

144. *Hearings, Radiation, Part II, supra* note 132, at 1336. However, even after the data was adjusted to allow for cigarette smoking, the pattern of lung cancer persisted, indicating that smoking alone could not have accounted for the increased incidence. *Id.*, Part I, at 141. Many companies instituted "no smoking" rules after 1967 in response to the PHS findings. *Hearings, Health Hazards, supra* note 133, at 51.

145. *Hearings, Health Hazards, supra* note 133, at 56-62 (testimony of Joseph K. Waggoner, Special Assistant for Occupational Carcinogenesis, Occupational Safety & Health Administration).

146. *Id.* at 61.

succeeded in reducing mine radiation significantly by 1967.¹⁴⁷ Originally set at 12 WLM by the United States Department of Labor in 1967,¹⁴⁸ the maximum exposure level was reduced to 4 WLM in 1971.¹⁴⁹ According to at least one industry official, the average working level exposure of uranium miners as of 1978 was well under this federal standard.¹⁵⁰ Present regulations call for mandatory sampling of mine air and maintenance of monitoring records to ensure compliance with these standards, in addition to records of exposure levels experienced by individual miners.¹⁵¹

Thus, today the mine radiation hazard is clearly nowhere near the magnitude of that experienced by early miners. Better ventilation, increased safety education, and the use of wetting agents to keep down dust have helped minimize mine radioactivity. What effect the lower radiation exposure levels will have on health is the subject of a study begun in 1977 by the state of New Mexico and the University of New Mexico.¹⁵² Because of the 10- to 20-year delay in the onset of mining-related cancer, however, the results of this study will not be available for years to come.

Attention is now shifting to the outside of the mines, where the venting that saves miners' lives is coming to be regarded as a potentially significant health hazard to surface workers and the general populace nearby. Vent emissions are presently not regulated by either the federal or state governments. It is thus possible that radioactivity from mines, once vented to the exterior, could travel downwind for many miles, posing a health threat to communities some distance from the mines. For example, an EPA study published in 1978 recorded the nation's third highest concentration of U-238 in the air around Santa Fe, New Mexico, although Santa Fe is 100 miles from the nearest uranium mining activity.¹⁵³ At the very least, it poses a threat to nearby residents. Investigators for one study observed open mine shafts within yards of Navajo dwellings;¹⁵⁴ at the Laguna Pueblo

147. Beverly, *Development and Legislation of Environmental Regulations for Mining*, 15 ROCKY MTN. MIN. L. INST. 163, 171 (1969).

148. *Id.* at 170-71.

149. *Hearings, Health Hazards*, *supra* note 133, at 48-53.

150. *Id.* at 48 (testimony of Langan Swent, Vice President of Engineering, Homestake Mining Corp.).

151. 30 C.F.R. §§ 57.5-33 through 57.5-47 (1979), *amended* 44 Fed. Reg. 31,908 (June 1, 1979).

152. *Hearings, Health Hazards*, *supra* note 133, at 48.

153. *See Peterson*, *supra* note 77.

154. *Guild Study*, *supra* note 36, at 6.

operations, a vent discharges dust and gas only a short distance from a schoolyard.¹⁵⁵

Uranium Milling Health Hazards

With the improvement of underground uranium mining environments, concern has arisen over radiological air pollution from other stages of uranium production. The NRC has found that, although radioactive dust is abundant in mines, the major source of the dust is the tailings from the processing of ore into yellowcake.¹⁵⁶ In fact, radioactivity from exposed tailings piles has been called "the dominant radiation exposure from the nuclear fuel cycle" by no less an authority than the former chairman of the NRC himself.¹⁵⁷

The primary sources of radioactivity emanating from tails are radon gas and its daughters, and alpha, gamma, and beta radiation.¹⁵⁸ Radon emissions from tailings may persist for 100,000 years or more,¹⁵⁹ although the half-life of radon itself is only about four days, once it is released to the atmosphere.¹⁶⁰

The release of radon and particulates increases dramatically as mill tailings dry out: The NRC found that five years after mill shutdown, radionuclide exposure from radon gas and particulates increased by as much as 60% for people living within a 50-mile radius of the mill.¹⁶¹ William Rowe, former Deputy Assistant Administrator for Radiation Programs of the EPA, testified in congressional hearings that radon gas is so highly carcinogenic that even reestablishing background levels of radioactivity at mill tailings sites would still approximately double the lung cancer rate for nearby residents.¹⁶² The NRC has concluded that even if individual mills comply with radiation standards, the emissions from

155. *Id.* at 9.

156. *Peshlakai Facts*, *supra* note 31, at 29.

157. *Hearings*, Mill Tailings Control Act, *supra* note 106, at 217 (testimony of Joseph M. Hendrie, Chairman, Nuclear Regulatory Commission).

158. *Id.* at 175 (testimony of Maxi L. Anderson, President, Ranchers Exploration & Development Co.).

159. *Id.* at 217 (testimony of Joseph M. Hendrie).

160. *Id.*

161. Nuclear Regulatory Comm'n, Draft Environmental Impact Statement on Uranium Milling, at 6-47 (Apr. 1979) [hereinafter cited as NRC, Uranium Milling DEIS].

162. *Hearings*, Mill Tailings Control Act, *supra* note 106, at 400 (testimony of William D. Rowe, Deputy Assistant Administrator for Radiation Programs, Environmental Protection Agency).

nearby mills may result in cumulative exposure of the people in the area to levels exceeding the maximum approved.¹⁶³

For uninformed Indians living near mills, airborne radiation is not the only threat. Many Indians living near tailings dumps use the tailings and waste ore from the milling process in the construction of their homes.¹⁶⁴ A CBS news crew documenting the plight of Navajo uranium miners discovered that some Navajo homes near a mill site emitted more than 100 rems, 20 times the maximum permissible yearly exposure to gamma radiation established by the federal government.¹⁶⁵ In the process of demolishing an old mill at Shiprock, New Mexico, the mill building itself was found to be highly radioactive because tailings dust, containing 25% uranium oxide, was sandwiched between two layers of plywood and had inadvertently been built into the roof.¹⁶⁶

Socioeconomic Impacts

The projected growth of uranium production activities in the San Juan Basin region in the immediate future presages a mining boom not unlike the gold rush in California, the Alaskan oil discoveries, and coal and oil shale development in Wyoming. The boomtown effects of such massive development are likely to be even more devastating in this case because most of the projected growth is expected to occur on remote Indian lands occupied by people who live in simple homes without electricity or plumbing, and who have lived in this traditional way for centuries.¹⁶⁷

Accelerated uranium production in the San Juan area is likely to have serious adverse impacts on at least three elements of economic life in the region: employment, housing, and social service programs. Considered as a whole, these socioeconomic impacts have been characterized as "the most significant cumulative effects" of the entire development scheme by the NRC itself.¹⁶⁸

Unemployment and Underemployment

During the last decade, unemployment on Indian reservations

163. NRC, Uranium Milling DEIS, *supra* note 161, at 4.

164. This story may sound somewhat familiar. A few years ago, it was found that a school in Grand Junction, Colorado, had been built atop an abandoned tailings dump. This discovery was made after an abnormally high incidence of leukemia was observed among children attending that school. Apparently Indians are not the only ones who use tailings in building construction.

165. *Hearings*, Health Hazards, *supra* note 133, at 40-41.

166. *Id.*

167. Draft San Juan Study, *supra* note 4, at I-8 through I-12.

168. NRC, Uranium Milling DEIS, *supra* note 161, at 21.

has been consistently higher than the national average. On the Navajo Reservation, for example, unemployment has been running at 30-60% for the last decade.¹⁶⁹ Resource development has been viewed as a way to help solve this problem and has provided energy companies substantial negotiating leverage when dealing with recalcitrant tribal governments.¹⁷⁰

However, results of preference programs for Indian employees have demonstrated serious flaws in this planning philosophy. First, enforcement of such provisions in leasing contracts has been lackadaisical at best.¹⁷¹ If enforcement is not improved in the future, there is no reason to expect that new mining projects will actually result in increased Indian employment. Second, even if the clauses are enforced, only a limited percentage of the potential Indian labor force can actually be expected to accept mining-related work. A recent survey conducted for the Navajo Nation found that mining is not a preferred occupation. In fact, of those polled, 65% of those employed on-reservation and 82% of those employed off-reservation said that they would not work in underground mines.¹⁷² Currently only 7% of the total Navajo labor force is employed in energy-related jobs, and of this figure two-thirds of the Navajo workers actually are employed in the public sector rather than by the mining companies.¹⁷³ One study estimated that total Indian employment in the San Juan Basin by the year 2000 will be 5,000.¹⁷⁴ Yet, according to employment projections for the area, Indian employees will be outnumbered by non-Indian employees two or even three to one.¹⁷⁵ These projections of the Indian share of new employment in the uranium in-

169. Henderson, *Economic Development and Employment: The Navajo Nation, Seminar on Indian National Resources Law: Summary of Proceedings*, at XIII-6 (rough draft 1979) [hereinafter cited as Henderson].

170. *Id.* at XIII-5.

171. In response to this enforcement void, the Navajo Nation established an Office of Navajo Labor Relations in 1973 which has been generally successful in achieving enforcement of Indian labor preference clauses, although leases entered into prior to 1973 may escape regulation by this agency. *Id.* at XIII-8.

172. Meyers, *Uranium Industry Labor Market Analysis, San Juan Basin Regional Uranium Study, Working Paper No. 10*, at 7 (May 1, 1978) [hereinafter cited as *Draft San Juan Study, Labor Analysis*].

173. Henderson, *supra* note 169, at XIII-8.

174. *Draft San Juan Study, Labor Analysis, supra* note 172, at 7.

175. Employment in the region is expected to double, with peak levels at 22,163 to 33,041 employees working in the 72 to 105 new mines expected to become operational between 1980 and 1985. One-half to three-quarters of these new jobs will most likely go to non-Indian immigrants to the area; *Draft San Juan Study, Labor Analysis, supra* note 172, at 32. *Draft San Juan Study, Uranium Projections, supra* note 7, at 15, 70.

dustry are consistent with present employment figures for the area.¹⁷⁶

Thus, even assuming maximum Indian employment and vigorous enforcement of preference clauses, Indian employees will still be outnumbered at least two to one in the San Juan Basin uranium projects.¹⁷⁷ Additionally, the non-Indian to Indian ratio may have other negative impacts that will outweigh any temporary Indian employment possibilities.¹⁷⁸

Social Programs and Housing

The effects of rapid growth in uranium production activities on social programs and housing will be no less severe. The Secretary of Energy has designated three counties within the San Juan Basin region (which together comprise all of the area within the Grants Mineral Belt) as "energy impact areas" under the Powerplant and Industrial Fuel Use Act of 1978.¹⁷⁹ Under the provisions of this Act,¹⁸⁰ areas meeting the criteria of "energy impact areas" are entitled to federal financial assistance. Two of the three criteria for designation as energy impact areas concern shortages of public facilities and housing that are the result of an 8% or greater increase in coal or uranium development-related employment.¹⁸¹ Thus, by definition, the entire Grants Mineral Belt will suffer serious public services shortages if projected uranium development occurs.

A study prepared by the state of New Mexico has predicted the following service-related impacts¹⁸²:

1. The economic base of the affected community will become heavily dependent on the new energy-based projects.

176. Navajo employment in uranium projects on the Navajo Reservation constituted 63% of the total labor force on such projects (387 out of 615). Henderson, *supra* note 169, at XIII-7 Table 3.

177. According to industry figures, Indian employment in uranium mining activities in other areas of the country may be higher. Seventy percent of the Spokane Reservation Sherwood Project work force is Indian, and the Laguna Pueblo operations allegedly employs an even higher percentage of Indian workers. E & MJ reprint, *supra* note 12.

178. See text accompanying notes 204-208 *infra*.

179. 44 Fed. Reg. 48,319, 48,320 (Aug. 12, 1979).

180. Powerplant and Industrial Fuel Use Act of 1978, Title VI, § 601, 92 Stat. 3289 (1978).

181. *Id.* at § 601(a)(1)(A).

182. Governor's Energy Impact Task Force, State of New Mexico, Managing the Boom in Northwest New Mexico, at II-2 (Sept. 1977) [hereinafter cited as Managing the Boom].

2. The need for community services and facilities will outstrip financial and managerial resources.

3. Public facilities like water and sewer systems will not be able to expand fast enough to meet expected growth.¹⁸³

4. Serious shortages of permanent and mobile housing will occur.

5. School classroom capacity will become inadequate to handle additional pupils.

Revenue to meet these problems will be in short supply. It is estimated that over the next five years some \$244 million will be required to meet increased capital expenditures in uranium boomtowns, yet based on current levels of government spending and state and federal aid, the incorporated communities in northwestern New Mexico will have only \$161 million with which to cover these expenses, a shortage of \$83 million.¹⁸⁴

These additional needs cannot be met by either local or state governments for at least the next five years because these communities are already saddled with the highest property tax rates in New Mexico and are for the most part bonded to their constitutional limits. Federal assistance likewise may lag behind the pace of growth. Private industry has resisted providing advance assistance and may in fact be restricted by the Internal Revenue Service from providing it.¹⁸⁵

Indian tribes will be particularly hard-pressed to meet these increased revenue demands because they receive little return on state taxes, and are wholly ineligible for federal benefits under section 601 of the Inland Energy Reserve Development Impact Assistance Act, enacted in 1979.¹⁸⁶ One possible solution is for tribes to initiate aggressive new taxation schemes to "trap" some of the capital generated by their lands;¹⁸⁷ however, private industry may vigorously oppose the imposition of taxes by a third level of government in addition to state and federal taxes.

183. A recent EPA study reported that the water supply of Crownpoint, New Mexico, the site of several proposed projects, including Mobil's in situ mining operation, is already overcommitted. Further demands could push the situation beyond the critical point. EPA-EDA, Crownpoint Water Supply DEIS, *supra* note 59, at 16.

184. Managing the Boom, *supra* note 182, at II-4, II-6.

185. *Id.* at II-14.

186. *Hearings, Health Hazards, supra* note 133, at 31.

187. The Navajo Nation enacted an entirely new taxation code in 1978. Title 24, Navajo Nation Tribal Code, chs. 3, 5 (Supp. 1980). See *Merrion v. Jicarilla Apache Tribe*, 617 F.2d 537 (10th Cir. 1980)(en banc), *aff'd on other grounds*, 102 S.Ct. 804 (1982).

Housing to accommodate the increased population in uranium boomtowns likewise presents a formidable problem. A study completed by the New Mexico State Planning Office has projected that between \$50 million and \$145 million in new housing will be needed in the Grants Mineral Belt alone by the year 1985.¹⁸⁸ Because of the boomtown character of growth, housing loans are likely to be considered high risk by moneylenders. In other boomtowns, experience has confirmed this prediction.

Finally, as is discussed in Part II, unless the Indian tribes affected by uranium development acquire a long-term interest in the exploitation of their own resources—something beyond mere passive receipt of royalties—uranium development will result in a net *outflow* of value from the reservations. Indian tribes will remain dependent on the “center” for capital, expertise, and social programs and will reap only meager profits from their resources, while outside interests benefit from favorable tax treatment and massive value-added profits.¹⁸⁹

Sociocultural Impacts

The sociocultural impacts of the birth of a boomtown in an isolated area inhabited by shepherds will be enormous. Rapid population increase and explosive growth in commercial activities can be expected to affect local Indian populations in the following ways: (1) erosion of traditional livelihoods and religion; and (2) increased friction between Indian and non-Indian residents of the area.

Uranium extraction and processing involve horrendous impacts on the natural environment, as described earlier. To Navajos and to other tribes who consider themselves to be an integral part of nature, this disruption of sacred sites is the worst sort of blasphemy. One Indian plaintiff in the *Peshlakai* suit expressed his beliefs as follows:

I feel that the earth is very powerful and that it has a spirit just like we do. The job of the earth has been from the very beginning to take care of mankind. But in return, mankind must treat the earth with respect.

By mining uranium the outsiders are attacking the very heart of the earth. They are upsetting the balance of the earth by

¹⁸⁸ N.M. State Planning Office, *The Grants Uranium Belt*, at 31.

¹⁸⁹ See text accompanying notes 269-271.

blasting and digging and removing what is under the ground. The results of this will be very bad for us all.¹⁹⁰

Uranium exploration activities have already disturbed some 85,000 acres of land in the San Juan area alone,¹⁹¹ resulting in the destruction of forage for livestock, the obliteration of natural sites held sacred by the Navajo, and the destruction of native plants Navajos use in their religious ceremonies.¹⁹² This callous disregard for the religious sensitivities of another society has been most fittingly described by a Navajo plaintiff in the *Peshlakai* suit:

The drillers did not ask us where our sacred sites were before they began doing their work. No efforts were made to determine which areas were sacred to us and to protect them even though these people must have known that Navajos have a special relationship to the land and would have such [sacred] areas.

Now that these places are destroyed it will not be easy for us to find other places for our ceremonies. We cannot just go and choose one. These places are traditional and have been selected through much prayer by many of our fathers and grandfathers. I do not know when we will find areas which we can use as we used these.¹⁹³

Another Navajo plaintiff in the *Peshlakai* suit has put this wanton destruction of sacred natural sites and healing plants in a white person's context: "It is as if we went about destroying the churches and Bibles and altars and other holy places and artifacts of the white man's religion."¹⁹⁴

The importance of preserving Indian religious sites was explicitly recognized by the passage of a joint resolution entitled "American Indian Religious Freedom Act" in 1978.¹⁹⁵ One of the primary interferences with the free exercise of native religions identified by Congress was denial of access to physical locations that are sacred to Indians.¹⁹⁶ The Act directs executive agencies to

190. Affidavit of Ernest Thompson, *Peshlakai* Facts, *supra* note 31, at 15.

191. *Peshlakai* Points and Authorities, *supra* note 15, at 52.

192. Affidavit of Walter Peshlakai, *Peshlakai* Facts, *supra* note 31, at 15-17.

193. *Id.*

194. Affidavit of Hah-no-bah Charley, *Peshlakai* Facts, *supra* note 31, at 17.

195. 42 U.S.C. § 1996 (Supp. 1980).

196. H.R. REP. NO. 1308, 95th Cong., 1st Sess., 1978 U.S. CODE CONG. & AD. NEWS 1262-66.

review their programs and activities to ensure that violations are corrected promptly and to assure that the agencies take into account the religious practices of Native Americans who may be affected by their operations. In response to this directive the Department of the Interior agreed that, before it proceeds with a proposed action, it will: (1) investigate to determine if a religious site will be affected; (2) if a site will be affected, consult with Native American traditional leaders to determine if the action would infringe upon religious freedom of their group; (3) if infringement is likely, prepare alternate plans that avoid infringement, and (4) if avoidance is not feasible, weigh the potential impacts against the importance of the project.¹⁹⁷ The report submitted to Congress by the BIA acknowledged that it was aware of complaints concerning infringement of religious freedom as a result of uranium mining in the San Juan Basin.¹⁹⁸ Despite the directives of the statute and documented proof that some Indians object to the interferences of uranium development activities with the exercise of their religion, no environmental impact statement investigating the impacts of such activities on Indian religious practices in the San Juan Basin area had been prepared as of the summer of 1979.¹⁹⁹

An even more tangible example of the erosion of traditional Indian culture because of uranium development is the destruction of forage and contamination of water used for livestock, the economic mainstay of the Navajo way of life. Grazing animals are not only the major asset of most Navajo extended families but are also the basic element of support for most of them.²⁰⁰ Yellowcake production in the area has already inflicted serious harm to some Navajos' livestock: mine discharge water contaminated with toxic metals and radioactive substances has poisoned sheep, cows, and goats that have drunk it,²⁰¹ and construction of exploration roads and drill holes has destroyed already overgrazed forage areas.²⁰² As the pace of development accelerates, these impacts can be expected to intensify.

In addition to disturbances created within traditional Navajo culture, massive uranium development is expected to cause

197. U.S. Dep't of Interior, Report to Congress on the American Indian Religious Freedom Act of 1978, *Peshlakai* Points and Authorities, *supra* note 15, at 14.

198. *Id.* at app. C.

199. See text accompanying notes 256-257.

200. Navajo-Exxon EIS, *supra* note 35, at II-130.

201. Affidavit of Leo Martin, *Peshlakai* Facts, *supra* note 31, at 17.

202. *Peshlakai* Facts, *supra* note 31, at 17.

substantial conflict between Indian residents and non-Indian immigrants into the areas affected by development. The explosive growth of the population in the San Juan Basin area—at least a doubling of the present figures by the year 2000²⁰³—will be caused primarily by an influx of non-Indian workers into the area. The Department of the Interior has already acknowledged the probable impact of such an imbalanced racial composition in areas of northwestern New Mexico affected by coal development, a situation analogous to uranium frontiers²⁰⁴:

In-migration of urban Anglos from outside New Mexico would increase the minority status of the native Hispanos and Indians. Different values and objectives between long-time Anglo inhabitants and newcomers, and between Anglos, Hispanos and Indians would result in increased conflicts.

Hispanos and Indians would encounter growing social and economic pressure to conform to Anglo values and lifestyles. Adverse impacts on the well-being of individuals, including disorderly conduct, alcoholism and psychological distress would be likely to result, particularly in the border towns of Farmington and Gallup. . . .²⁰⁵

Past experience with boomtown environments has confirmed the social disruption that accompanies such massive, sudden growth:

Attempted suicide, divorce, truancy, crime, child beating, and alcoholism have all been observed to rise dramatically in such boomtowns as Rock Springs and Gillette, Wyoming and Craig, Colorado In such an environment, the first issue of life in a boomtown becomes, as one study concluded, simply human survival at a level above mere existence.²⁰⁶

The impact of this cultural shock on fragile, traditional Indian life-styles would be devastating. The primary danger would be created from the clash of traditional values with new, imported values, reflected in a polarization of the Indian community between the new class of wage-earners and the traditional pastoral community.²⁰⁷ The EIS for one western energy development project predicted the results of that development as follows:

203. Draft San Juan Study, Uranium Projections, *supra* note 7, at 15, 70.

204. EIS, Star Lake-Bisti, *supra* note 5, at V-1.

205. *Id.*

206. *Id.* at IV-66.

207. This polarization was earlier predicted by Ruffing in her study of the impacts of uranium development on Navajo society. Ruffing, *the Navajo Nation: A History of*

All of these changes would impact upon the tenacity with which these Navajo people cling to traditional lifestyles and sooner or later erosion of some traditional beliefs would set in. The shift may be slow but innovation would eventually change the ways in which these traditional Navajos live their lives.

The result of these changes would be characterized by family conflict, the abandonment of traditional economic activities, frustration with new and culturally unacceptable surroundings and some inability to cope with a strange environment. In some instances families may disintegrate and for some who cannot cope with the impact of change retreat into emotional instability or alcoholism may result.²⁰⁸

Although these predictions were made for coal development, uranium development portends the same social upheaval given the rapid rise in population, the increased and partially unmet demands for public services and facilities, the disparity between cost of living and income levels, and the influx of a non-Indian transient population into a relatively small area.²⁰⁹ If uranium development exceeds the projected "moderate" level, the impacts could be even more severe.

II. *Indian Control of Indian Uranium: The Myth and the Reality*

Given the massive effects on Indian lands, society, and health, one might wonder why it is that organized Indian opposition to uranium resource development has not been stiffer. In fact, opposition has been noticeable, but for the most part it has also been limited to isolated manifestations of resistance, such as the *Peshlakai* lawsuit and internal tribal actions.²¹⁰ Indians who ob-

Dependence and Underdevelopment, at 59 (first draft 1978) [hereinafter cited as Ruffing].

208. U.S. Dep't of Interior, Final Environmental Impact Statement, Proposed Western Gasification Company (WESCO) Coal Gasification Project and Expansion of Navajo Mine by Utah International, Inc., San Juan County, New Mexico, at 3-210 through 3-216.

209. Draft San Juan Study, *supra* note 4, at V-46, VI-14.

210. The *Peshlakai* suit was brought by a number of Navajo Indians who live near the Mobil Oil in situ uranium mining project outside of Crownpoint and who opposed the initiation of that project. Chapters—local governmental bodies whose representatives sit on the Navajo Tribal Council—directly affected by uranium exploration and development on the Navajo Reservation have been voicing strong opposition to such activities since 1978. For instance, since 1978 four chapters (Shiprock, Crownpoint, Dalton Pass, and Canoncito) have taken issue with the Navajo tribal government's "bullish" resource development stance.

ject to the rapid development of uranium deposits and the concomitant deterioration in the physical and social environments of their lands find themselves confronted by a mountain of governmental and legal obstacles. Some of these obstacles are the result of federal government Indian policy, some are caused by economic forces, and some have their roots in tribal politics. Whatever their cause, these barriers impose serious constraints on Indian people in the San Juan Basin and elsewhere striving to exercise control over their own futures. This section will examine the causes and effects of those limitations.

Indian Leasing Policies: A Political and Economic Straitjacket

At the root of the Indians' inability to manage their own resources lies the infrastructure of federal constitutional restrictions, statutes, and regulations that govern the legal relationships of Indians with the non-Indian world.

The basic tenet of federal Indian policy is now and has been since the early 1800s that Indian tribes are sovereign nations—sort of. Thus, although tribes have an absolute right to occupancy of the lands reserved to them by treaty, act of Congress, or executive order,²¹¹ the fee title to such tribal lands and the underlying mineral estates is held in trust by the federal government.²¹² This legal relationship has had definite political and economic consequences for tribes intent on exercising their sovereignty over their lands and minerals. Principal among such effects are:

1. Lands and the accompanying mineral rights held in trust for tribes by the federal government are subject to a general restriction against alienation.²¹³ By analogy, lands held in trust by the federal government for individual Indians holding trust patents on *allotted* parcels²¹⁴ have likewise by and large been

211. Lavell & Black, *Indian Land Status*, ROCKY MTN. MIN. L. FDN. INST. ON INDIAN LAND DEVELOPMENT: OIL, GAS, COAL AND OTHER MINERALS 5-3 (1976).

212. F. COHEN, FEDERAL INDIAN LAW ch. 15 (1942).

213. 25 U.S.C. § 177 (1976) states: "No purchase, grant, lease, or other conveyances of lands or of any title or claim thereto, from any Indian nation or tribe of Indians, shall be of any validity in law or equity, unless the same be made by treaty or convention entered into pursuant to the Constitution."

214. Under the General Allotment Act of 1887, 25 U.S.C. §§ 331-34, 339, 341-42, 348-49, 381 (1976), and other allotment acts applicable by their terms to specific tribes, individual Indians could acquire a patent in a plot of land for their own use, subject to retention of the fee by the United States government in trust for such individuals. Upon

made subject to a similar restraint.²¹⁵ Since Indians do not control the fee to the vast majority of their lands,²¹⁶ land-use policies for Indian property becomes more a matter of federal prerogative than of Indian choice. Theoretically, the range of acceptable uses is limited by the federal government's fiduciary duty as trustee for its Indian beneficiaries; however, given the often competing goals of Indian preferences and federal land-use policy, the trust relationship still frequently takes a back seat to "national priorities."²¹⁷ With the heightened pressure on resource owners to develop their holdings in order to ease the energy crisis, tribes are likely to confront a government ever more hostile to exercising wise fiduciary discretion in supervising Indian resource development, if the latter translates into "preservation" rather than exploitation.

2. The favored—indeed, until very recently, the *only*—means adopted by the federal government to authorize non-Indian development of Indian lands and resources has been leasing.²¹⁸

expiration of a 25-year period of restriction during which the United States held fee title to the land, the Indian patentees could obtain a fee patent to the land, free of all trust restrictions. The allotment program was formally closed in 1934 with the enactment of the Indian Reorganization Act, which also extended the period of trust restrictions on trust patents indefinitely, in response to widespread abuses of the allotment system by unscrupulous white landowners and unsympathetic government agents.

215. 25 U.S.C. § 348 (1976).

216. Allotments under trust patent and reservation lands constitute the bulk of most tribes' land areas, although some tribes (notably the Navajo) have in recent years purchased lands in fee from the United States and private landowners contiguous to their own, which had been lost by sale to non-Indians. The Pueblo Indians present something of an anomaly; they hold their lands in fee simple but are still subject to the mineral leasing statutes and regulations applicable to Indian land in general.

217. The United States Department of the Interior encompasses, in addition to the Bureau of Indian Affairs (BIA), the United States Geological Survey (USGS), the Bureau of Mines, the Bureau of Land Management, and the Forest Service, all of which may at times have priorities diametrically opposed to Indian interest. See, e.g., *Pyramid Lake Paiute Tribe of Indians v. Morton*, 354 F. Supp. 252 (D.D.C. 1973). Beyond this, other federal departments are equally, if not more, likely to advocate certain positions contrary to those favored by the government's Indian "wards." For instance, Interior may find itself doing battle against the United States Department of Energy, or its child, the Nuclear Regulatory Commission.

218. Authority for leasing tribal mineral interests is contained in a number of federal statutes. Preeminent among these are: (a) the Indian Reorganization Act of 1934, 25 U.S.C. §§ 461-80 (1976), (b) the Omnibus Tribal Leasing Act of 1938, 25 U.S.C. §§ 396a-396g (1976), (c) various statutes authorizing leasing for mining or other purposes, e.g., the Act of Feb. 28, 1891, 25 U.S.C. § 397, authorizing the mining of surplus agricultural lands "bought and paid for" by Indians; the Act of June 30, 1919, 41 Stat.

After nearly fifty years of experience with the present federal leasing scheme, tribes increasingly find that it is an anachronistic, unfairly restrictive system that tends to maximize the non-Indian lessees' profits at the Indian lessors' expense. A few examples should help illustrate this contention.

(a) Under the regulations promulgated pursuant to authority granted the Department of the Interior under the various leasing statutes,²¹⁹ any lease of Indian mineral rights requires the approval of the Secretary of the Interior before it will be considered valid. Tribes may vary the lease negotiation process *only* if the Secretary approves such action in writing in advance. Even if a tribe then successfully negotiates a lease that both the Indian lessor and the non-Indian lessee find wholly acceptable, the Secretary has an absolute veto power over such an agreement and can order the negotiated agreement to be rejected and the traditional advertised bid process reinstated.²²⁰

The disadvantages such a procedure has for tribes seeking to maximize their control over tribal resources are exemplified in the fate of the recently approved Exxon lease of some 625 square miles of Navajo land for uranium exploration. In January of 1973 the Navajos sent out 25 invitations for bids on uranium exploration. A year later they had determined that Exxon had made the best offer and entered into an agreement with that company which would provide that the Navajos could either take royalties ranging from 12-25% of the value of any ore found or could acquire a working interest of up to 49% in the project. The Navajos submitted the agreement for secretarial approval. Because the regulations required competitive bidding, however (despite the fact that almost half of prior competitive auctions had received

1231, and the Act of Dec. 16, 1976, 25 U.S.C. § 399, both of which authorized the leasing of unallotted lands "opened" by the Secretary which were withdrawn from entry under the general mining laws prior to June 30, 1919, for mining purposes only; the Act of Apr. 17, 1926, 25 U.S.C. § 400a, which authorized leasing for mining purposes of lands on Indian reservations reserved for Indian agencies or schools; and other acts applicable by their terms to leases for oil and gas only. Authority for leasing individually owned Indian land is found at 25 U.S.C. §§ 396, 403.

219. *Id.*; 25 C.F.R. §§ 171-72 (1980). Leasing regulations that apply to certain tribes in particular are found at 25 C.F.R. §§ 173-76, 178-79 (1980). A number of other parts in the 170 and 180 series deal with certain types of leases and reclamation procedures. Proposals for revising most of these regulations were submitted to the Secretary of the Interior in 1977. 42 Fed. Reg. 18,083 (1977). These amendments have not yet been approved by the United States Department of the Interior.

220. 25 C.F.R. § 171.2 (1981).

only one bid), the BIA Area Office refused to approve the lease.²²¹

Further delay resulted when, in April of 1974, the Commissioner requested that an environmental impact statement be prepared. This study was not even started until January, 1976. The lease was not finally approved until January of 1977, three years after Exxon and the Navajo Nation had entered their original agreement. Navajo Mineral Department officials claim that as a result of the delay (which some consider to have been caused by the BIA Area Office's pique at having been excluded from preliminary negotiations²²²), the Navajo Nation lost more than a million dollars in interest on a bonus Exxon had promised to pay upon approval of the agreement.²²³

(b) Under the terms of 25 C.F.R. § 171.6, the Secretary is the party authorized to set bonding rates and is given absolute discretion in determining whether a lesser bond will fully protect the interests of the Indian mineral holder.²²⁴ The bond requested by the BIA for the leasing of the world's largest open-pit uranium mine, the Jackpile-Paguate Mine on Laguna Pueblo lands, was only \$10,000, a sum that "would not have covered 100 square feet."²²⁵ Upon being prodded by the Laguna Pueblo governor, the USGS raised the bond to \$100,000, still woefully inadequate.²²⁶ Eventually, the bond was raised to \$10 million until final reclamation plans are settled.²²⁷

(c) The regulations set fixed royalty rates which, in today's energy-hungry market, are absurdly low.²²⁸ In 1977, for example, Navajo lessors received only about 8% of the total revenue from the sale of uranium mined on the Navajo Reservation.²²⁹ Low

221. AMERICAN INDIAN POLICY REVIEW COMMISSION FINAL REPORT, TASK FORCE NO. 7: REPORT ON RESERVATION AND RESOURCE DEVELOPMENT AND PROTECTION app. I at 140 (1976) [hereinafter cited as AIPRC FINAL REPORT, app.]

222. Ruffing, *supra* note 207, at 37.

223. *Id.*

224. 25 C.F.R. § 171.6 (1981).

225. Correa, The Tribal Role in Labor Disputes and Other Resources Conflicts, Seminar on Indian Natural Resources Law: Summary of Proceedings, at XIII-27 (rough draft 1979) [hereinafter cited as Correa].

226. *Id.*

227. *Id.*

228. The applicable sections are 25 C.F.R. § 171.12 (1981) (advance royalties), 25 C.F.R. § 171.14 (1981) (minimum development expenditures), and 25 C.F.R. § 171.15 (1981) (royalty rates).

229. This amounted to only \$744,038 out of a total of \$9,770,019. Henderson, *supra* note 169, at XIII-3.

royalty rates are especially prevalent in Indian uranium leases because of the evolution of the uranium industry in this country from government monopoly to private, regulated industry.²³⁰

(d) In addition to being ridiculously low, royalties are not paid to the Indian lessors directly, but to the Superintendent of the local reservation (Area Office), or to the Supervisor of the USGS.²³¹ Needless to say, in the typical paper shuffle of a government agency, payments allegedly made may mysteriously dematerialize: in 1974 the Auditor General of the Navajo Nation investigated the USGS in Roswell, New Mexico, and discovered that various companies were in arrears.²³² A few years later, the Pueblo of Laguna hired an auditor—over the objections of the Department of the Interior—who found a number of underpayments on the part of the Anaconda Company for its Jackpile-Paguate operations.²³³

Beyond these specific examples of lease provisions gone awry, the leasing system as a whole tends to hamstring the independence of tribes' decision making, which in turn serves to undermine their bargaining strength vis-a-vis powerful energy corporations.²³⁴ The tribes' weak bargaining position is exacerbated by several other factors, both social and economic, over which tribes historically have had little control. Primary among such factors are:

1. the paucity of scientific research and statistical informa-

230. From 1942 to 1966, uranium production in the United States was a government monopoly under the now-defunct Atomic Energy Commission (AEC). Uranium mills operated only with the approval of the AEC; the AEC set purchase prices; and the AEC was the sole buyer of all uranium oxide produced. Alfery, *The Uranium Royalty Today*, 25 ROCKY MTN. MIN. L. FDN. INST., 19-1, 19-6 (1979) [hereinafter cited as Alfery]. The simplicity of the royalty provisions for uranium oxide that were developed was a direct consequence of the simple market situation under the AEC monopoly. *Id.* at 19-8. Under the Atomic Energy Commission's "Circular 5," a fixed price royalty arrangement was adopted by the uranium industry which was based on the contained U_3O_8 in a given volume of ore. Peterson, *The Uranium Royalty Provision: Its Evolution, Present Complexity, and Future Uncertainty*, ROCKY MTN. MIN. L. FDN. URANIUM EXPLORATION AND DEVELOPMENT INST. 4-1 (1976). Even after the termination of the AEC monopoly in the mid-1960s this simple fixed royalty provision continued to be used in the industry, despite rapid changes in the uranium market and industry recognition of the inadequacies of contemporary royalty calculations. *Id.* at 4-3 to 4-6; Alfery, *supra* at 19-2 to 19-3.

231. 25 C.F.R. § 171.12 (1981).

232. Ruffing, *supra* note 207, at 36.

233. Correa, *supra* note 225, at XIII-28

234. The American Indian Policy Review Commission Final Report was perhaps the first major study to identify this problem. AIPRC FINAL REPORT, app., *supra* note 221.

tion that is available to tribes embarking on resource management planning;

2. strictly limited tribal financial resources;
3. a lack of taxing and regulatory power over non-Indian enterprises on Indian lands;
4. the lack of consistent enforcement of contract clauses by the United States government in its capacity as tribal trustee; and
5. the sometimes acrimonious debates among members of tribes concerning the advisability of resource exploitation. These factors are explored at some length in the following pages.

1. *Lack of Access to Information*

It is axiomatic in contract law that for an agreement to be enforceable it must represent the result of a bargain undertaken by two parties fully informed of the terms of that bargain and aware of its consequences. Unfortunately, until very recently, rarely did a tribe entering a mineral leasing agreement have sufficient information to appraise the situation accurately and make a truly informed decision. In theory, the federal government as trustee is responsible for tribes having enough information about a proposal to be able to make decisions in their own best interests. In practice, neither the USGS nor the BIA has ever undertaken a comprehensive inventory of Indian resource reserves to provide tribes with a basis for their decisions.²³⁵ Tribes who have needed such information before sitting down at the negotiating table with powerful corporations have been forced to obtain as much information as they could with limited tribal financial resources.²³⁶ Corporations have been reluctant to share information gained from extensive exploration with tribes, fearing that they could back out of pending negotiations and leave a company with nothing more than the bill for exploration costs.²³⁷ Even the

235. The United States Department of Energy and four other federal departments and agencies have recently made \$24 million available to the Council of Energy Resource Tribes. Part of this funding will be used to conduct an extensive resource inventory of all tribal lands. The BIA and USGS are to provide at least \$7 million for this project. E & MJ reprint, *supra* note 12.

236. For example, the Navajos contracted a study of potential oil and gas reserves on their lands a few years ago. Ruffing, *supra* note 207, at 34. The Northern Cheyenne instituted a comprehensive evaluation of their coal reserves and potential impacts from their development in 1973. Monteau, Potential for Indian Natural Resource Development, pt. I, Seminar on Indian Natural Resources Law: Summary of Proceedings, at II-1 to II-3 (rough draft, 1979).

237. Ferguson, *Industry Problems with the Emerging Tribal Role*, ROCKY MTN. MIN.

federal government has seemingly discouraged a free flow of information among tribes with resources: for instance, when the Navajo Nation suggested in 1978 that a procedure for exchanging information with other BIA personnel conducting mineral negotiations be established, its proposal was actively *opposed* by the BIA Washington Office because tribes might use such information without giving due consideration to local conditions, and "it would be difficult and expensive to establish such a system."²³⁸ At the time, the BIA Navajo Area Office did not even employ a mining engineer or geologist.²³⁹

However, the future looks brighter. In 1975 twenty-five tribes possessing substantial mineral resources formed the Council of Energy Resource Tribes (CERT) to assist tribes in developing their management capabilities for resource development and protection.²⁴⁰ Since that time, CERT has successfully lobbied the federal government for more than \$20 million for a variety of assistance programs, which include conducting a comprehensive resource inventory of all Indian lands,²⁴¹ providing \$10 million in loan guarantee funds, funding three CERT pilot feasibility energy projects on Indian lands, and assisting in the establishment of an information storage and distribution center in Denver, Colorado.²⁴² CERT also helps tribes on an individual basis to compile information on particular projects and prepare analyses of the impacts of energy development on local Indian populations.

Indian tribes also have been establishing their own internal departments to deal with resource development. For example, the

L. FDN. INST. ON INDIAN LAND DEVELOPMENT: OIL, GAS, COAL AND OTHER MINERALS II-12 (1976). Such disingenuity could be precluded simply by inserting a confidentiality clause in the exploration contract, or by otherwise assuring the company that it would have first right to use its own information. Lipton, Problems in Negotiating Indian Mineral Agreements, Seminar on Indian Natural Resources Law: Summary of Proceedings, at IV-9 (rough draft 1979) [hereinafter cited as Lipton].

238. Ruffing, *supra* note 207, at 33.

239. *Id.*

240. Fifteen of those tribes have been identified as having known of potential uranium reserves. They are: Acoma Pueblo, Cheyenne River Sioux, Colville, Hopi, Jemez Pueblo, Jicarilla Apache, Laguna Pueblo, Navajo, Santa Ana Pueblo, Southern Ute, Spokane, Uintah-Ouray, Ute Mountain, Wind River, and Zia Pueblo. Of these fifteen, three (the Navajo, Spokane, and Laguna Pueblo) presently have uranium production facilities in operation and two-thirds of these are located within the general Southwest-San Juan Basin region. E & MJ reprint, *supra* note 12.

241. See AIPRC FINAL REPORT, app., *supra* note 221.

242. E & MJ reprint, *supra* note 12.

Navajo Nation has professionally staffed tribal offices to deal with mineral development, employment preferences, economic planning, and environmental protection (among others). The tribal government of Laguna Pueblo assumed an active role in compelling negotiations between labor and management when confronted with a possible strike at the Jackpile-Paguate uranium mine in 1977.²⁴³

Finally, the federal government itself has been making money available to tribes to strengthen their control over resource development through programs and agencies such as the BIA Revolving Loan Fund, the Economic Development Administration, the Office of Minority Business Enterprise, the Small Business Administration, and the now-defunct CETA program.²⁴⁴ The fate of these funds under the Reagan Administration, however, is at best dubious. Proposed new regulations for Indian mineral leasing procedures include a number of specific provisions requiring the BIA and USGS to provide information and technical assistance to Indian tribes and individuals engaged in resource negotiations,²⁴⁵ but these regulations have been awaiting approval for four years and it is improbable that they will now be adopted under James Watts's term of office as Secretary of the Interior.

2. *Limited Financial Resources*

Tribes are heavily dependent on revenue from resource development. For example, in 1975 mineral leasing accounted for 70% of the Navajos' total tribal revenue.²⁴⁶ The Jackpile-Paguate

243. Correa, *supra* note 225, at XIII-24 through XIII-28.

244. Ryan, Introduction to Federal Agencies and Programs Dealing with Indian Natural Resource Development, Seminar on Indian Natural Resources Law: Summary of Proceedings, at XV-i through XV-iii (rough draft, 1979).

245. 42 Fed. Reg. 18,083 (Apr. 5, 1977). For example, section 171.3(b) mandates that the BIA Area Director, USGS Mining Supervisor, and any other appropriate federal agencies such as the Bureau of Mines shall provide any "technical or other advice or assistance regarding development of Indian-owned minerals" requested by tribal or individual Indian mineral owners. Section 171.4 requires the operator to submit "written evidence . . . that minerals are being produced in paying quantities" at the expiration of the principal lease term and at the end of each fiscal year thereafter until the expiration of the contract. Section 171.6 requires that a written economic assessment of the proposed contract be provided the Indian mineral owner in all cases whether or not requested. Section 171.9(b) specifies that the BIA Area Director must provide tribal mineral owners, and must provide individual Indian mineral owners, all information and determinations made by the USGS Mining Supervisor concerning the minerals covered by the contract or their development.

246. Ruffing, *supra* note 207, at 66, table 4.

Mine on the Laguna Pueblo Reservation probably supplies a similar percentage of that tribe's finances. As a result, tribes are sometimes hesitant to take a hard line with energy corporations when to do so would jeopardize the flow of revenue from resource operations. The corporate negotiators know this and can often force a tribe's hand by offering enticing short-term, quick payoff provisions (such as bonuses) instead of long-term, low-return arrangements that would provide more revenue over the long run.²⁴⁷ Internal pressure from tribal members to make deals may also influence tribal negotiators.²⁴⁸

As explained in the foregoing section, tribes are acquiring more and better information about exactly what it is that they are bargaining for, and the federal government has been making more money available to them to strengthen their economies. These factors should help assure that a shortage of revenue will not be the sole justification for entering mineral development agreements.

3. *Lack of Taxing and Regulatory Authority*

Tribes are "third in line" after the federal and state governments, both for taxation and regulatory purposes.²⁴⁹ State taxes are particularly burdensome for Indian mineral holders, not only because of the high rates for severance taxes but in some cases because none of this state revenue makes its way back onto the reservation where it originated.²⁵⁰ Federal taxation is also devastating: although the development corporations are able to benefit from such federal tax benefits as the investment tax credit, accelerated depreciation, the depletion allowance, and partially tax-exempt intangible drilling and development costs (IDC), no tribe appears to be taking advantage of such benefits, which may add up to 25% of the value of the minerals produced.²⁵¹ In fact, the taxes the federal and state governments take out often exceed the total wages, rents, and royalty payments received by a tribe under a mineral lease. For instance, Arizona property taxes

247. Lipton, *supra* note 247, at IV-17 through IV-18.

248. *Id.*

249. AIPRC FINAL REPORT, app., *supra* note 221, at 140.

250. Lipton, *supra* note 237, at IV-13, cites as an example the Montana severance tax on coal. At 30%, it is the highest tax of its kind in the world. Furthermore, Montana does not classify tribal governments as local governments; therefore, tribes do not receive any of the revenue generated from mining of resources on their own lands.

251. *Id.* at IV-13 through IV-14.

paid by coal producers on reservation lands for one project in 1975 (the Black Mesa Pipeline) amounted to more than \$1 million. Navajo wages, royalties, rents, bonuses, and rights of way on the other hand totaled only \$239,000.²⁵²

When a tribe has attempted to exercise taxing authority, it has been met by stiff resistance from developers. This resistance may take the form of clauses in contracts requiring the tribe to waive its right to levy any taxes or open court challenges to the tribe's jurisdiction.²⁵³ In the face of this resistance, tribes may consider as an alternative to taxation the renegotiation of their now-inequitable contracts so that they can recoup part of their lost revenues. However, these efforts have likewise been largely unsuccessful for many of the same reasons that make initial negotiations so difficult. The situation might be ameliorated somewhat if the Secretary would exercise his power as trustee and cancel leases that are plainly unfair to the tribes.²⁵⁴

Despite a plethora of statutes and regulations designed to protect the natural environment in the face of development, it is clear that presently neither federal nor state agencies are enforcing environmental protection laws in the San Juan Basin (nor in other Indian territories afflicted with rapid development). Only four environmental impact statements have been prepared to date out of more than forty actions involving potentially significant impacts on the environment.²⁵⁵ Because of the magnitude of the development predicted for the San Juan Basin, several agencies have recommended that a regional EIS be prepared prior to any further uranium development activities.²⁵⁶ The *Peshlakai* suit

252. Ruffing, *supra* note 207, at 65.

253. Henderson, *supra* note 169, at XIII-6.

254. This was what happened when Secretary Kleppe cancelled the Crow and Northern Cheyenne coal leases in 1973-74.

255. Such actions include: (a) the execution of a lease sale offering almost 90,000 acres of Navajo allotted lands underlying Mobil's proposed in situ project in 1972, *Peshlakai* Facts, *supra* note 31, at 1; (b) the sale of a lease to approximately 29,000 acres of this land, *id.*; (c) the preparation and approval by the United States Department of the Interior of exploration plans for Mobil's in situ project; *id.*; (d) the approval of Mobil's mining and reclamation plans for the project, *id.* at 3; (e) the review of pending applications submitted by various uranium mining companies, including eight mining and reclamation plans, forty-four uranium prospecting permits, nine patent applications for uranium claims, six National Pollutant Discharge Elimination Systems (NPDES) water discharge permits, and one right-of-way application, *id.* at 11. All of these proposed activities are located within the San Juan Basin and the majority are on Indian or federal lands.

256. The following agencies and individuals have recommended that a regional en-

sought the same end, but its prayer for a regional EIS on uranium development in the San Juan Basin area was denied. Despite these demands, no such study has yet been undertaken, leading one commentator to observe: "The regulatory network that exists in the San Juan Uranium Basin to govern health and environmental impacts of uranium development is not effective. Much of the industry's activity is left unregulated, and it is the case that in fact no one knows what is happening in the San Juan Uranium Basin."²⁵⁷

Faced with this enforcement vacuum, some tribes have attempted to institute their own environmental, cultural, and economic regulations. For example, the Navajo Nation has established a tribal Environmental Protection Commission with the authority to issue and enforce rules and regulations, to issue cease and desist orders, to levy fines, and to undertake environmental studies.²⁵⁸ The commission has also served as an able liaison with Washington during congressional hearings on topics concerning uranium development. In 1973 the Navajo Office of Energy Resources was formed with stated objectives to evaluate mineral resources and development potential, to monitor mineral production from Navajo lands, and to encourage innovative licensing arrangements with energy corporations.²⁵⁹ Finally, an entire chapter of the Navajo Tribal Code is devoted to provisions ensuring safe mine working conditions.²⁶⁰

As might be expected, corporate resistance to the assertion of tribal regulatory authority has been stiff. At times resistance may take the form of clauses in lease contracts requiring the tribe to suspend its legislative and regulatory authority over company activities on the reservation and, at other times, as open court challenges to the assertion of tribal regulatory authority. Although the law is far from settled as to the extent of tribal regulatory authority over non-Indian activities on the reservation,

vironmental impact report be prepared: officials from the Southwest Region of the Department of the Interior, the Office of Environmental Policy Review of the Department of the Interior, the USGS Conservation Manager of the Central Region, the Environmental Section of the USGS and the Draft San Juan Study prepared by the Department of the Interior. *Peshlakai* Points and Authorities, *supra* note 15, at 42-47.

257. Sorenson & Marston, *Uranium Mining and Milling and Environmental Protection: Mitigation of Regulatory Problems*, San Juan Basin Regional Uranium Study, Working Paper No. 35, at 58 (1978).

258. Navajo Tribal Code §§ 3401, 3404 (1977).

259. Navajo Tribal Code § 202 (1977).

260. *Id.*, ch. 5, §§ 401-409.

what law there is and modern federal Indian policies suggest that tribes may have substantial authority in this area—if they dare exercise it.²⁶¹

4. *Lack of Contract Enforcement by the Federal Government*

As trustee for the tribes, the federal government has the ultimate responsibility for making sure corporate contractors are adhering to the terms of their agreements with Indian tribes. However, even were the federal government astute in bringing such actions to protect its Indian beneficiaries' interests, which it is not, most of the contract clauses in present federal lease forms are so vague as to be unenforceable in court.²⁶² The lack of ensured enforcement makes it difficult for tribes to use the tactic of threatening to insert protective clauses in leases in order to gain concessions from the corporations.²⁶³

5. *Lack of Tribal Consensus*

The social and cultural traditions of almost all North American Indian tribes emphasize the importance of community decision making. However, as in any representative government, tribal representatives may not always reflect the views of *all* their constituents, especially in populous tribes like the Navajo. Many traditional Indian people and an increasing number of young activists are deeply concerned about the irreversible impacts uranium mining will have on their life-styles and livelihoods.²⁶⁴ There is even concern among the members of some tribes who will be most directly affected by uranium production that their own governments are simply not acting in their best interests.²⁶⁵ Such internal dissension can be used by companies to their advantage, for example, by selectively releasing information concerning

261. See, e.g., Will, *Indian Lands Environment—Who Should Protect It?* 18 NAT. RESOURCES J. 465 (1978); Israel, *The Reemergence of Tribal Nationalism*, ROCKY MTN. MIN. L. FDN. INST. ON INDIAN LAND DEVELOPMENT: OIL, GAS, COAL AND OTHER MINERALS 10-24 to 10-40 (1976).

262. Ruffing, *supra* note 207, at 32.

263. AIPRC FINAL REPORT, app., *supra* note 221, at 140.

264. Ruffing, *supra* note 207, at 39.

265. For example, according to the investigation of one group, despite the unqualified opposition of the Shiprock Chapter of the Navajo Nation, the tribal council proceeded with its agreement with Exxon to lease 625 square miles (400,000 acres) of Navajo land lying largely within the Shiprock Chapter's area. Other chapters whose lands lie within the uranium belt have likewise expressed their opposition to uranium development, for example, the Dalton Pass Chapter in 1978 and the Crownpoint Chapter in 1980.

pending negotiations in order to channel internal political discussion among tribal members.²⁶⁶ At the very least, the positions of tribal negotiators are seriously compromised because they may subsequently be subject to attack from their own people.²⁶⁷

Tribes also face pressure from the BIA and the corporations to make quick deals, even if such arrangements are not in the best long-term interests of the tribe. These pressures may lead to frequent personnel changes among negotiators, resulting in less than adequate representation of tribal interests at the bargaining table.²⁶⁸

The penultimate results of the constraints placed on tribes by the federal leasing system and the foregoing factors are potentially perpetual leases to explore for and produce uranium, and absurdly low royalties.²⁶⁹ The ultimate result is a siphoning of capital from the reservation, where it is needed to fuel tribal economies, to the federal government, which, through its various social programs, tends to keep tribal societies in a perpetual state of peonage. Despite great natural resource wealth, reservations are still some of the most economically deprived areas of the country. For example, most traditional Navajo homes have no electricity, and the unemployment rate has been between 30% and 60% during the last decade.²⁷⁰ The situation has been compared by at least one commentator to that which existed in third world countries colonized by the overdeveloped countries prior to their increased political sophistication in the 1970s: resource development is financed by corporations outside the Indian economies and proceeds of the development are drawn off the reservations by the industrial needs of the "center" (national

266. AIPRC FINAL REPORT, app., *supra* note 221, at 144.

267. This is in essence what happened in the *Peshlakai* suit, where several Navajo residents affected by the Mobil in situ project decided to resist the tribal government's "bullish" stance on development and brought their own suit to stop the project.

268. For example, the AIPRC suggested that Shell Oil Company, in its negotiations with the Crow Tribe, use the pressure of a quick deal to create dissension within the tribe, eventually causing the replacement of one negotiator with another who apparently was more willing to deal with the company on its own terms. AIPRC FINAL REPORT, app., *supra* note 221, at 144.

269. Low royalties for uranium have been discussed *ante*; the perpetual nature of leases is caused by the ambiguous wording of 25 U.S.C. § 196 (1970) (the tribal leasing statute), which limits the lease terms to ten years, but then goes on to add, "and as long thereafter as minerals are produced in paying quantities." Many companies have interpreted this to mean, not unreasonably, that they have a lease for the full length of their operations.

270. Henderson, *supra* note 169.

economy). The capital produced from sale of resources is primarily used to fund social programs to offset the economically depressed "periphery" (the reservation) rather than to develop internal productive industries.²⁷¹ The inability of tribes to arrest these transfers of value by levying property, severance, and related taxes augments the drain of capital resources from Indian lands, particularly when combined with the effect state and federal taxation of these same operations has on the ultimate price of development.

Conclusion

Indian tribes in the San Juan Basin region of the American Southwest are in the midst of an unprecedented uranium mining boom. Rapid development of their uranium resources has had ripple effects in almost every area of these tribes' day-to-day existences: the physical environment is being dramatically altered; their traditional Indian religions are under attack from bulldozers and drilling rigs; their ancient social customs are being challenged by the influx of thousands of non-Indian immigrants; and their very economic survival is at stake.

On the other hand, as many of their leaders are quick to point out, uranium development offers tremendous short-term possibilities for economic growth. Managed properly, revenue from uranium production could serve as the basis for building tribal economies independent of federal manipulation, signaling the beginning of a new era of self-determination in all aspects of Indian life.

Before this can occur, non-Indian government and corporate leaders must demonstrate a deeper sensitivity to Indian concerns, and Indian leaders must establish cohesive political and economic foundations within their tribes on which to base their energy development plans.

271. Ruffing, *supra* note 207, at 17-18.