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FINANCIAL ALTERNATIVES FOR
STABILIZATION, RECLAMATION AND LONG-TERM
MONITORING AND MAINTENANCE OF
URANIUM MILL TAILING PILES



PREPARED BY:
SCIENCE APPLICATIONS, INC.

23-533-2705

- R. ZISKIND *project manager*
- W. DWYER
- D. ENGDAHL *attorney*
- F. GRANGE
- D. HAUSKNECHT *manager*

PREPARED FOR:
ARGONNE NATIONAL LABORATORY

D.A. BRODNICK
PROJECT MANAGER

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TABLE OF CONTENTS

	PAGE
1.0 SUMMARY	1
2.0 BACKGROUND AND CURRENT REGULATORY ENVIRONMENT	3
2.1 Definition of Typical Mill	4
2.2 Federal Regulatory Authority Over Uranium Mill Tailings Piles	4
2.2.1 NRC Authority in Non-Agreement States	4
2.2.2 NRC Bonding Authority	6
2.2.3 Agreement State Assumption of NRC Licensing Authority	8
2.3 Existing and Proposed Legislation to Provide A Long-Term Maintenance	10
2.3.1 New Mexico	10
2.3.2 Colorado	12
3.0 FINANCIAL ALTERNATIVE FOR ASSURING TAILING PILE MANAGEMENT SHORT-TERM (15 YEARS)	14
3.1 Description of Alternative and Their Applicability	15
3.1.1 Surety Bonds	15
3.1.2 Deposits of Cash into Escrow	19
3.1.3 Certificates of Deposit	20
3.1.4 Deposits of Securities into Escrow	23
3.1.5 Secured Interest	24
3.1.6 Letters of Credit	44
3.1.7 Self-Insurance by the Mill Operator	46
3.2 Evaluation and Recommendations	48
3.2.1 Survey of Current Practice	48
3.2.2 Matrix Evaluation	58
3.3 Discussion of Favorable Approaches and Aspects of Their Implementations	60
3.3.1 Implementation	60A
3.3.2 Conclusions	61
4.0 FINANCIAL REQUIREMENTS FOR LONG-TERM MONITORING AND MAINTENANCE	62
4.1 Impact of Variations In Assumptions And Parameters on M&M Financing	70

TABLE OF CONTENTS (Cont'd)

	<u>PAGE</u>
4.1.1 Years of Mill Production Remaining	70
4.1.2 Expected Inflation Rate for M&M Costs	72
4.1.3 Discount Rate for Fund Sizing	73
4.1.4 Mill Production Rate	74
4.1.5 Number of Years For Which M&M Must Be Performed	74
4.2 Alternative Approaches for Long-Term Financing	75
4.2.1 Generic Uranium Tax on the Mill Operator	75
4.2.2 Surety Bonds and Other Performance Guarantee Approaches	78
4.2.3 Generic Uranium Tax on Downstream Fuel Cycle Facility Operator	79
4.2.4 Mill Operator Funded Earmarked Annuity	80
4.2.5 Mill Operator Purchased Investment Securities	81
4.2.6 Mill Operator Lump Sum Payment	82
4.2.7 Fiscal Evaluation Summary	82
4.2.7.1 May a State Require Bonding Appropriate to Guarantee Development of Revenue To Fund M&M as a Pre-condition to Uranium Milling Operators Within the State?	84
4.2.7.2 May A State Require Uranium to Contribute to A Fund For Long-Term or Perpetual Moni- toring and Maintenance of Tailings Piles?	87
4.2.7.3 May A Tax Be Imposed To Create A Special Fund For This Purpose, or May Such a Fund Be Created Other Than Taxation?	87
4.2.7.4 May A State Require That Title To Land On Which Tailings Piles Stand be Trans- ferred to the State At The End of Active Mill Life, as a Condition to Conducting Mill Operations?	88
4.3 General Evaluation Criteria of Alternative Approaches	90
4.4 Conclusions	
APPENDIX A	95
APPENDIX B	99

LIST OF TABLES

		<u>PAGE</u>
Table 3-1	Types of Sureties Provided For In State Mining or Radiation Control Laws to Insure Reclamation of Mined Lands	54
Table 3-2	Short-Term Financial Alternatives Evaluation Matrix	59
Table 4-1	Lump Sum Post-Operation M&M Costs For A New Mill Starting in 1978	64
Table 4-2	Lump Sum Post-Operation M&M Costs for Existing, New, and Planned Mills	64
Table 4-3	Discounted Lump Sum Post-Operation M&M Costs For A New Mill Starting in 1978	67
Table 4-4	Uranium Mill Tax Per Ton of Ore Required to Establish M&M Fund	69
Table 4-5	Uranium Mill Revenue Per Pound U_3O_8 Produced Required to Establish M&M Fund	69
Table 4-6	Uranium Mill Revenue Rate Per Ton of Ore Required for Mills of Various Ages	71
Table 4-7	Uranium Mill Tax Per Ton of Ore Required To Establish M&M Fund For Perpetual Care	76
Table 4-8	Uranium Mill Per Pound U_3O_8 Produced Required to Establish M&M Fund for Perpetual Care	76
Table 4-9	Financing Alternatives	77
Table 4-10	Fiscal Evaluation Criteria	77
Table 4-11	Intercomparisons of Alternative Long-Term Financing Approaches	83
Table 4-12	General Long-Term Financing Intercomparison	93

LIST OF EXHIBITS

PAGE

Exhibit 3.1	Certificate of Deposit	21
Exhibit 3.2	General Security Agreement	26
Exhibit 3.3	Pledge Agreement	33
Exhibit 3.4	Financing Statement	42
Exhibit 3.5	Sample Letter of Credit	45

1.0 Summary

Alternative financing approaches have been evaluated for assuring short-term tailings stabilization and reclamation and long-term monitoring and maintenance (M&M). Required revenues and rates were based on a typical mill. In order to define and analyze realistic financing alternatives certain underlying issues were examined. These included; a review of the NRC regulatory requirements and authority for mills and tailings management; identification of state regulatory authority over all reasonably possible circumstances of land ownership and mill operatorship; an examination of NRC and individual state bonding authority; and discussion of current and proposed legislation to provide M&M funding.

The following types of short-term financing assurances were considered.

- o surety bonds, purchased by the mill operator
- o cash deposits to the state agency
- o certificate of deposit
- o deposit of securities to the state agency
- o secured interests, in mill operator's assets
- o letters of credit from a financial institution
- o self insurance by the mill operator

Each method's operation was described including: advantages and disadvantages exposed, consistency with existing authority, and cost. The most favorable short-term financing alternatives were determined by a rating system which evaluated; administrative time; in-place authority; operator expense; loss of productive use of corporate assets; flexibility of surety value; ease of collection in case of default; problems encountered in asset valuation. By these measures the surety bond, cash deposit, self insurance and certificates of deposits rated highest. Least favored were secured interests and letters of credit. Alternatives which involve the taxing authority of the state or federal government were not considered feasible.

Because of the variability of state needs and authorities, and the resources of mill operators, a variety of financing alternatives should be permitted. The latitude in choosing the type of assurance facilitates the case-by-case selection of an acceptable alternative which does not place the mill operator in a disadvantageous competitive position. However, this analyses has pointed out some of these issues which could be utilized by the regulatory

body as a guide to avoid potential difficulties such as a greater likelihood of court action upon default.

Long-term M&M of reclaimed tailings areas does not have the same degree of experience and precedent as does the short-term. The federal and state regulatory authority is not in-place. However, some experience and regulatory insight is available from parallel concerns of perpetual care at low level commercial nuclear waste burial grounds. Long-term M&M was assumed to require \$5,000 annually (in 1977 dollars) for 100 years after productive mill life.

The revenues required, per measure of production, to support M&M will be dependent upon; the years of mill production remaining; expected inflation rate; discount rate and mill starting date. The significance of these factors can be appreciated by noting that the revenue rate (per ton of ore or per pound of yellowcake) required throughout the active plant lifetime (1977-1992) increases by nearly a factor of four in going from an inflation rate of 6 percent to 8 percent. Guidelines for uniform inflation factors and procedures for developing M&M cost estimates should be constructed by the federal regulatory agencies to assure uniformity and adequacy of M&M.

Three categories of financing alternatives were considered: uranium product taxation; surety bonds and other performance guarantees; and mill operator generated funds. Only specific approaches within the last categories were deemed acceptable. These alternatives were: an earmarked annuity managed by the regulatory body; purchased investment securities managed by the operator during the active milling period; lump sum final payment secured by surety bonding. In order to assure site access to perform M&M it is recommended that title transfer of the reclaimed tailings areas be required. There appears to be no impediment to implementing this requirement under existing state authority for non-federally owned land.

Accident contingency financing should be handled on a national level and considering the uranium milling as a group for pooling resources. Legislation implementing this approach should be considered.

In all realistic cases of inflation, discount rate, and typical mill parameters, required short- and long-term financing costs appear to be sufficiently small so as not to radically affect the growth, balance and practices of the uranium milling industry.

2.0 BACKGROUND AND CURRENT REGULATORY ENVIRONMENT

There is a recognized need to effectively deal with nuclear waste management issues of the nuclear fuel cycle. The purpose of this study is to determine and evaluate alternative approaches to assure financing for uranium mill tailings management.

Tailings management is ordinarily defined as the program to control the tailings pond and pile from dam and embankment construction through the monitoring and maintenance (M&M) period. For the purposes of this study, dam and embankment construction financing will be excluded since they are ordinarily unambiguously considered as mill capital costs borne by the operator. The problem, and thus this report, is divided into an analysis of two tailings management financing requirements: short-term financial assurances that the mill produced tailings disposal areas will be stabilized and reclaimed; and long-term financing to provide revenue to conduct M&M for the reclaimed tailings disposal areas during a 100-year period following the active plant lifetime. Decommissioning of the mill processing facilities are not considered in this study. Decommissioning plans are being submitted separately (from the environmental impact statement) to the NRC and details are not required until late in the active milling period. Conversely, tailings pile management must be detailed during the plant licensing cycle and is likely to be initiated after several years of plant operation.

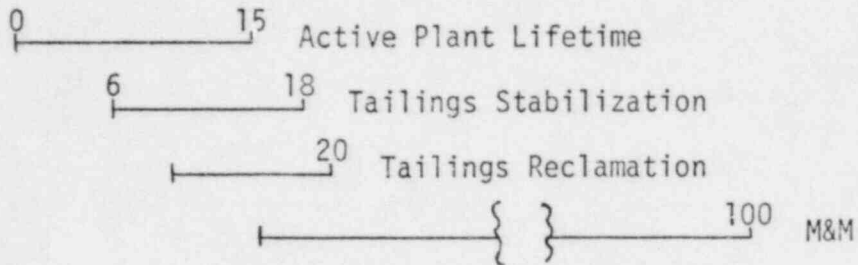
Only limited attention has been given to developing accident contingency funds. Such needs are assumed to arise from the danger of severe natural conditions such as a flood, tornado or earthquake destabilizing the tailings pile. Furthermore it is assumed that the consequences of any such accident during the licensed period will be the responsibility of the mill operator. Therefore, accident contingency is only considered during the long-term M&M interval.

Finally, this work assumes the need exists to provide M&M during the post-reclamation period although the NRC has established an objective "to eliminate the need for an ongoing monitoring and maintenance program following successful reclamation". Additionally, it is recognized that selection of a 100-year M&M period represents an arbitrary cutoff point. No long-term financing method will be keyed in any restrictive manner to being effective over just this specific period.

2.1 DEFINITION OF TYPICAL MILL

For the purposes of this research, a typical mill has been characterized as follows:

- Mill timelines (years after plant operation began)



- Mill capacity is 2000 tons of ore per day (730,000 per year) which yields 8000 pounds of yellow-cake per day.
- Average condition of a currently operating mill is taken as midpoint of the 15-year active lifetime.
- Cost of tailings stabilization and reclamation - \$3.0 million.
- Annual cost of M&M - \$5,000 in 1977 dollars.

It is recognized that real mills can significantly differ from the typical mill. For example, the cost estimates of stabilization and reclamation might range from \$2 to \$50 million dollars. Financing requirements will ordinarily be expressed as a normalized quantity such as dollars per pound of yellow-cake in order to facilitate scaling to actual mill capacity.

2.2 FEDERAL REGULATORY AUTHORITY OVER URANIUM MILL TAILINGS PILES

2.2.1. NRC Authority in Non-Agreement States

At the present time, the Nuclear Regulatory Commission (formerly the Atomic Energy Commission) is authorized to license uranium mill operations in all states. In several states this authority has been delegated to the state pursuant to agreements. The interaction of federal/state authority in agreement states is discussed in detail in the following section. This section deals exclusively with NRC authority. The NRC licenses are issued in accordance with regulations adopted pursuant to the Atomic Energy Act of 1954, as amended, (68 Stat. 919) and Title II of the Energy Reorganization Act of 1974 (88 Stat. 1242). Under the regulations:

". . . Any person is exempt . . . from the requirements for a license set forth in Section 62 of the Act to the extent that such person receives, possesses, uses, transfers, delivers, or imports into or exports from the United States source material in any chemical mixture, compound, solution, or alloy in which the source material is by weight less than one-twentieth of 1 percent (0.05 percent) of the mixture, compounds, solution or alloy, . . ." (10 CFR §40.13)

Uranium mill tailings piles generally contain insufficient quantities of source material to constitute by regulatory definition a hazard to public health and safety. Even though the mill tailings piles could qualify for exemption treatment under 10 CFR §40.13, the NRC still exercises authority over the piles.

The director of the Division of Licensing and Regulation included in an opinion issued by the Atomic Energy Commission, the following remarks pertinent to the issue of jurisdiction assumed over mill tailings piles:

"Since the discharge of radioactive mill effluent into the environment and the accumulation of radioactive tailings at mill sites are an integral part of the mill operations, such discharge and accumulation are, . . . within the Commission's regulatory jurisdiction and are regulated by the Commission, notwithstanding the fact that the effluents and tailings generally do not contain 0.05% or more of uranium or thorium . . ." (opinion issued by Director of Licensing and Regulation, Atomic Energy Commission, March 7, 1961).

In September of 1965, Howard K. Shapar, Assistant General Counsel to the Licensing and Regulation Division of the AEC, qualified the issue of regulatory authority over mill tailings piles in the following statement:

"Any assertion of regulatory jurisdiction over the tailings (containing source material in amounts less than 0.05 percent by weight) after the point in time when the mill is shut down would, in my opinion, be highly questionable as not having a reasonably close enough connection to the actual operation of the mill." (Howard K. Shapar, "Commission's Regulatory Authority over Uranium Mill Tailings," September 22, 1965, p. 2)

Prior to the passage of the National Environmental Policy Act of 1969, regulatory authority over mill operations was believed to extend only to active plant operations. Therefore, upon termination of mill operations, regulatory authority could not adequately assure that steps to insure proper tailings management could be taken because of an extinguishment of licensing jurisdiction. With the enactment of NEPA, NRC authority was believed expanded to encompass "a supplemental grant of substantive authority" with which termination of a license could be conditioned upon the failure of an operator to follow through

with measures incorporated into a license for purposes of environmental protection. (Joanna M. Becker, Chief, Regulations Counsel, note to L. C. Rouse dated October 17, 1975, p. 2)

Contemporary guidelines issued by the Atomic Energy Commission Regulatory Guide 3.8--Preparation of Environmental Reports for Uranium Mills, April 1973, require various issues to be discussed that focus primarily upon the impact of proposed site reclamation and restoration. An environmental report must include discussions of:

- plans for reclaiming and restoring lands disturbed by mining activities,
- a technical and financial feasibility assessment on methods and costs of stabilizing tailings retention system(s),
- financial arrangements to be made (such as bonding arrangements, etc.) to insure that adequate funds will be available for site reclamation and restoration when operations are concluded,
- provisions for acquiring ownership of the property (if not already owned) on which the tailings will be stored,
- plans and methods for providing long-term maintenance and control over the tailings upon termination of milling activities. (Regulatory Guide 3.8--Preparation of Environmental Reports for Uranium Mill, April 1973 §9.0)

These guidelines, by requiring mill operators to submit proposed site reclamation and restoration plans, enable the NRC to more readily identify necessary precautions that must be taken to protect the environment indigenous to each site. Precautions such as the requiring of a posting of surety to assure site restoration and reclamation can be incorporated into the license issued. The re-licensing of an operator is then conditional upon adequate measures taken by the operator to follow through with proposed tailings management systems.

2.2.2. NRC Bonding Authority

The NRC requires the posting of a bond in order to facilitate mill operator compliance with conditions incorporated within a source material license. Chief regulations counsel, Joanna M. Becker, explains in a note to L. C. Rouse, dated October 17, 1975, that:

"A bond can be viewed as a requirement reasonably related carrying out NRC's obligations under NEPA. In this context, a bond to be held by NRC can be regarded as a contractual, voluntary, or common law bond supported by consideration--the source material license."

The authority to require a bond stems from NRC's broad licensing authority. In an opinion by Thomas F. Engelhardt entitled "Legal Justification for Requiring Evidence of Financial Responsibility or in the Alternative Surety Bonds of Waste Disposal Licensees," it was noted that no express authority exists within the NRC statutory framework with which a bond can be required to be posted. However, with exceptionally broad authority to license source materials, the NRC has adopted a method of posting that is voluntarily undertaken by prospective licensees to insure source material license condition compliance.

The viability of a voluntarily posted surety stems from the common law and is contractual in nature. In contrast to a statutory bond which is authorized to be received or taken by statute, the voluntary bond must be

" . . . properly executed and delivered, and founded upon sufficient consideration." (See memo to files by Thomas F. Engelhardt, "Legal Justification for Requiring Evidence of Financial Responsibility or in the Alternative Surety Bonds of Waste Disposal Licensees" dated March 8, 1962, p. 5)

Furthermore, explains Mr. Engelhardt,

" . . . such bonds to be valid must be entered into by competent parties without fraud or unlawful compulsion and for a purpose not legally prohibited." (ibid., p. 5)

As stated by Ms. Becker, the source material licensing authority provides the NRC with sufficient consideration with which to effect a legally binding contract.

The IRC then apparently has the authority to require bonds designed to insure stabilization and reclamation of piles through their licensing authority. However, as stated by Mr. Shapar, they do not feel that they have authority over piles after the shutdown of mill operations and this leads to the conclusion that they have no authority to require acts from the licensee which go beyond the period of the license.

NRC authority to require bonds is often a duplication of statutory bonding authority that currently exists in the non-agreement states. As indicated on Table 3-1, South Dakota, Utah, and Wyoming all have specific bonding provisions in existing state legislation. Wyoming's authority is included in their Environmental Quality Act which requires bonding to insure reclamation of "affected lands." Included in the definition of "affected lands" are lands

on which mill tailing are deposited from uranium mills. South Dakota's authority stems from their Surface Mining Land Reclamation Act. It would apply only to surface mining operations, and related processing facilities. Land on which tailing piles have been deposited would be subject to the reclamation bond requirements only where it is connected to a surface mine. Utah's bonding authority stems from the Mined Land Reclamation Act which includes surface and underground mining operations, but does not include off-site activities. Their bonding provisions would only apply to mine/mill complexes which are on-site at the mining operations.

2.2.3. Agreement State Assumption of NRC Licensing Authority

The licensing of "byproduct, source, and special nuclear materials" has historically been directed by the Nuclear Regulatory Commission (formerly the Atomic Energy Commission). Given the intimate interaction between the licensing of source materials and the state's respective obligations to proficiently allocate development and use of energy resources within geographic constraints, Congress has seen fit to provide for the delegation of licensing authority to the states. The states are empowered, pursuant to Section 274 of the Atomic Energy Act of 1954 [as added September 23, 1959, publ. 86-373 §1, 73 Stat. 688, and amended 1970 Reorg. Plan, No. 3, §2(a)(7), 6(2), eff. December 2, 1970, 35 F.R. 15623, 84 Stat. 2086, 42 USC §2021, et.seq.] with authority to assume jurisdiction over the licensing of "byproduct, source, and special nuclear materials."

The purpose of §274 is to interface federal and state regulatory authority for the following reasons:

- to recognize the interests of the states in the peaceful uses of atomic energy, and to clarify the respective responsibilities under this chapter of the states and the Commission with respect to the regulation of byproduct, source, and special nuclear materials;
- to recognize the need, and establish programs for, cooperation between the states and the Commission with respect to control of radiation hazards associated with use of such materials;
- to promote an orderly regulatory pattern between the Commission and state governments with respect to nuclear development and use and regulation of byproduct, source, and special nuclear materials;
- to establish procedures and criteria for discontinuance of certain of the Commission's regulatory responsibilities with respect to byproduct, source, and special nuclear materials, and the assumption thereof by the states;

- to provide for coordination of the development of radiation standards for the guidance of federal agencies and cooperation with the states; and
- to recognize that, as the states improve their capabilities to regulate effectively such materials, additional legislation may be desirable. [42 USC §§2021(a)(1-6)]

The above sections identify federal and state responsibilities and the importance of securing uniformity in the licensing of "byproduct, source, and special nuclear materials."

For a state to assume jurisdiction over licensing of "byproducts, source and special nuclear materials," the NRC must enter into an agreement with the governor of that state. The agreement must provide for the discontinuance of NRC licensing authority and individual state assumption of that authority [42 USC §2021(b)]. In order to form an accord, the NRC specifies two conditions each state must comply with. First, the governor of a state must certify that his state has an adequate program of radiation control sufficient to protect public health and safety with respect to the licensing of materials defined in the agreement [42 USC §2021(d)(1)]. Second, that the state program adopted must be compatible with the NRC's regulatory program and adequate enough ". . . to protect the public health and safety with respect to the materials covered by the proposed agreement," [42 USC §2021(d)(2)].

Under [42 USC §2021(i)] the NRC may terminate an agreement state's licensing authority and reassert its own. The NRC will suspend or terminate licensing authority only where protection of public health and safety are threatened.

As noted on Table 3-1, two of the five agreement states have not adopted statutory bonding requirements. Those which do require bonding have very abbreviated statutory bonding programs. Presumably the agreement states would all have the same common law bonding authority that is inherent in NRC's licensing authority.

2.3 EXISTING AND PROPOSED LEGISLATION TO PROVIDE A LONG-TERM MAINTENANCE AND MONITORING FUND

2.3.1. New Mexico

In March 1977, the New Mexico legislature passed an amendment to the New Mexico Radiation Protection Act (New Mexico Laws of 1977, Chapter 343), which established provisions for short-term bonding of mill operators and also established a Continued Care Fund for long-term maintenance of tailing piles. The Continued Care Fund provisions require the mill operator to contribute to the Fund at the rate of \$.10/lb. of yellowcake extraction to accrue to a limit of \$1 million per mill site. As stated, this amendment has been enacted but will not be effective until regulations drafted by the New Mexico Environmental Improvement Agency (EIA) are put before public hearings and approved. The EIA has decided to present its draft regulations in two packages; the first will deal with short- and long-term financial requirements for mill licensing and waste management. These regulations should be ready for hearing in December 1977. The remaining regulations will then be presented in March 1978.

The above-stated terms of the Continued Care Fund are subject to change by the EIA following the hearings. At present, all action is being held in abeyance pending the outcome of these hearings.

There are presently five active mills in the State of New Mexico, three of which were licensed under the AEC regulations and will come up for relicensing next year.

The following is the text of the New Mexico statute describing the Continued Care Fund:

12-9-5.1 NMSA 1953.

"12-9-5.1 Continued Care Fund Regulations--Requirements--Exemptions--Modification.--

- A. In the adoption of regulations governing continued care fund requirements, the board shall consider the desirability of prorated payments by the licensee in relation to the expected life of the licensed operation.

- B. Licensees whose licensed activities consist only of uses of radioactive material which do not create a situation requiring continued care of radioactive materials after the expiration of the license, including but not limited to X-ray generating devices, laboratories, medical facilities, pharmacies, industrial radiography, well logging and gauges shall not be required to make deposits to the continued care fund.
- C. Until the Nuclear Regulatory Commission adopts regulations governing continued care activities, continued care fund deposits required from a uranium mill license holder shall be ten cents (\$.10) per pound of U_3O_8 in uranium concentrate (yellowcake) produced from such mill, unless the board determines that a lesser amount is appropriate and the requirement of a mill license holder to make deposits to the continued care fund will terminate for each mill after the cumulative continued care fund deposit for that mill reaches one million dollars (\$1,000,000).
- D. After the Nuclear Regulatory Commission adopts regulations governing continued care activities:
- (1) the board may alter the amount or character of a licensee's obligation by regulation if such regulations are not more stringent than the regulations of the nuclear regulatory commission governing continued care activities;
 - (2) the board may adopt continued care requirements more stringent than those of the Nuclear Regulatory Commission upon the finding that such regulations are necessitated by unique or special circumstances in New Mexico; and
 - (3) deposits by a licensee to the continued care fund shall be considered in adopting regulations altering the amount or character of a licensee's continued care obligation."

Section 7. A new Section 12-9-5.2 NMSA 1953 is enacted to read:

"12-9-5.2. Continued Care Fund Created--Appropriation--Approval--Regulation.--

- A. The "radiation protection continued care fund" is created in the state treasury. Cash balances in the fund shall be invested by the state treasurer as other state funds under his jurisdiction are invested. Income earned on the investment shall be credited to the continued care fund for use as provided in the Radiation Protection Act.
- B. Money in the continued care fund is appropriated to the agency for use in remedying and preventing situations which may be harmful to the health, safety, welfare or property of the people, involving abandoned wastes or inoperative facilities.

ties which are or were operated by depositors to the continued care fund.

- C. Emergency expenditures up to the amount of one hundred thousand dollars (\$100,000) for any single emergency incident may be made from the continued care fund by the director subject to approval of the chairman of the board. Expenditures involving more than one hundred thousand dollars (\$100,000) shall be made only after prior approval of the state board of finance.
- D. Subject to the provision of this section, the board shall adopt regulations governing the administration of the continued care fund."

2.3.2. Colorado

Colorado also has enacted legislation which mandates a license fee designed to provide funds to cover the maintenance and monitoring of lands after the terms of the license. The text of the pertinent language is as follows:

Colorado Statutes Title 25, Article 11, §25-11-102(7)(b)...

"Each such lease or license shall provide for the payment to the state of a fee based upon the quantity of radioactive material stored in the lands covered thereby. Such fee shall be established at such rate that interest on the sum of all fees reasonably anticipated as payable under any lease or license shall provide an annual amount equal to the anticipated reasonable costs to the state of such maintenance, monitoring, and other supervision of the lands and facilities covered by such lease or license, following the terms thereof, as are required in the interest of the public health and safety. In arriving at the rate of the fee, the department shall consider the nature of the material to be stored, the storage space available, estimated future receipts, and estimated future expenses of maintenance, monitoring and supervision.

(c) Said lease shall include a payment in lieu of taxes which shall be paid over to local governmental units in compensation for loss of valuation for assessment. Said payment shall be adjusted annually to conform with current mill levies, assessment practices, and value of land and improvements.

(d) All fees provided in this section shall be paid quarterly as accrued, to the department, which shall receipt for the same and shall transmit such payment to the state treasurer and take his receipt therefor."

As yet, the fee has not been required from mill operators. Draft regulations have been drawn up by the Department of Health, Occupational and Radiological Health Division and are scheduled for hearings in October of 1977. After hearings, the Board of Health will vote on the regulations requiring the fee. Mr. Richard Searles of the Colorado Attorney General's office foresees some difficulty in maintaining and monitoring the piles because of ownership transfers and a continued right in the state to inspect and repair, but as yet, no other significant problems have surfaced. The hearings on the Colorado and New Mexico provisions should provide additional insights into problems which might be expected in establishing such a fund.

3.0 FINANCIAL ALTERNATIVES FOR ASSURING TAILING PILE MANAGEMENT SHORT TERM (15 YEARS)

The basic social need providing impetus for consideration of alternatives for short-term financial assurances is that tailing piles will be managed and reclaimed in a manner which is consistent with public health and welfare. This assurance is necessary during mill operations and for a short time after termination of them.

In that assurance of compliance is the basic motive for the alternatives, the alternatives considered most feasible are:

- surety bonds, purchased by the mill operator from a surety company
- cash deposits to the state agency
- certificate of deposit
- deposit of securities to the state agency
- secured interests, in mill operator's assets
- letters of credit, from a financial institution
- self-insurance by the mill operator

Alternatives which involve the taxing authority of the state or federal government for development of a fund are not considered feasible for short-term financing. A tax or fee would entail significantly greater administrative costs than the alternatives listed above and in most cases would provide very little additional security that reclamation will occur in the proper manner. With the alternatives presented, the state and/or the federal government would oversee the establishment of assurances but would not be as heavily burdened by their administrative or fund disbursement responsibilities. The alternatives discussed also assume that any expenses involved in tailing pile management are a legitimate cost of operating a mill and should be incorporated into production costs.

The alternatives presented then are those which would be expected to entail the least amount of administrative costs to assure the required reclamation given that all pile stabilization and reclamation costs should be internalized as part of production costs.

The following sections present discussions of each of the alternatives listed above. Evaluations of the alternatives and recommendations are presented in Sections 3.2 and 3.3. A matrix listing methods allowable under existing state laws for assuring performance of reclamation is presented in Table 3-2. The eight states with significant uranium mining and/or milling activity are listed in Table 3-1 as are seven other states which have similar legislation directed primarily towards reclamation of areas strip-mined for coal. The list of feasible alternatives was developed from recommendations made by the Western Interstate Nuclear Board, Committee on Mining and Milling of Nuclear Fuels,* from recommendations of the "Task Force on Bonding and Perpetual Care of Licensed Nuclear Activities" of April 1976 and from a study of existing alternatives in the uranium milling states and states with analogous requirements in strip-mining areas. Many but not all of the forms that a surety could take are included in the list of alternatives.

3.1. DESCRIPTION OF ALTERNATIVES AND THEIR APPLICABILITY

3.1.1. Surety Bonds

Surety bonds are presently the most extensively used method for providing assurance in the uranium milling states. Surety bonds are also extensively used in many states to insure reclamation of land strip-mined for coal. As noted in Table 3-1, six of eight uranium milling states have express provisions which give state agencies authority to require a surety bond. One state, Washington, has bonding authority implied in provisions which give the agency authority to place conditions on licenses issued to handlers of radioactive material. Only one state, Arizona, has no apparent existing authority to require a bond. All of the surface coal mining states included in Table 3-1 had express bonding provisions.

Conceptually, a surety bond is simply a method of providing a co-signer on an obligation. The surety company takes on a possible liability for a profit. The assurance provided by a bond that a fund will be available on default is no better than the ability of the surety to pay the obligation.

* "Policy Recommendation on Financing Stabilization, Perpetual Surveillance and Maintenance of Uranium Mill Tailings," April 1977.

Surety companies are generally regulated by state laws which are designed to insure that the surety is solvent and has assets of at least a minimum amount.* The policing of surety companies by a separate state agency gives the agency concerned with reclamation additional assurance that the surety will be able to pay on default, but does not guarantee the availability of funds. Additionally, in a telephone interview, Mr. Bill Rainey of the West Virginia Department of Natural Resources stated that defaults on surety bonds almost always wind up in court and thus are a much greater problem to collect on than are certificates of deposit.

As stated, surety bonds are used in many states to insure reclamation of land strip-mined for coal and several studies and articles have been directed towards defining the proper total amounts for these bonds and describing problems associated with the bonds.† Major problems appear to be; setting a proper

* "Policy Recommendation on Financing Stabilization, Perpetual Surveillance and Maintenance of Uranium Mill Tailings", April 1977.

† Strip Mine Reclamation Regulation; Lathrop N. Gates, 39 Missouri Law Review, 1974, p. 429.

Strip Mining: A Policy Evaluation; Robert E. Mintz, 5 Ecology Law Quarterly, 1975, p. 461.

A Novel Approach to Reasonable Regulation of Strip Mining; Denis Binder, 34 University of Pittsburgh Law Review, 1973, p. 339.

Strip Mining: The Ohio Experience; Bruce Cryder, 4-5 Capital University Law Review, 1975, p. 169.

Strip Mine Reclamation and Economic Analysis; David Brooks, 6 Natural Resource Journal, 1966, p. 13.

Coal Surface Mining and Reclamation; and Environmental and Economic Assessment of Alternative, Council on Environmental Quality, S. Ser. No. 93-8, 93d Congress 1st Session, 1973, p. 35.

University of Maryland School of Law; Legal Problems of Coal Mine Reclamation; Environmental Protection Agency Water Pollution Research Series, 1973.

Environmental Protection in Surface Mining of Coal; Grimm and Hill, 1974, p. 28 EPA.

total amount for the bond and, in determining when to release the bonds. As with uranium mill tailing waste piles, the costs of management of a strip-mined area vary with topography, hydrography, climatology, and economies of scale. Also, the extent of reclamation desired and length of time necessary to determine the success of reclamation may be as variable for uranium tailing piles as they are in areas strip-mined for coal. It would, therefore, seem likely that determining proper amounts for bonds and bond release criteria will present problems for tailing pile bonding programs. These problems, however, would apply to all surety methods.

Two of the states of concern in this study, Texas and Wyoming, presently exert bonding authority over mill tailings through legislation designed primarily to insure reclamation of strip-mined areas. They both have specific bonding provisions and with both the total amount of the bond is based on reclamation cost estimates made prior to the start of mining. When the administrator of the act has determined that the reclamation plan has been complied with, most of the bond is released; the remainder is kept for a number of years to insure that revegetation has been successful. With total bond amounts designed to meet cost estimates, the actual costs of a bond will be site specific and with total release dates that vary from state to state or are released at the discretion of the state administrator, the bond cost will vary from state to state. Also, as stated, the bond will vary according to the financial stability of the company requesting the bond.

Despite the existence of problems associated with bonding programs, they do present a viable alternative to insure the stabilization of uranium tailing piles. Some of the advantages of bonding are:

- (a) Administrative costs associated with a bond exclusive of costs related to forfeitures would be minimal. A document sent to the agency from the surety and filed with the operator's application and some assurance that the surety is properly certified by the state agency licensing sureties would be all the effort necessary to implement the bond. Amendments to the amount of the bond would also involve minimal correspondence with the surety. Bonding companies thoroughly screen the credit record of the companies that they bond, so the state is not involved in checking an operator's financial condition.

Forfeitures may involve appeals by the mill operator which will entail costs for attorneys, hearing commissions, and, possibly, court time. These costs, however, would be expected to be similar regardless of the financing method used. All methods would be expected to provide a means for an operator to appeal forfeitures.

- (b) As stated, bonds are presently an allowable method in the existing regulatory authority of most milling states. The authority exists either in specific statutory language or is implied as an allowable condition precedent to obtaining a state or federal license.
- (c) For the mill operator, the total bond amount can be carried as a contingent liability which would not impair their liquidity in that their liability does not have to be reflected in balance sheets and no assets are lost to more productive uses.

Standard bonding provisions could be applied to all milling states through NRC's authority in direct licensing and authority over standards in agreement states. While bonding provisions could be uniform bond amounts, requirements and durations would still remain site specific.

- (d) A simple rider to an existing bond would be all that is necessary to adjust the amount of the bond.
- (e) No problem of asset valuation exists in this alternative.

The major disadvantages of bonding are:

- (a) The operator incurs out-of-pocket expenses for the bond. Telephone contacts with the following groups indicate bond prices to be as follows:

- Federal Insurance of New Jersey *San Francisco*
\$3.75/yr./\$1000, for highest rated companies
\$7.50/yr./\$1000, for medium risk companies
\$10.00/yr./\$1000, for highest risk companies
- Safeco Insurance Company
\$12.50/yr./\$1000 is book rate, adjustments are allowed depending on the company, actual rates may be from \$3.50-\$10.00/yr./\$1000
- Surety Association of America
\$12.50/yr./\$1000

- o West Virginia*
\$12.00-\$20.00/yr./\$1000
- o Ohio*
\$8.00/yr./\$1000
- o Tennessee*
Charge to operator ranges from \$2.00-\$20.00/yr./\$1000

For a \$3-million surety bond at \$7.50/yr./\$1000 the cost for the typical mill would be about 3¢ per ton of ore milled if the lifetime of the mill and the duration of the bond were the same.

- (b) Obtaining funds from the surety upon default may be more difficult than with some other alternatives.

3.1.2. Deposits of Cash into Escrow

Five uranium mill states, Colorado, South Dakota, Texas, Utah and Wyoming, as shown in Table 3-1 expressly allow cash to be deposited into an escrow account as a method of assuring reclamation, six of the seven coal surface mining states also expressly allow cash deposits. An amount equal to or greater than the estimated costs of reclamation is often allowed to be deposited into an escrow account, usually with the state treasurer. If and when the mill operator defaults, the state may withdraw the fund.

Some of the advantages of this method include:

- (a) It is currently an authorized method in five milling states.
- (b) There is no additional cost to the operator above the required escrow sum.
- (c) There is minimal difficulty in obtaining funds in case of default by the operator, especially where the escrow account is administered by the state.
- (d) No problem of asset valuation exists in this alternative.

* From phone conversations with state agencies involved in bonding programs for coal strip mining.

Some disadvantages of this method are:

- (a) Time required to collect, transfer and account for funds and interest is greater for the state agency than the time required for other alternatives.
- (b) While cash is in the escrow account, there is a loss of productive use of a corporate asset. If it were not in escrow it could be used in productive investments for the mill operator which would be expected to earn greater profits than the interest paid on the cash.
- (c) There is more effort needed to adjust the amount of the fund than is required for some other alternatives. This time difference, however, is minimal. To increase the amount, a letter must be sent to the operator to obtain additional funds and funds must be transferred.

3.1.3. Certificates of Deposit (CD)

Currently seven uranium mill states appear to have implied authority which allows the use of the CD as a method of assuring reclamation. As shown in Table 3-1, all but Arizona allow the mill operator to deposit a CD with the state. Three coal mining states expressly provide for use of this method. Generally these may be issued by any bank in the state. Cash or securities are deposited by the mill operator with the bank and a CD is issued, made payable to the state. Certificates of deposit are generally in a standard form which include the amount of deposit, interest rate and maturity date. A sample CD is presented in Exhibit 3-1. CD's are a negotiable instrument and can be cashed at any time up to the specified maturity date. Because they are negotiable, without an underlying contract, the state could cashout the certificate regardless of default by the mill operator. For the protection of the operator, the license to mill should provide the contractual terms associated with the CD, such as why it is provided and the elements of default.

A minor problem with a CD arises with the maturity date on the face of the certificate. Technically, the holder of the certificate may cash it in

La Jolla Bank & Trust Company
PROSPECT AND IVANHOE
LA JOLLA, CALIF

60488
_____ 19____

FIXED MATURITY
NO INTEREST AFTER MATURITY

_____ HAS DEPOSITED IN THIS BANK
_____ DOLLARS \$ _____

PAYABLE TO _____
UPON MATURITY AND PRESENTATION AND SURRENDER OF THIS CERTIFICATE, PROPERLY ENDORSED, AT THE OFFICE OF
ISSUE, THIS CERTIFICATE MATURES ON _____ AND BEARS INTEREST AT THE RATE OF _____% PER ANNUM
FROM DATE UNTIL MATURITY, PAYABLE MATURITY QUARTERLY

TED 7-2143 (249)

CERTIFICATE OF DEPOSIT
NOT SUBJECT TO CHECK

POOR ORIGINAL

upon maturity, and interest accrual is terminated as of the maturity date. It is standard practice to include automatic renewal provisions in the negotiations for certificates of deposit to avoid cashing or termination of interest after the first maturity date and before completion of the contract. In surety reclamation contracts, the automatic renewal provision should appear on the face of the certificate of deposit or in the accompanying letter from the bank.

Some of the advantages of this method of financing include:

- (a) Currently seven milling states have laws which imply that this method may be used.
- (b) No out-of-pocket expenses are incurred by the mill operator.
- (c) In the event of default by the operator, the funds are easily obtained. The state has possession of the certificate of deposit, which, being a negotiable instrument, is easily cashed.
- (d) No problem exists as to asset valuation for the state. The certificate of deposit is issued for the estimated reclamation cost.

Disadvantages of this method include:

- (a) The administrative hours required by the state to implement this method are minimal. Most of the work is done by the bank and the mill operator, but this method does require more administrative time than other alternatives.
- (b) For the mill operator there is a loss of productive use of corporate assets. When cash is deposited with the bank, although interest is earned on such, it usually is not as much as could be earned on other investments.
- (c) There is some difficulty associated with adjusting the amount of certificate. This may require that a new certificate be issued. Closely related with this is the need by the state to monitor the certificates to assure that the maturity date has not expired where the CD is not automatically renewed.

3.1.4. Deposits of Securities into Escrow

Presently five of the uranium mill states expressly provide that government bonds may be deposited into escrow to insure reclamation. One state appears to have implied authority to allow use of securities. Five coal states provide express authority to use this method. Five uranium mill states, Colorado, South Dakota, Texas, Utah and Wyoming, currently allow the mill operators to deposit securities into an escrow account with the state. However, some of the states place restrictions on the type of securities they will accept.

One state, South Dakota, will only accept United States Government bonds. Colorado and Wyoming are two states that don't limit the deposits to U. S. Government bonds but will accept any government security. Utah on the other hand accepts any security with no specification as to type.

Texas, however, is the most lenient state in that it will accept any security, including a corporation's own bonds. The only requirement is that the corporation show that it is financially secure.

Five of the coal-mining states surveyed, Iowa, Maryland, Pennsylvania, Tennessee and West Virginia, also currently allow a mill operator to post securities into an escrow account as an alternative financing method.

One state, Maryland, limits the securities it will accept to United States Government bonds. Two states, Iowa and West Virginia, make no distinction as to the type of government security they will accept, but do limit them to government securities rather than corporate.

Pennsylvania lists the securities that it will accept, which include U. S. Government securities, certain Pennsylvania State securities and Pennsylvania municipal bonds. Tennessee also lists the acceptable securities including U. S. Treasury bonds, general obligation municipal bonds, or corporate bonds which have at least an 'A' rating by Moodys and/or Standard and Poors rating services. An operator whose own corporate bonds meet such a rate, may execute its own bond for deposit.

Securities with a value greater than the actual estimated reclamation cost are usually required. Bonds are generally discounted from their market value to assure that the cash value is sufficient when and if the mill operator defaults on reclamation.

Some of the advantages of this method include:

- (a) Authority presently exists in six uranium milling states.
- (b) The mill operator incurs no out-of-pocket expenses.
- (c) There is little difficulty of obtaining the funds in the event of default by the operator as the state already has the necessary funds in escrow.

Some disadvantages associated with this method are:

- (a) More administrative time is required than with some of the other alternatives. The state must establish the escrow account and depending on the securities, must check on the value of the securities. Additionally, changes in bond or security market may necessitate calls for additional securities. The state must take a more active role in this method than most other alternatives by holding the funds in escrow, distributing interests and dividends from the securities to the mill operator, determining security values and exchanging from the escrow account securities for other securities as the mill operator desires.
- (b) There is a loss of productive use of corporate assets while in escrow. Bonds lose their liquidity, and while exchanges of bonds are possible, the state must approve the bonds used. Bonds which the state allow for security deposits generally do not earn as much as other investments might.
- (c) A minimal amount of difficulty is involved with adjusting the amount in the escrow account. It involves contacts with the mill operator for additional securities, and fund administration time.
- (d) The values of the securities will fluctuate and cause additional administrative time to insure the proper amount is maintained in the fund.

3.1.5. Secured Interests

Two uranium milling states, Colorado and Utah, as shown in the matrix in Table 3-1, currently provide that security interests may be used as a method to insure reclamation of mill tailing piles. Basically, a secured

interest is an interest in personal property or fixtures of the mill operator which gives to the holder of the interest, rights to possession of the property to insure payment of an obligation. A secured interest running to the state gives the state the right, in the event of default by a mill operator, to take possession of the assets it has an interest in and sell them in satisfaction of their claim. In most cases where a security interest has been properly created, the holder of the interests has priority over these assets if the mill operator goes bankrupt. The secured assets may be repossessed by the secured interest holder and proceeds from sale of the assets are not required to be shared with other creditors in bankruptcy. Generally, secured interests are governed by Article 9 of the Uniform Commercial Code, which has been enacted in all states except Louisiana, with only a few local variations.

For a state to acquire a valid security interest in the assets of the mill operator, four basic steps must be followed; these are detailed in Article 9, Section 203 of the Uniform Commercial Code and include:

(1) The parties must make a security agreement, which is simply an agreement to create a security interest. This must include a description of the collateral (assets included in the security interest) and evidence of an intent to create a security interest.

The agreement must be reduced to writing and signed by the mill operator; or in the absence of a writing, the mill operator may give possession of the collateral to the state.

The collateral used can be any of the assets of the mill operator including its equipment, accounts receivable, or any of its inventory. With inventory, however, the agreement must be drawn up carefully to provide for fluctuations in inventory levels and inventory subject to the agreement must be identified as specifically as possible. It should also be noted that a security interest does not attach to minerals to be extracted until they have been extracted from the land, however, a valid security interest can attach to the land itself.

Examples of two types of security agreements are provided in Exhibits 3-2 and 3-3. Exhibit 3-2 is a general security agreement which can be used for many types of collateral. Exhibit 3-3 presents a sample security agreement for use where land is being used as the collateral.

EXHIBIT 3-2. GENERAL SECURITY AGREEMENT

In consideration of financial accommodations given, to be given or continued, the mill operator named below grants to (state) a security interest in (a) the collateral described below now owned by mill operator of the type or class described below or in any schedule supplementary hereto or in any financing statement filed by state and mill operator. Unless otherwise defined, words used herein have the meanings given them in the Uniform Commercial Code.

Mill operator warrants, represents and agrees:

1. Mill operator will immediately perform (a) any obligation when due; (b) state's costs of fulfilling mill operator's obligatory performance, of realization on collateral, and any expenditure of state pursuant hereto, including attorney's fees and expenses, with interest at the maximum rate allowed by law from date of expenditure; and (c) any deficiency after realization on collateral.
2. As to all collateral in mill operator's possession (unless specifically otherwise agreed by state in writing) mill operator will:
 - (a) Have, or has, possession of the collateral at the location disclosed to state and will not remove the collateral from that location.
 - (b) Keep the collateral separate and identifiable.
 - (c) Maintain the collateral in all such ways as are considered good practice by owners of like property, use it lawfully and only as permitted by insurance policies, and permit state to inspect the collateral at any reasonable time.
 - (d) Not sell, contract to sell, lease, encumber, or transfer collateral (other than inventory collateral) until the debt has been paid, even though state has a security interest in proceeds of such collateral.

EXHIBIT 3-2. (Continued)

3. As to collateral which is inventory and accounts, mill operator:

- (a) May, until notice from state, sell, lease, or otherwise dispose of inventory collateral in the ordinary course of trade only, and collect cash proceeds of inventory collateral.
- (b) Will deposit all cash proceeds as received in a non-interest-bearing account with state containing only such proceeds and deliver statements identifying units of inventory disposed of, accounts which gave rise to proceeds, and all acquisitions and returns of inventory, as required by state.
- (c) Will receive in trust, schedule on forms satisfactory to state and deliver to state all noncash proceeds other than inventory received in trade.
- (d) If not in default, may obtain release of state's interest in individual units of inventory upon request therefor, payment to state of the release price of such units shown on any collateral schedule supplementary hereto, and compliance herewith as to proceeds thereof.

4. As to collateral which is contract rights, chattel paper, general intangibles and proceeds described in 3(c) above, mill operator warrants, represents and agrees:

- (a) All such collateral is genuine, enforceable in accordance with its terms, free from default, prepayment, defense and conditions precedent (except as disclosed to and accepted by state in writing) and is supported by consecutively numbered invoices to, or rights against, the debtors thereon. Mill operator will supply state with duplicate invoices or other evidence of mill operator's rights on state's request.
- (b) All persons appearing to be obligated on such collateral have authority and capacity to contract.
- (c) All chattel paper is in compliance with law as to form, content and manner of preparation and execution and has been properly registered and filed to perfect mill operator's interest thereunder.

EXHIBIT 3-2. (Continued)

- (d) If an account debtor shall also be indebted to mill operator on another obligation, any payment made by him not specifically designated to be applied on any particular obligation shall be deemed to be a payment on the account in which state has a security interest. Should any remittance include a payment not on an account, it shall be delivered to state and if no event of default has occurred, state shall pay mill operator the amount of such payment.
 - (e) Mill operator agrees not to compromise, settle, or adjust any account or renew or extend the time of payment thereof without state's written consent.
5. Mill operator owns all collateral absolutely and no other person has or claims any interest in any collateral except as disclosed to and accepted by state in writing. Mill operator will defend any proceeding which may affect title to or state's security interest in any collateral, and will indemnify state for all costs and expenses of state's defense.
6. Mill operator will pay when due all existing or future charges, liens or encumbrances on and all taxes and assessments now or hereafter imposed on or affecting the collateral and, if the collateral is in mill operator's possession, the reality on which the collateral is located.
7. Mill operator will insure the collateral with state as loss payee in form and amounts, with companies, and against risks and liability satisfactory to state, and hereby assigns such policies to state, agrees to deliver them to state at state's request, and authorizes state to make any claim thereunder, to cancel the insurance on mill operator's default, and to receive payment of and endorse any instrument in payment of any loss or return premium.
8. Mill operator will give state any information it requires. All information at any time supplied to state by mill operator (including, but not limited to, the value and condition of collateral, financial statements, financing statements, and statements made in documentary collateral), is correct and complete, and mill operator will notify state of any adverse change in such information. Mill operator will promptly notify state of any change of mill operator's residence, chief place of business or mailing address.

EXHIBIT 3-2. (Continued)

9. State is irrevocably appointed mill operator's attorney in fact to do any act which mill operator is obligated hereby to do, to exercise such rights as mill operator might exercise, to use such equipment as mill operator might use, to enter mill operator's premises to give notice of state's security interest in, and to collect collateral and proceeds and to execute and file in mill operator's name any financing statements and amendments thereto required to perfect state's security interest hereunder, all to protect and preserve the collateral and state's rights hereunder. State may:

- (a) Endorse, collect, and receive delivery or payment of instruments and documents constituting collateral.
- (b) Make extension agreements with respect to or affecting collateral, exchange it for other collateral, release persons liable thereon or take security for the payment thereof, and compromise disputes in connection therewith.
- (c) Use or operate collateral for the purpose of preserving collateral or its value and for preserving or liquidating collateral.

10. If more than one mill operator signs, their liability is joint and several. Discharge of any mill operator except for full payment, or any extension, forbearance, change of rate of interest, or acceptance, release or substitution of collateral or any impairment or suspension of state's rights against a mill operator, or any transfer of a mill operator's interest to another, shall not affect the liability of any other mill operator. Until the debt shall have been paid or performed in full, state's rights shall continue even if the debt is outlawed. All mill operators waive (a) any right to require state to proceed against any mill operator before any other, or to pursue any other remedy; (b) presentment, protest and notice of protest, demand and notice of nonpayment, demand of performance, notice of sale, and advertisement of sale; (c) any right to the benefit of or to direct the application of any collateral until the debt shall have been paid; (d) and any right of subrogation to state until debt shall have been paid or performed in full.

11. On mill operator's default, at state's option, without demand or notice, all or any part of the debt shall immediately become due. State shall have all rights given by law, and may sell, in one or more sales, collateral

EXHIBIT 3-2. (Continued)

in any county where state has an office. State may purchase at such sale. Sales for cash or on credit to a wholesaler, retailer or user of the collateral, or at public or private auction, are all commercially reasonable. State may require mill operator to assemble the collateral and make it available to state at the entrance to the location of the collateral, or a place designated by state.

12. Defaults are:

- (a) Mill operator's failure to pay or perform this or any agreement with state or breach of any warranty herein.
- (b) Any change in mill operator's financial condition which in state's judgement impairs the prospect of mill operator's payment or performance.
- (c) Any actual or reasonably anticipated deterioration of the collateral or in the market price thereof which causes it in state's judgement to become unsatisfactory as security.
- (d) Any levy or seizure against mill operator or any of the collateral.
- (e) Death, termination of business, assignment for creditors, insolvency, appointment of receiver, or the filing of any petition under bankruptcy or debtor's relief laws of, by or against mill operator.

13. State's acceptance of partial or delinquent payments or failure of state to exercise any right shall not waive any obligation of mill operator or right of state or modify this agreement, or waive any other similar default.

14. Time is of the essence. This agreement and supplementary schedules hereto contain the entire security agreement between state and mill operator. Mill operator will execute any additional agreements, assignments or documents reasonably required by state to effectuate this agreement.

Collateral not described in financing statements, schedules, or in state's possession:

C-1. Savings account or time deposit:

EXHIBIT 3-2. (Continued)

Depositor(s)

Depository

Account No.

To the extent of: (check one)

() \$

() The total balance therein.

Mill operator warrants and represents that the balance of said account is now at least \$ and revokes any tentative trust created by said account to the extent of state's security interest therein. Should state's security interest be satisfied, mill operator intends that the terms of said tentative trust should again take full effect.

C-2. Contract rights: (describe)

Mill operator warrants and represents that the amount which he will be entitled to receive under said collateral is at least \$

Mill operator agrees that he will fully perform any such contract and do whatever state may require to assure payment to state of all money to be paid or benefits to be derived thereunder. State is not bound by any such contract or bound to perform any obligations of mill operator thereunder.

C-3. Other:

Dated: , 19 .

. (signature)
Mill Operator

Third Party Security Agreement

The undersigned grants to state a security interest in the collateral described above on the terms above stated to secure payment to state. The term "mill operator" as used above means the undersigned in any provision dealing

EXHIBIT 3-2. (Continued)

with the collateral, and means mill operator in any provision dealing with performance of obligations.

Dated: , 19 .

. (signature)

. (signature)

EXHIBIT 3-3. PLEDGE AGREEMENT

THIS AGREEMENT, made and entered into this day of 19 , at (state), by and between . . . (name of mill operator), hereinafter referred to as "mill operator" and (name of state), hereinafter referred to as "state";

Recitals

Mill operator in performance of his obligation to the state to reclaim land used for uranium mill tailing operations at an estimated expenditure (cost) of \$, hereby pledges that said sum be secured by certain described land sale contracts and promissory notes secured by deeds of trust, which contracts and secured notes are owned by mill operator as collateral for the above-mentioned obligation.

IT IS THEREFORE AGREED as follows:

Pledge of Collateral

1. In consideration of any financial accommodations given, or to be given, or continued, to the mill operator by the state, and as collateral security for the payment of any indebtedness, obligation, or liability of the mill operator to the state, now or hereafter existing, matured or to mature, absolute or contingent, and wherever payable, including but not limited to the obligation of the mill operator to the state under promissory note(s) of even date herewith, the mill operator hereby assigns, transfers to, and deposits with the state the promissory note(s), deed(s) of trust, and land sale contract(s), hereinafter described, delivered by the mill operator to the state, or which may now be held by the state, and such additional property as may hereinafter be delivered by the mill operator to the state during the existence of this Agreement. The note(s), deed(s) of trust, and contract(s), herewith delivered or now held by the state are described as follows:

. (include description of each item of collateral)

EXHIBIT 3-3. (Continued)

Warranties by Mill Operator

2. The mill operator warrants and represents with respect to each promissory note, deed of trust and land sale contract assigned hereunder that:

- (a) The mill operator is the absolute owner of said documents, and the obligations described in said documents are due and payable as stated therein, and that the obligor(s) under said instruments are not now in default, as to payment of money or in any other respect, in any obligations thereunder; and
- (b) Said collateral is not subject to any prior assignment, claim, lien, or security interest, and the mill operator will not make any further assignment thereof or create any further security interest therein, nor permit his rights therein to be reached by attachment, levy, garnishment or other judicial process; and
- (c) The obligations of the obligor(s) under said instruments are not subject to any claim for credits, allowances or adjustment; and
- (d) No notice of the bankruptcy, insolvency or financial embarrassment of any obligor(s) under said instruments has been received by the mill operator and upon mill operator's receipt of any such notice the mill operator will immediately give state written notice thereof; and
- (e) The mill operator has maintained and will continue to maintain accurate and complete records and accounts concerning all obligations given as collateral hereunder, and agrees to permit inspection of said records and accounts by the state and to submit to the state statements of said accounts in such form as shall be prescribed by the state.

Power of Sale

3. The power of sale and all other powers hereinafter granted by the mill operator shall apply to all collateral of any kind of description, including all moneys, negotiable instruments, bonds, stocks, and commercial paper,

EXHIBIT 3-3. (Continued)

credits, choses in action, claims, or demands of every kind at any time during the existence of this Agreement deposited with or in the possession or control of the state, or any of its agents.

Substitution of Collateral

4. If, with the consent of the state, the mill operator shall substitute or exchange other collateral, securities or instruments in place of the collateral herein mentioned, then all of the rights and privileges of the state and all obligations on the part of the mill operator shall be forthwith applicable to said substituted or exchanged collateral, securities or instruments, the same in all respects as with respect to the property originally pledged and held as collateral hereunder.

Collection of Collateral

5. The state shall have the right to notify the debtor(s) obligated under any or all of the promissory notes, deeds of trust and land sale contracts held as collateral hereunder to make payment direct to the state, and to take control of all proceeds of any such instruments, and enforce any and all obligations of the obligor(s) under said instruments, which rights the state may exercise at any time, whether or not the mill operator is then in default hereunder or was theretofore making collections thereon. Until such time as the state elects to exercise such rights by mailing to the mill operator written notice thereof, the mill operator is authorized to collect payments and enforce all rights under said notes, deeds of trust, and land sale contracts, as to current and past-due payments, but is not authorized to collect any prepayments, fire insurance proceeds, or condemnation award without the prior written consent of the state. The costs of such collection and enforcement, including attorney's fees and out-of-pocket expenses, shall be borne solely by the mill operator, whether the same are incurred by the state or the mill operator.

EXHIBIT 3-3. (Continued)

Fire Insurance

6. All fire insurance required to be maintained by the obligor(s) under the terms of all deeds of trust and land sale contracts assigned as collateral hereunder shall be written with loss payable to the state, and such policies, or certificates evidencing the same shall be furnished to the state in form satisfactory to the state. If the obligor(s) and mill operator fail to pay any premium on any such insurance, the state may, but shall not be required, to pay the same and add the amount thereof to the debt(s) secured hereby. The mill operator hereby appoints the state his attorney-in-fact to endorse any draft or check which may be payable to the mill operator in order to collect the proceeds of such insurance or any condemnation award, and any balance of proceeds remaining after payment in full of all amounts secured hereunder shall be paid to the mill operator. The amount collected under any fire or any other insurance policy and any condemnation award may be applied by the state upon any indebtedness secured hereby, and in such order as the state may determine, or, at the option of the state, the entire amount so collected, or any part thereof, may be released to the mill operator.

Sale of Collateral

7. In the event of the failure in or suspension of business, insolvency, petition filed in bankruptcy hereafter, or a general assignment by the mill operator for the benefit of mill operator's creditors, or in the event of any default by an obligor under any of the terms of the promissory note(s), deed(s) of trust, and land sale contract(s) assigned hereunder as collateral, all the liabilities of the mill operator to the state shall, at the option of the state, become immediately due and payable, notwithstanding any credit or extension of time allowed to the mill operator by any instrument evidencing any of said liabilities; and in any such event, as well as in the event of the nonpayment of principal or interest, when due, on all or any of the liabilities of the state secured and intended to be secured hereby, in accordance with the terms of the instrument evidencing the same, the mill operator hereby constitutes and irrevocably appoints the state attorney-in-fact of the mill operator, and hereby authorizes, empowers, and instructs said

EXHIBIT 3-3. (Continued)

attorney-in-fact to sell the collateral. Such sale of the collateral may be as a unit or in parts, at any time and place and on any terms, provided the state acts in good faith and in a commercially reasonable manner. Unless the collateral threatens to decline speedily in value, the state shall give to the mill operator, and to any other person who has filed with the state a written request for notice, a notice in writing of the time and place of any public sale, or of the time on or after which any private sale or other intended disposition is to be made. Such notice must be delivered personally or be deposited in the United States mail, postage prepaid, addressed to the mill operator at his address as set forth in this Agreement, or at such other address as may have been furnished to the state in writing for this purpose, or, if no address has been set forth or furnished, at mill operator's last known address, and to any other person who has requested notice at the address set forth in his request for notice, at least five days before the date fixed for any public sale or before the date on or after which any private sale or other disposition is to be made. Notice of the time and place of a public sale shall also be given at least five days before the date of sale by publication once in a newspaper of general circulation, published in County, (state), in which county the sale shall be held. Any public sale may be postponed from time to time by a public announcement at the time and place last scheduled for sale, and the state may buy at any public sale. Any sale of which notice is delivered or mailed and published as herein provided and which is held as herein provided is a public sale.

Application of Sale Proceeds

8. After deducting all legal and other costs, expenses, and charges, including attorney's fees, incurred in the collection, sale, delivery, or preservation of the collateral security, or any part thereof, the state shall apply the residue of the proceeds of such sale to the payment of all of the indebtedness of the mill operator to the state and the interest thereon; and should there be any surplus of said proceeds after the payment of all the indebtedness of the mill operator to the state together with expenses, attorney's fees and all charges and other liability incurred by the state in the keeping, delivery, and preservation of said collateral security, such surplus shall be

EXHIBIT 3-3. (Continued)

subject to order of the mill operator. The mill operator agrees to pay to the state on demand, in lawful money of the United States, whatever balance may be due after the sale of said collateral security and the application of the proceeds thereof as above provided.

Retention of Collateral

9. Upon the occurrence of any event authorizing the state to sell the collateral under paragraph 7 of this Pledge Agreement, the state shall have the right, but shall not be required, to propose to retain the collateral in satisfaction of all obligations of the mill operator secured hereunder. Written notice of such proposal shall be sent to the mill operator, and to any other person who has requested notice of any sale of the collateral. If the mill operator or other person entitled to received notification objects in writing within thirty days from the receipt of the notification, the state must dispose of the collateral by a sale thereof under the terms and conditions provided in paragraph 7 of this Pledge Agreement, or as otherwise authorized by law. In the absence of such written objection, the mill operator may retain the collateral, without any right of redemption, in full satisfaction of the mill operator's obligations and indebtedness to the state.

Attorneys' Fees

10. In the event of any litigation of any nature between the parties hereto, or any of them, regarding the rights and obligations of the parties under this Pledge Agreement or any obligation secured hereby, the prevailing party in such litigation shall be entitled to recover his reasonable attorneys' fees as determined by the court.

Waiver of Rights by Mill Operator

11. Each mill operator, if there are more than one, waives any right to require the state to (a) proceed against any person, (b) proceed against or exhaust any collateral, or (c) pursue any other remedy in the state's power; and waives any defense arising by reason of any disability or other defense of

EXHIBIT 3-3. (Continued)

any other mill operator or any other person, or by reason of the cessation from any cause whatsoever of the liability, of any other mill operator or any other person. Each mill operator authorizes the state to (a) take and hold security, other than the collateral herein referred to, for the payment of the indebtedness or any part thereof, and exchange, enforce, waive, and release the collateral herein referred to or any part thereof, or any such other security; and (b) release or substitute any other mill operator.

Continuing Agreement

12. It is further agreed that these presents constitute a continuing agreement applying to any and all future, as well as existing, transactions between the mill operator and the state, and that the powers of sale and all other powers, rights, and privileges herein given apply to and bind the heirs, executors, administrators, successors, and assigns of the respective parties hereto.

Time of the Essence

13. Time is of the essence of this Pledge Agreement.

Payments and Notices

14. All payments and notices under this Pledge Agreement or otherwise required by law shall be made to the state held by the State Treasury Department (street address, city and state), and to the mill operator at (street address, city and state) or such other address as the party entitled to such payment or notice may designate to the other party in writing.

Satisfaction of Obligation

15. Upon the satisfaction of all obligations of the mill operator to the state secured hereby, the state shall return to the mill operator the promissory note(s), deed(s) of trust, land sales contract(s) and all other documents and securities given as collateral hereunder, and shall endorse all instruments to

EXHIBIT 3-3. (Continued)

the mill operator or his order, and give an assignment of all such note(s), deed(s) of trust and contract(s) in recordable form.

Dated: , 19 .

. (state)

By (authorized signature
of state official)
(typed name and title)
STATE & STATE OFFICIAL

. (name of mill operator)

By (signature)
(typed name and title)
MILL OPERATOR

(2) The mill operator must retain some rights in the collateral.

(3) The state must give something of value, which could be the permit for the mill operator.

(4) Although a security interest can be valid and enforceable without perfecting it, it should be perfected to give the holder priority over other secured and non-secured creditors in bankruptcy and to afford protection from sale of the asset to a third party. The most common method of perfecting a security interest is to file with the county recorder for the county in which the asset is located, a financing statement which is essentially a notice stating that the state claims an interest in certain collateral of the mill operator. An example of the type of information required for filing a financing statement is found in Exhibit 3-4.

Some of the advantages of this method are:

- (a) No out-of-pocket expenses are incurred by the mill operator. The only costs involved would be those associated with drawing up the required documents.
- (b) There is no loss of productive use of corporate assets. The collateral which is used as the secured interest can stay with the mill operator for use in his operations.

Disadvantages of this method are:

- (a) A significant amount of time may be necessary to administer this procedure. In addition to the manhours that may be needed in case of default, it may take a substantial amount of time to establish a security interest by completing all the necessary paperwork, inspecting collateral and perfecting the interest. Time may also be necessary to periodically check the assets used for collateral to insure that they haven't been sold or depreciated substantially. When assets of the mill operator are used as collateral, there is an additional problem of valuation of the assets. It is often difficult to place a value on such assets as equipment.
- (b) Currently, only two milling states, Colorado and Utah, have legislated authority to use this method.

EXHIBIT 3-4. FINANCING STATEMENT

This FINANCING STATEMENT is presented for filing pursuant to the California Uniform Commercial Code.

1. DEBTOR <small>(LAST NAME FIRST-IF AN INDIVIDUAL)</small>		1A. SOCIAL SECURITY OR FEDERAL TAX NO.	
1B. MAILING ADDRESS		1C. CITY STATE	1D. ZIP CODE
2. ADDITIONAL DEBTOR <small>(IF ANY) (LAST NAME FIRST-IF AN INDIVIDUAL)</small>		2A. SOCIAL SECURITY OR FEDERAL TAX NO.	
2B. MAILING ADDRESS		2C. CITY STATE	2D. ZIP CODE
3. CUSTOM & TRADE NAMES OR TITLES <small>(IF ANY)</small>		3A. FEDERAL TAX NUMBER	
4. SECURED PARTY		4A. SOCIAL SECURITY NO. FEDERAL TAX NO. OR BUSINESS IDENT. NO.	
<small>NAME</small>		<small>STATE</small>	
<small>MAILING ADDRESS</small>		<small>CITY STATE ZIP CODE</small>	
5. ADDRESSEE OF SECURED PARTY <small>(IF ANY)</small>		5A. SOCIAL SECURITY OR FEDERAL TAX NO. OR BUSINESS IDENT. NO.	
<small>NAME</small>		<small>STATE</small>	
<small>MAILING ADDRESS</small>		<small>CITY STATE ZIP CODE</small>	

6. This FINANCING STATEMENT covers the following types or items of property (include description of real property on which located and owner of record when required by instruction 6).

7. CHECK <input checked="" type="checkbox"/> <small>IF APPLICABLE</small>	7A. <input type="checkbox"/> <small>PRODUCTS OF COLLATERAL ARE ALSO COVERED</small>	7B. DEBTOR(S) SIGNATURE NOT REQUIRED IN ACCORDANCE WITH UCC SECTION 9-311 (2)(A) <input type="checkbox"/> (1) <input type="checkbox"/> (2) <input type="checkbox"/> (3) <input type="checkbox"/> (4)
8. CHECK <input checked="" type="checkbox"/> <small>IF APPLICABLE</small>	<input type="checkbox"/> <small>DEBTOR IS A "TRANSMITTING UTILITY" IN ACCORDANCE WITH UCC § 9108 (1) (A)</small>	
9.	DATE:	10. THIS SPACE FOR USE OF FILING OFFICER (DATE TIME FILE NUMBER AND FILING OFFICER):
SIGNATURE(S) OF DEBTOR(S)		1
TWO OR MORE SIGNATURE(S) OF DEBTOR(S)		2
SIGNATURE(S) OF SECURED PARTY(IES)		3
TWO OR MORE SIGNATURE(S) OF SECURED PARTY(IES)		4
TWO OR MORE SIGNATURE(S) OF BOTH DEBTOR(S) AND SECURED PARTY(IES)		5
(1) Return copy to:		6
NAME <input type="checkbox"/>	ADDRESS <input type="checkbox"/>	7
CITY <input type="checkbox"/>	STATE <input type="checkbox"/>	8
ZIP CODE <input type="checkbox"/>		9
(2) FILING OFFICER COPY	FORM UCC-9 FILING FEE \$ 3.00	10
<small>Approved by the Secretary of State</small>		

- (c) When it becomes necessary to adjust the amount of fund, additional assets must be added to the agreement or withdrawn as the reclamation cost decreases. This involves the problem of valuation of assets.
- (d) Significant difficulty may exist in obtaining the fund on default. Article 9 of the Uniform Commercial Code provides that the state has the right on default to take possession of the collateral. However, this may be done without using the court's process only if it is done without a breach of the peace. Section 503 of the UCC provides:

"Unless otherwise agreed a secured party has on default the right to take possession of the collateral. In taking possession a secured party may proceed without judicial process if this can be done without breach of the peace or may proceed by action. If the security agreement so provides the secured party may require the debtor to assemble the collateral and make it available to the secured party at a place to be designated by the secured party which is reasonably convenient to both parties. Without removal a secured party may render equipment unusable, and may dispose of collateral on the debtor's premises under Section 9-504."

Although it is difficult to determine exactly what is a breach of the peace, repossession is usually not permitted when the owner protests or refuses to grant consent to such repossession. When that happens, the normal procedure is for the state to commence suit against the operator and obtain judgement for the amount owed. After judgement the clerk of the court will, on request, issue a writ of execution, which directs the sheriff or other appropriate officer to seize the property and sell it to satisfy the judgement.

Such use of judicial process is provided for in Section 501 of the UCC:

"When a debtor is in default under a security agreement, a secured party may reduce his claim to judgment, foreclose or otherwise enforce the security interest by any available judicial procedure."

This can be a very time-consuming procedure which can be avoided when the reclamation funds are held by the state.

3.1.6. Letters of Credit

Letters of credit are another short-term alternative to insure reclamation of mill tailing piles. Currently, two uranium milling states, Colorado and Utah, have legislated authority to use this method of financial assurance. None of the coal surface mining states have authority to use this method. Traditionally, letters of credit have been primarily used in international trade. They are beginning, however, to be used more in domestic transactions. In using this method, the mill operator would apply to his bank for the issuance of a letter of credit that commits this bank to pay the beneficiary (the state) when the letter of credit comes due; in this case it would become due upon default of an operator's duty to reclaim. The Uniform Commercial Code in Article 5 deals with letters of credit. A typical letter of credit is shown in Exhibit 3-5.

For a mill operator to obtain a letter of credit he must apply to a bank or financial institution which will issue one. Many banks will not issue a letter of credit. He will often be required to give the bank some type of security interest in the mill operator's property. In the alternative, he may need to supply capital to the bank to insure that he will not default.

On the basis of telephone interviews it has been determined that not all banks will issue this type of a letter of credit which is referred to as a "standby letter of credit." Crocker National Bank, Security Pacific, Bank of America, La Jolla Bank & Trust, and Wells Fargo Bank have all stated that they would issue this type of letter of credit, while San Diego Trust & Savings will not. Of those that will issue a standby letter of credit, they will do so for differing amounts and for differing fees. Security Pacific charges a fee of 1 percent of the face value of the letter of credit per year. Bank of America's rate ranges from 1 to 2 percent. Wells Fargo will issue one at the rate of 1 1/2 to 2 percent, based on the amount of the letter of credit and the status of the account. On the other hand, La Jolla Bank & Trust is only able to issue a letter of credit for an amount up to \$300,000 at a fee of \$1500. Additionally, La Jolla Bank & Trust charges a penalty of from 1 to 2 percent above the prime interest rate in the event of default by the operator.

For a \$3-million letter of credit at 1.5 percent, the cost for the typical mill would be about 6¢ per ton of ore milled if the lifetime of the mill and the duration of the letter of credit were the same.

EXHIBIT 3-5. SAMPLE LETTER OF CREDIT

UC

STANDBY
LETTER OF CREDIT
NO. 00003
AMOUNT

UNITED CALIFORNIA BANK
 BOX 54191 TERMINAL ANNEX - LOS ANGELES, CALIFORNIA 90054
 405 MONTGOMERY STREET - SAN FRANCISCO, CALIFORNIA 94104

CABLE ADDRESS: UCAIBANK

_____ 19__

Mill Operator

This is the confirmation of the credit opened today by cable through our above named correspondent. It is only available for such amount as has not already been availed of under such cable advice and may not be availed of at all unless attached to and as a part of our correspondent's notification of such cable advice, the two jointly constituting evidence of the outstanding amount of this credit.

Gentlemen:

We hereby authorize you to draw on United California Bank, Box 54191, Los Angeles, California

at - - - - - sight for account of Mill Operator

up to an aggregate amount of

Drafts to be accompanied by:

1. Proof of default by operator.
2. Detailed description of reclamation remaining to be completed.
3. Estimated cost of remaining reclamation.

Drafts drawn hereunder must specifically mention the number and date of this letter of credit. The amount of each draft negotiated, together with the date of negotiation, must be endorsed on the reverse side of this Letter of Credit.

We hereby agree with the drawers, endorsers and bona fide holders that the drafts drawn under and in accordance with the terms of this credit shall be duly honored upon presentation to the drawee, if negotiated on or before

Sincerely,

AUTHORIZED SIGNATURE

AUTHORIZED SIGNATURE

Except as otherwise stated herein, this credit is subject to the Uniform Customs and Practice for Documentary Credits (1962 Revision) International Chamber of Commerce Brochure No. 222.

Some of the advantages of this method include:

- (a) This method requires only a minimal amount of time, on the part of the state, to administer. The letter of credit is filed with the operator's license. A check of the bank's financial status may also be desirable.
- (b) There is no valuation of assets problem for the state. It simply receives the letter of credit for the amount required.

Disadvantages of this method include:

- (a) At present only two uranium mill states allow this method of financing.
- (b) The mill operator incurs some out-of-pocket expense.
- (c) The bank may require some security for the letter of credit so that some corporate assets may be lost to more productive uses.
- (d) Some difficulty exists in adjusting the amount of the surety. This would require the issuance of a new letter of credit from the bank.
- (e) In the event of default by the mill operator, funds may be difficult to obtain from the bank. The state would have to prove the default of the operator, to which the bank may object or have defenses.

3.1.7. Self-Insurance by the Mill Operator

Only two uranium milling states, Texas and Utah, presently provide for the possibility of self-insurance by the mill operator. None of the coal-surface mining states allow self-insurance. Utah has provisions which give a great deal of discretion to the administrative agency in deciding what form of surety will be accepted. Utah's laws do not, however, specifically mention self-insurance. The Texas Surface Mining and Reclamation Act does specifically provide that an operator may give a bond without a surety. As used in this analysis, self-insurance means an agreement whereby the operator agrees to perform the reclamation and in case of default will pay the state sums required for the state to perform the reclamation. In effect, it is the alternative

of no additional assurance other than the operator's legal obligation to perform. The legal obligation will exist where reclamation is required regardless of a separate contract whereby the operator agrees to perform. Some of the advantages of this alternative are:

- (a) No extra administrative time is required.
- (b) No out-of-pocket expenses are incurred by the operator.
- (c) No loss of productive assets is involved.
- (d) No adjustments in amount of surety would be necessary.
- (e) No valuation problem exists.

Some disadvantages are:

- (a) Authority to allow self-insurance only exists in two milling states.
- (b) In case of default, the state would have to obtain a judgement based on their contract and would have to execute their judgement if the operator has assets out of which the judgement can be satisfied. The state has no rights in addition to those that exist without any form of surety.

3.2. EVALUATION AND RECOMMENDATIONS

Three approaches were taken to evaluate the relative merits of the short-term financial alternatives. The first approach, presented in the preceding sections, evaluated the applicability of each alternative and highlighted some of the advantages and disadvantages of each. The second approach was a telephone survey of current-use practices in the uranium milling states and in states where similar financial arrangements are in use to insure reclamation of areas strip mined for coal. The third approach was an evaluation of all of the alternatives against a given set of criteria. Table 3-2 presents the matrix used in this evaluation. The following section describes the results of interviews conducted with several state officials involved in mined land or mill tailing pile reclamation. The state interview summary section is followed by the summary of the matrix evaluation.

3.2.1. Survey of Current Practices

Several state conservation, mining and reclamation agencies were interviewed to obtain their evaluations of alternative short-term methods of financing which are currently in use to insure reclamation. Some of the states surveyed were states with uranium milling activity. Several states with coal surface mining reclamation programs were also surveyed. The reclamation programs in coal states have generally been in existence much longer than have uranium mill tailing programs and the experiences of the coal states were sought to provide insights gained through their experience.

The information sought included:

- (a) The most popular types of surety presently being used by the state for reclamation assurance.
- (b) The type of surety preferred by the state, if any, and why.
- (c) Whether the state requires the full amount for reclamation initially or allows for phased payment.
- (d) How much administrative time is involved in processing the surety.

The following capsulizes a review of the states interviewed, focussing on short-term financing for reclamation operators.

Colorado

Colorado is a uranium mill tailing state but has no sureties presently in effect to insure reclamation of mill tailing piles. The state will soon require such sureties pursuant to new license application regulations for reclamation. According to the draft regulations, the following types of financing will be accepted: bond by fidelity of surety company, personal bond secured by collateral, letter of credit, and cash bond by licensee. In addition, the regulations permit cash or government securities to be deposited with the Mined Land Reclamation Board, or the substitution of other land, in lieu of sureties.

Maryland

Maryland is a coal-surface mining state which allows cash deposits, negotiable government bonds, certificates of deposit and corporate surety bonds.

- (a) Most reclamation financing was done with certificates of deposit, but now larger companies are using corporate surety bonds.
- (b) The State Bureau of Mines has no preference for which form of reclamation assurance is used.
- (c) Since the full reclamation cost is not required initially, the operator can pay periodically at an agreed rate established after the plans are approved or by amendment once operations have begun.
- (d) A certificate of deposit merely requires a phone call to the state bank that issued it to see if there are sufficient funds. A surety bond in Maryland requires a bit more administrative time to check the bonding company with the list of legal bonding companies and can require up to two days.

Ohio

Ohio is a coal-surface mining state and permits reclamation financing with cash deposits, certificates of deposit or surety bonds.

- (a) Surety bonds are the predominant means of reclamation financing.
- (b) The State Division of Forestry and Reclamation has no preference among assurance methods.
- (c) The Chief of the Division sets the bonding rate depending on the project. The bond can be paid in any amount and period that is arranged to the satisfaction of the Division and the operator.
- (d) It was indicated that certificates of deposit take more time than surety bonds in bookkeeping, holding the deposit and distributing the deposit upon completion of the project or default. Surety bonds, on the other hand, only require visual inspection provided they contain proper endorsement and amount.

Pennsylvania

Pennsylvania is a coal-surface mining state which sanctions negotiable government bonds, treasury bonds, cashiers' checks, municipal bonds, school building bonds and state licensed corporate surety bonds.

- (a) Corporate surety bonds are the most used.
- (b) There is no preference among the available financing methods.
- (c) Payment is required for the full amount of reclamation when the permit is issued.
- (d) No substantial administrative time is involved in processing either type of surety outside of nominal personnel costs.

South Dakota

South Dakota is a uranium mill tailing state which permits reclamation assurance in the form of cash, cashiers' checks, negotiable government securities, certificates of deposit (if a valid, non-photostatic copy is submitted in the name of the State Conservation Commission of South Dakota) and surety

bonds. At present, there are no uranium mill operations in South Dakota, but application has been made to reopen a mill and mine abandoned in 1974.

- (a) Surety bonds are the most often used.
- (b) The State Conservation Commission of South Dakota has no preference for a particular type of surety.
- (c) The full amount of the reclamation cost is required at the outset of the operations.
- (d) Minimal amount of administrative time is required by the state in each of the alternative methods.

Tennessee

Tennessee is a coal-surface mining state which allows operators to deposit cash, negotiable United States Treasury, municipal, or corporate (with at least an 'A' rating by Moodys and/or Standard & Poors rating services) bonds, and surety bonds.

- (a) Surety bonds were used primarily but they are becoming increasingly difficult to obtain due to the recent high rate of forfeiture. Now more negotiable bonds may begin to be used.
- (b) The Department of Conservation prefers surety bonds only to the extent that they are negotiated strictly between the operator and the surety company and the Department is merely the holder.
- (c) The full amount of reclamation cost is required initially.
- (d) No substantial administrative time is involved except the normal personnel costs to process the operator's application.

West Virginia

West Virginia is a coal-surface mining state and permits reclamation surety in the form of corporate sureties, certificates of deposit, cash deposits and municipal bonds.

- (a) Corporate sureties and certificates of deposit comprise approximately one-half each of the financing methods used.
- (b) State licensed corporate surety bonds are preferred because they take the least amount of administrative time.
- (c) The state requires full payment initially and then allows the operator to negotiate a reduction form with the bonding company. The full reclamation cost is initially required with certificates of deposit, after which they may be reduced as areas are graded.
- (d) The surety bonds require less administrative time since they need only be attached to the operator's application. Certificates of deposit must be sent to a state bank, entered on the Department of Natural Resources' books and distributed at the end of the operation.

Wyoming

Wyoming is a uranium mill tailing state which permits assurance by government securities, cash deposits (interpreted to mean certificate of deposit) and surety bonds.

- (a) Surety bonds and certificates of deposit are the most used.
- (b) The Department of Environmental Land Quality Division prefers surety bonds and certificates of deposit to the extent that they are the most used and therefore the easiest to work with.
- (c) The Department requires full initial payment of reclamation costs.
- (d) Nominal administrative time and costs are involved regardless of which type of surety is used.

Two of the states interviewed, Texas and Utah, do not use the more popular forms of financing such as surety bonds, certificates of deposit, or cash deposits. These states are using unique methods and are thus discussed separately below.

Texas

Texas permits all the common forms of assurance in their regulations, but the state presently allows the mill operators to be self-assuring. The rationale behind this practice is that two large corporations, Exxon and Chevron, are the only mill operators presently in Texas and the state feels that there is no point in a bonding company taking a risk when the assets of the two corporations are more than able to facilitate self-assurance. Consequently, the two corporations execute performance bonds to be held by the state until reclamation is complete.

Utah

Utah law also permits common surety methods, but the state is using a unique escrow plan. Under this plan, the operators deposit funds on a monthly basis into an escrow account which is administered by the state. The funds are then held pending completion of the reclamation project. Uranium mills in Utah are run by small corporations and the state feels that the operators are better off economically by spreading out the reclamation financing as opposed to depositing the full amount initially required by some surety bonds.

The states interviewed permit a wide variety of financing for reclamation assurance. Some of the states expressed a preference for surety bonds because they require less administrative time to process. Surety bonds are simply inspected and clipped to the operator's application rather than having to be sent to a bank and entered on administrative ledgers. Surety bonds were also the most predominately used method. Most states, however, had no strong preference for any of the alternatives allowed by their laws. Differences in administrative time required by the alternatives were generally considered insignificant. The interview with West Virginia provided some insights to their experiences with surety bonds and certificates of deposit. Surety bonds were preferred because they are easily administered but upon default, which has occurred often in West Virginia, they are more difficult to collect. Mr. Bill Rainey stated that the surety defaults "almost always wind up in court." Certificates of deposit, on the other hand, put the burden of court action to collect the funds on the defaulting operator.

TABLE 3-1. TYPES OF SURETIES PROVIDED FOR IN STATE MINING OR RADIATION CONTROL LAWS TO INSURE RECLAMATION OF MINED LANDS

State	Title & Cite to Law or Regulation	Administrative Agency	Application of Law						Types of Sureties Allowed					
			Surface Mining & Reclamation Act	Underground Mining & Reclamation Act	On-site Mills	Off-site Mills	(A) Bonds	(B) Cash Deposits	(C) Certificate of Deposit	(D) Deposit of Government Securities or Other Securities	(E) Secured Interests	(F) Letters of Credit	(G) Other	
ARIZONA	None	Arizona Atomic Energy Commission	Arizona has no active mills and no legislation is currently in force or being considered to manage future mills.											
COLORADO	Draft Agreement State (2 off-site mills)	Dept. of Health Occupational & Radiological Health Division (est. date of enactment Nov 1977)	Yes	Yes	Yes	No*	Yes-bond by fidelity of surety company (amt. of sureties to be between 500,000 & 5,000,000).	Yes-cash bond by licensee.	Not specifically allowed but may be implied by cash bond.	No	Yes-personal bond secured by collateral.	Yes-from recognized financial institution.	None	
	Rules & Regs. of Colo. Mined Land Reclamation Board, 5/77 Rules 1-7	Mined Land Reclamation Board	Yes	Yes	Yes	No*	Yes	Yes	Yes-not specifically mentioned but authority broad enough for Board to accept.	Yes-govt. securities.	Yes-same as (C).	Yes-same as (C).	Interests in other lands may be transferred to the state.	
IOWA	Iowa Code Title V, Ch. 85A, Eff. 1/68, Amended 8/73	Dept. of Soil Conservation	Yes	Yes	Yes	No	Yes-requires bonds by a licensed corporate surety equal to amt. of est. cost of rehabilitation be filed with Dept.	Yes-may deposit cash with Dept. of Soil Conservation equal to est. cost of rehabilitation.	No	Yes-may deposit govt. securities with Dept. equal to est. cost of rehabilitation.	No		None	
KENTUCKY	Ky. Rev. Stats Title XXVIII, Ch. 353, Amended by Ch. 3 Laws of 1972	Division of Reclamation	Yes	No	Yes	No	Yes-must file with Division surety bond of at least \$200/acre but not more than \$1000/acre with minimum of \$2000 bond.	No	No	No	No		None	
MARYLAND	Ann. Code of Md., Title 7 §501 et. seq.	Maryland Bureau of Mines	Yes	No	Yes	No	Yes-must file with the state a bond by licensed corporate surety of \$400/acre with a minimum of \$3000 for duration of operation plus 5 years.	Yes-may deposit cash in lieu of a bond equal to required sum of bond which is held by state treasurer.	Yes-in lieu of bond may have cert. of deposit equal to required bond, issued by bank in the state with written agreement to pay on demand to state.	Yes-may deposit negotiable bond of U.S. Govt. in lieu of surety bond in amt. equal to sum required for bond.	No		None	

TABLE 3-1. TYPES OF SURETIES PROVIDED FOR IN STATE MINING OR RADIATION CONTROL LAWS
TO INSURE RECLAMATION OF MINED LANDS (Continued)

State	Title & Cite to Law or Regulation	Adminis- trative Agency	Application of Law						Types of Sureties Allowed						
			Surface Mining & Associated Mills	Underground Mining & Assoc. Mills	On-site Mills	Off-site Mills	(A) Bonds	(B) Cash Deposits	(C) Certificate of Deposit	(D) Deposit of Government Securities or Other Securities	(E) Secured Interests	(F) Letters of Credit	(G) Other		
NEW MEXICO Agreement State	Radiation Protection Act, Amended 3/77, Ch. 343	N. M. Environmental Improvement Agency	Awaiting draft regulations from EIA.						Yes	No apparent authority at this time.	No apparent authority at this time.	No apparent authority at this time.	No apparent authority at this time.	No apparent authority at this time.	None
OHIO Coal Surface Mining State	Ohio Rev. Code, Ann. Title 15, §§1513.01 et. seq.	State Division of Forestry & Reclamation	Yes	No	Yes	Yes	Yes-requires bond from a state authorized surety company for an amt. equal to est. cost of reclamation but not less than \$5000.	Yes-in lieu of a surety bond cash equal to the required bond may be deposited with the state.	Yes-in lieu of a surety bond negotiable cert. of deposit may be deposited with the state by any bank in the state with a cash value equal to or greater than the bond. The banks are required to pledge securities at least equal to the amt. in excess of FDIC insurance.	No	No			None	
PENNSYLVANIA Coal Surface Mining State	Penn. Stats. Ann., Title 52, §§1396.1 et. seq.	Dept. of Environmental Resources	Yes	No	Yes	Yes	Yes-operator required to file a bond by a state licensed corporate surety in an amt. equal to total est. cost to the state to complete reclamation plan. No bond may be filed for less than \$5000.	Yes-in lieu of surety bonds operator may deposit with state cash at least equal to the sum of the bond.	No	Yes-in lieu of a surety bond operator may deposit with the state U.S. Govt., state, or municipal bonds having a market value at least equal to the sum of required surety bond.	No			None	
SOUTH DAKOTA Non-agreement State (No active mills)	Surface Mining & Land Reclamation Act, S. Dak. Laws Ch. 45-6A §§45-6A-1 et. seq.	Conservation Commission	Yes	No	Yes	No	Yes-in form approved by Commission & signed by a surety certified by the state.	Yes	No specific mention but may be allowed.	Yes-U.S. Govt. securities only.	No	No		None	

POOR ORIGINAL

TABLE 3-1. TYPES OF SURETIES PROVIDED FOR IN STATE MINING OR RADIATION CONTROL LAWS TO INSURE RECLAMATION OF MINED LANDS (Continued)

State	Title & Cite to Law or Regulation	Adminis- trative Agency	Application of Law						Types of Sureties Allowed					
			Surface Mining & Reclamation Act		Underground Mining Act		On-Site Mills		(A)	(B)	(C)	(D)	(E)	(F)
			Yes	No	Yes	No	Bonds	Cash Deposits	Certificate of Deposit	Deposit of Government Securities or Other Securities	Secured Interests	Letters of Credit	Other	
TENNESSEE	Tenn. Codes Ann. Ch. 15 §§58-1540 et. seq.	Dept. of Conservation	Yes	No	Yes	No	Yes-operator required to file a bond by state licensed corporate surety of amt. not less than \$600/acre. In counties requiring bond of \$2000/acre operator may present evidence of such in lieu of posting a bond.	Yes-operator may deposit cash in lieu of surety bond for an amt. equal to the required bond to be held by the state treasurer.	No	Yes-in lieu of surety bond negotiable U.S. Treasury bonds, or municipal bonds & corporate bonds with at least an 'A' rating by Moodys and/or Standard & Poors rating service may be deposited with the state which have a market value at least equal to the bond.	No	No	Yes-operators with outstanding corporate bonds with at least an 'A' rating by Moodys and/or Standard & Poors may execute its own bond as surety.	
TEXAS	Surface Mining & Reclamation Act (1 active mill)	Railroad Commission	Yes	No	Yes	No	Yes-by corporate surety licensed to do business in state.	Yes	No	Yes-negotiable securities acceptable to Commission.	No	No	Bond of operator without a surety may be accepted when operator demonstrates the existence of a suitable agent to receive service of process, a history of financial solvency & continuous operation sufficient to self-insure such amount.	
UTAH	Reg. for Control of Radiation, Dev. Civil Stats. Art. 4550F	State Board of Health, Dept. of Health Resources	Yes	Yes	Yes	No	These regs. apply to the handling of radioactive materials & will apply regardless of type of mine or mill location.	No specific mention of types of surety requirement. Authority exists to place conditions on licenses, this would allow bonding or other surety as a license condition.	Yes	Yes (implied)	Yes-any securities.	Yes-collateral	Yes (implied)	The forms of surety can be any method "acceptable to operator & consistent with the act".
UTAH	Mined Land Reclamation Act, Utah Codes Ann. Title 40- Mining 8, 5/75	Board of Oil, Gas & Mining, Division of Oil, Gas & Mining	Yes	Yes	Yes	No	Yes-bond or other insured guarantee.	Yes	Yes (implied)	Yes-any securities.	Yes-collateral	Yes (implied)	The forms of surety can be any method "acceptable to operator & consistent with the act".	

POOR ORIGINAL

TABLE 3-1. TYPES OF SURETIES PROVIDED FOR IN STATE MINING OR RADIATION CONTROL LAWS
TO INSURE RECLAMATION OF MINED LANDS (Continued)

State	Title & Cite to Law or Regulation	Admin-istrative Agency	Application of Law						Types of Sureties Allowed							
			Surface Mining & Associated Mills	Underground Mining & Assoc. Mills	On-Site Mills	Off-Site Mills	(A) Bonds	(B) Cash Deposits	(C) Certificate of Deposit	(D) Deposit of Government Securities or Other Securities	(E) Secured Interests	(F) Letters of Credit	(G) Other			
WASHINGTON Agreement State (2 active mills)	Dept. of Soc. & Health Services Reg. Wash Admin. Code §§402-20-010 et. seq.	Dept. of Social & Health Services	Applies to handling of radioactive material regardless of type of mine or site location.						No specific mention of types of surety allowed or any surety requirement. Authority exists to place conditions on licenses, this would allow bonding or other surety as a license condition.							
WEST VIRGINIA Coal Surface Mining State	Surface Mining & Reclamation Act, W.Va. Code Vol. 8, Ch. 20, §§20-6-2 et. seq.	State Dept. of Natural Resources	Yes	No	Law could be applied to include off-site mills	Yes	operator required to deposit bond by a state licensed corporate surety in an amt. determined to be the est. reclamation cost but not less than \$600/acre nor more than \$1000/acre. The minimum amt. of the bond must be \$10,000.	Yes	in lieu of bond, operator may deposit with the state cash in an amt. equal or greater than the sum of the bond.	Yes	in lieu of surety bond operator may deposit with the state a cert. of deposit in a bank in the state in favor of the state an amt. equal or greater than the sum of the bond.	Yes	in lieu of bond operator may deposit with the state securities having a market value equal to or greater than the sum of the bond. Securities may be bonds of the U.S. or its possessions, federal land banks, home owners' loan corp. & general obligation bonds of any state, county, district or municipality.	No		None
WYOMING Non-agreement State (6 active mills, approx. 1/2 off-site)	Environmental Quality Act of 1973, Wyo. Stats. Ch. 9.1 §§35-402.1 et. seq.	Dept. of Environmental Land Quality Division	Yes	Yes	Yes	Yes	Yes	Yes		No		Yes	govt. securities.	No	No	No others are allowed by this statute.

POOR ORIGINAL

3.2.2. Matrix Evaluation

The following criteria were used to evaluate all of the alternatives:

- Amount of administrative time required to implement the surety.
- Number of states with existing authority to require the surety (i.e., which would need no new legislation).
- Out-of-pocket expense incurred by the mill operator.
- Loss of productive use of corporate assets.
- Difficulty level to adjust amounts of surety.
- Difficulty level to obtain fund in case of default.
- Problems of asset valuation engendered by the surety.

The results of the evaluation done by the study team represents conclusions based on information gathered from interviews conducted with the state agencies, banks, surety companies, and mill operators and information from independent research. In some instances the conclusions are necessarily subjective evaluations based on the above research.

Table 3-2 presents a matrix with each of the alternatives compared to each of the evaluation criteria. A rating was given to each alternative depending on whether the alternative was considered favorable, neutral, or unfavorable when matched to the criteria. If the alternative was considered favorable it was given a plus 1 rating, if neutral it was given a zero, and if unfavorable it was given a minus 1. The overall rating for each alternative is presented in the right-hand column of the table.

The most favorable alternatives, as determined by the ratings, are the surety bond, cash deposit, self-insurance and certificates of deposit. The least favored are secured interests and letters of credit. It is important to recognize in this comparison that all the evaluation criteria were given equal weight. This is a simplifying assumption and does not reflect the diversity of strong positions which mill operators, regulators, intervenors and others may feel in a specific situation. In general, mill operators would obviously prefer to minimize out-of-pocket expenses and loss of productive use of assets, while regulators would favor minimal difficulty in obtaining funds in case of default. Hence, an optimal or "best" choice can be expected to be a matter for some give and take on all sides and would depend on the specific case.

TABLE 3-2. SHORT-TERM FINANCIAL ALTERNATIVES EVALUATION MATRIX

Type of Surety	Administrative Time Required to Implement Surety	No. of Uranium Milling States with Authority to Use Surety in Existing Legislation	Out-of-Pocket Expense to Operator to Provide Surety	Loss of Productive Use of Corporate Assets Associated with Surety	Difficulty of Adjusting Amount of Surety	Difficulty of Obtaining Funds in Case of Default	Problems Encountered in Asset Valuation	Alternative Rating
Surety Bond	(+1) Minimal - to insure terms of bond are proper, to adjust bond amounts, check on bond company.	(+1) Direct - 6 Implied - 1	(-1) \$3,50-10,00/\$1000 of bond annually is est. cost for avg. milling co. may be as low as \$2/\$1000 & as high as \$20/\$1000.	(+1) None	(+1) Minimal difficulty if bonding co. agrees to adjust as needed at time of bonding. No more than letter should be needed.	(0) Some difficulty as long as surety is solvent & the elements of default are clearly specified this method would provide little difficulty.	(+1) No valuation em.	4
Cash Deposit with Agency	(+1) Minimal - to insure terms of deposit, to set up account & adjust amount.	(+1) Direct - 5 Implied - 1	(+1) None	(-1) Yes - cash deposited would be unproductive except for interest earned. Interest earned would most likely be less than the profits from the money that the corporations could earn elsewhere.	(0) Some difficulty. Letter of request to company, transfer of funds.	(+1) Minimal difficulty.	(+1) No valuation problem.	4
Certificate of Deposit	(0) Some - to obtain CD, to set up account & to adjust CD, renew at expiration date.	(+1) Implied - 5	(+1) None	(-1) Yes - same as above for cash.	(0) Some difficulty. New CD must be issued.	(+1) Minimal difficulty.	(+1) No valuation problem.	3
Deposit of Securities	(-1) Some - to set up account, valuation of assets, & payment of interests or dividends.	(+1) Direct - 5 Implied - 1	(+1) None	(-1) Yes - loss of liquidity to company from ability to use as source of additional funds.	(0) Some difficulty. Letter of request to company, must send additional securities.	(+1) Minimal difficulty. Some may be encountered in negotiating securities.	(-1) Some valuation problem, depends on types of securities allowed.	+1
Secured Interest	(-1) Significant - valuation of assets, drafting documents, keeping track of collateral.	(0) Direct - 2 Implied - 1	(+1) None	(+1) None - collateral remains with the mill operator.	(-1) Some difficulty - requires that new agreement be drawn & again problem of valuation of assets.	(0) Significant difficulty - if mill operator refuses to allow repossession of collateral, state must institute court action.	(-1) Some difficulty - may be difficult to place a value on assets such as equipment, inventory, land.	-1
Letter of Credit	(0) Some - check terms, contact bank & adjust amount.	(0) Direct - 1 Implied - 2	(-1) 1-2% of face value of letter of credit annually.	(-1) Yes - loss of liquidity as to securities deposited with bank as collateral.	(0) Some difficulty - requires new letter of credit from issuing bank.	(0) Some difficulty - bank may have set up defenses against paying fund to state.	(+1) No valuation problem.	-1
Self-Insurance	(+1) Minimal - to insure that company has adequate funds.	(0) Direct - 1 Implied - 1	(+1) None	(+1) None	(+1) No problem	(-1) Significant difficulty - have no contractual agreement with operator which binds him to payment.	(+1) No valuation problem.	4

3.3 Discussion of Favorable Approaches and Aspects of their Implementation

Of the four most favorable approaches presented in Table 3-2, the surety bond is the only one which requires an out-of-pocket cost of the mill operator. For the typical plant assumed for this study, the active lifetime is 15 years during which it would process 11 million tons of ore and produce 21,900 tons of yellowcake. Assuming that the surety bond would be required beginning in its first year of operation and continuing through 5 years after the active plant lifetime gives a total of 20 years during which it would be an out-of-pocket cost item. If 3 million dollars is the level of assurance required throughout this period at a cost of \$7.50 per \$1000 per year then for each of twenty years the out of pocket cost is \$22,500 or \$450,000 total for 20 years. The cost per ton of ore processed would be 4 cents per ton and the cost per pound of yellowcake is one cent per pound. Compared to current and expected prices of yellowcake, an increase of 1 cent per pound appears to be a modest cost to bear for the financial assurances of stabilizing and reclaiming the tailings pile.

It is to be expected that the costs for stabilization and reclamation may inflate in future years and the amount of the surety bond will have to keep pace with the inflation rate. On balance, the full \$3 million bond is excessive during the first few years of mill operation when the pile is small and stabilization and reclamation would be less costly. The intent of the preceding computation was only to give an order of magnitude estimate of the out-of-pocket costs for a typical mill.

A second area which is of primary importance to mill operators in addition to out-of-pocket costs is the loss of productive capital. Both the cash deposit with an agency and the certificate of deposit could result in a large amount of corporate assets being unavailable for the conduct and development of business. The interest rate on these deposits would in many cases be significantly less than the percent profit earned by the corporation. These types of deposits would place a significant financial burden on a small milling company and might preclude their entering the market.

Large corporations, such as some of the oil companies, could certainly be expected to have adequate resources for self-insurance. However, the regulatory framework and means for enforcement is no stronger than for the original obligation to perform. In case of default, the state would have to execute the judgment out of the assets of the operator. While this approach is favorable to mill corporations and credible when a large one is involved, it provides little additional assurance beyond regulations requiring pile stabilization and reclamation.

3.3.1 Implementation

Much of the legal framework required of states to implement assurances for stabilization and reclamation of tailings piles are in place or forthcoming in Colorado, South Dakota, Wyoming, Texas and Utah. No special problems appear to be involved with drafting legislation of this type for privately or state owned land. However, the situation for federal or Indian lands is more complex and is discussed thoroughly in Section 4.

On privately owned land a state has the power to exercise its general "police power" to protect the life, health and safety of the public. Considerable precedent supports a state's power to impose a bonding requirement with respect to such operations on private land if the authorized state authority (legislature or administrative agency) reasonably concludes that the requirement will promote public health and safety.

On state owned land, a bonding requirement would be supported not only by the police power, but also by the very broad proprietary discretion which the state, like any landowner, enjoys with respect to its own property. In this situation, a state may refuse to allow milling operations on its land unless the operator agrees to bonding or virtually any other condition the owner, i.e., the state, chooses to impose.

3.3.2 CONCLUSIONS

The state agencies that must implement short-term financing alternatives are faced with different agency staffing problems, different mill operators, and different legislated authorities. Their ability to handle the more complex alternatives may be limited. They may encounter large and solvent operators or smaller less stable companies. Because of the variable nature of the state's needs, both actual and perceived, a variety of financing alternatives should be available to the state agencies.

The differences which exist between the alternatives also engender this conclusion. Although some differences in administrative time exist, the differences are not generally significant and all of the alternatives, with the exception of self-insurance, provide some additional assurance that a fund will be available upon default. All the alternatives could involve court action upon default and will all have similar problems in determining the total amounts of the assurance, the timing of release of the assurance, and in determining the elements of default.

If a state agency has the authority to pick a specific alternative for a particular mill operator, the operator may be placed in a disadvantageous competitive position. Some latitude in choosing the type of assurance which would be acceptable should be provided so that the agency can implement assurances on a case-by-case basis. Additionally, where a variety of assurance methods are available, the mill operator can choose the one which best suits his financial situation.

However, indiscriminately allowing self-insurance, albeit easy for the regulatory body and economical for the mill operator, could lead to abandoned tailings piles and no recourse but civil suits.

It is recommended that mill operators be given a choice between a surety bond, a certificate of deposit or a cash deposit with the agency in order to satisfy the need for assurance that their tailings piles are stabilized and reclaimed. Depending on a companies financial resources their choice of one of these options does not appear to significantly affect a competitive position, since the costs or investment appear small compared to current and projected prices of yellowcake.

4.0 FINANCIAL REQUIREMENTS FOR LONG-TERM MONITORING AND MAINTENANCE

Long-term monitoring and maintenance (M&M) of a stabilized tailings pile create a well defined long-term financial need. Objective fiscal evaluation of this need requires an analysis which is independent of whether the uranium milling company, the state, or the federal government administers the long-term M&M after the active mill lifetime.

M&M activities require the expenditure of a sum of money in each year after mill closure. For the study mill, annual M&M costs are assumed to be \$5,000, and it is further assumed that M&M should be continued for 100 years after abandonment. These assumptions would nominally obligate the M&M administering agency for a total of $\$5,000 \times 100 = \$500,000$. Over a period of 100 years, however, more stringent monitoring practices could escalate costs, whereas new technology could cause costs of M&M to decrease, while inflation will increase M&M costs. No attempt will be made to assess such potential influences except inflation. A "nominal" annual rate of inflation may be assumed to affect M&M. Naturally, the actual rate of inflation will almost surely vary from year to year; furthermore, it should be emphasized that the rate of inflation discussed here applies to M&M costs only, and not to prices of all goods and services.

Assume a decimal inflation percentage i and consider a study mill starting up on January 1, 1978. Then, if M&M costs \$5,000 in 1977 dollars, M&M costs in 1978 would be $\$5,000 \times (1 + i)$. Assuming that the same inflation rate i prevails in 1979, M&M costs in that year will be $\$5,000 \times (1 + i) \times (1 + i)$. By the time the study mill has ceased productive operation in 1992, annual m&M will have inflated to $\$5,000 \times (1 + i)^{15}$. For a nominal inflation rate of 6 percent annual M&M will be \$11,983 at time of mill abandonment. Furthermore, if M&M costs continued to inflate at the same 6 percent rate, the annual cost at the end of the 100-year M&M period would be \$4.07 million, which is over eight times the lump sum requirement over the full 100 years of \$500,000, when inflation is ignored. The total lump sum M&M costs over the 100-year care period for such a study mill with 6 percent inflation is \$71.62 million. (Details of the calculations are given in Appendix A.)

The 100-year lump requirement, however, differs for both the expected inflation rate and also the year in which the study mill is abandoned. If M&M

cost inflation is expected to be only 4 percent, the lump requirement is only \$11.59 million; but if an extraordinary (and unlikely) rate of 12 percent is assumed, the requirement is \$21.33 billion. Table 4-1 shows the variation of the lump sum requirement for 100-year M&M with expected inflation rate for a study mill starting up in 1978. These figures, though, overstate the requirement for a mill that is currently operating. A study mill that is in the middle (eighth year) of its 15-year operation in 1977 would be abandoned at the end of 1984; in 1985, the first year of the 100-year M&M activity, the annual M&M cost would be but \$7,518 for a 6 percent inflation rate prevailing from 1977 through 1984. The total lump sum M&M costs for such a mill over the 100-year care period would be only \$44.93 million, assuming constant 6 percent inflation. Of course, seven and one-half fewer years of active mill lifetime would be available for the necessary funds to be generated through plant activities. The financial requirement for 100-year M&M care is thus dependent not only on the inflation rate assumed to prevail, but also on whether the mill is currently in operation or is new. The effect of both inflation rate and remaining years of mill life are illustrated in Table 4-2, which shows lump sum requirements at inflation rates of 2 percent, 6 percent, and 10 percent, for mills abandoned in 1977 (present), 1982 (5 years hence), 1987, 1992, and 1997.

In summary, the financial requirements for long-term maintenance and monitoring depend strongly on:

- the base-year cost of M&M (assumed \$5,000 for the study mill);
- The rate of M&M cost inflation anticipated over the remaining mill life and the 100-year care period;
- The year in which the mill is abandoned.

Each of these factors must be considered in assessing the long-term cost for a single mill.

Although methods to be explored for financing long-term M&M will consider various revenue sources (e.g., mill operator, uranium hexafluoride plant operator, electric utility, consumer, governmental body), it is useful to express the basic fiscal analysis assuming the perspective of the mill operator. Therefore, the premise that M&M of the reclaimed tailings piles will be the financial obligation of the mill operator will be adopted. Since the mill

TABLE 4-1. Lump Sum Post-Operation M&M Costs for
a New Mill Starting in 1978

BASIS: Study mill assumptions
 15-year operations (abandoned 1992)
 M&M costs \$5,000 in 1977 dollars
 M&M must be provided for 100 years
 Constant inflation rate occurs for M&M costs

Inflation Rate	Lump Sum M&M Costs
2%	\$ 2.14 million
4%	\$ 11.59 million
6%	\$ 71.62 million
8%	\$ 470.80 million
10%	\$ 3,165.85 million
12%	\$21,334.09 million

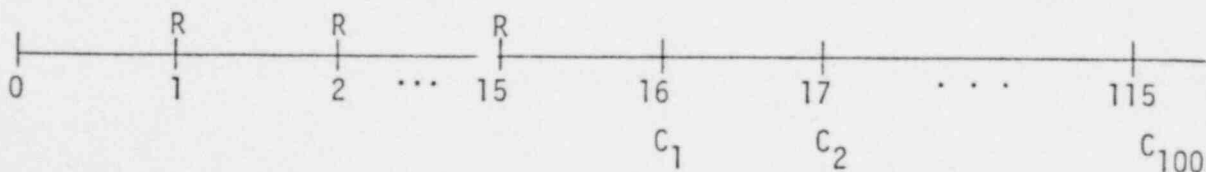
TABLE 4-2. Lump Sum Post-Operation M&M Costs for
Existing, New, and Planned Mills

BASIS: Study mill assumptions
 15-year operations for new mills
 M&M costs \$5,000 in 1977 dollars
 M&M must be provided for 100 years
 Constant inflation rate occurs for M&M costs

Year Mill Abandoned	Lump Sum M&M Costs (\$ million)		
	Inflation Rate		
	2%	6%	10%
1977	1.59	29.98	757.88
1982	1.76	39.99	1,220.57
1987	1.94	53.52	1,965.74
1992	2.14	71.62	3,165.85
1997	2.37	95.84	5,098.63

operating company may not continue in business beyond the abandonment of the mill, we presume that the post-operation M&M must be financed from mill operations. This presumption is not restricted to situations in which the state or federal government actually performs or contracts for the monitoring and maintenance. However, if the operating company actually performs the M&M activities, company management will evaluate the economics of the mill, including post-operation M&M, as if the mill operation were financing them. Therefore, initially assume that the company will perform M&M. It will be seen that the analysis is equivalent to company-financed but publicly performed care.

One approach that the mill operating company might take in evaluating the economics of a proposed mill would be to compute the "revenue requirement" from the project necessary to meet the company's minimum required rate-of-return.* In the revenue requirement method, the mill operator translates all operating costs and investments into a product price required by discounting these at the company's minimum required rate-of-return (or, equivalently, reinvestment rate). The company will undertake all M&M activities over the 100-year care period, and thereby incur all M&M costs. These costs must be offset by a portion of the product revenue received during the mill's operations. The costs incurred and the revenues received do not occur at the same time, however. By generally accepted evaluation practices, the company will implicitly assume that the product revenues from sales of yellow-cake can be applied towards investment in other income-producing investments (such as other uranium mills) which will make cash available to offset future M&M costs for exhausted mills. The figure below illustrates the timing of the cash flows for a new study mill. The symbol R represents the revenue generated in each year of the 15-year operation, while the symbol C_n represents the



* The revenue requirement method discussed here gives identical results to the perhaps better known methods of "discounted cash flow rate of return" or "net present value" analysis. (See F.J. Stermole, Economic Evaluation and Investment Decision-Making, Second Edition, Colorado School of Mines, Golden, Colorado, 1973.

post-operation M&M cost incurred by the company over the 100 years immediately following mill closing. Because the study mill produces 2000 tons per day (or 730,000 tons per year) throughout its life, the mill contributes the same revenue R towards M&M care in each year of operation.* The annual M&M cost C_n incurred in year n following mill abandonment is assumed to increase each year because of inflation.

Unlike the previous evaluation of financial requirements, however, the mill operator will discount the future M&M costs to compute the lump sum requirement at the time of mill closing. Suppose that the company uses a reinvestment rate of 10 percent for project evaluation purposes, and that M&M costs are anticipated to inflate at 6 percent annually. Then, for a new mill to start in 1978 and to operate through 1992, the 100-year care cost evaluated as a discounted lump sum at the time of mill closing would be \$309,725. Note that this is considerably less than the undiscounted lump sum requirement for 100-year M&M with 6 percent inflation of \$71.62 million computed previously. The discounting procedure implicitly assumes that the lump sum fund established for M&M at the time of mill abandonment is invested in some kind of income-producing asset. To compute the discounted lump sum, however, we must specify a discount rate (the company's reinvestment rate), which directly affects the size of the discounted lump sum. For example, if the company reinvestment rate were 8 percent instead of 10 percent, then the discounted lump sum M&M cost would be \$537,129. (See Appendix A for details of these calculations.) Table 4-3 shows the lump sum requirements for 100-year post-operation M&M assuming various discount rates and inflation rates. Note that for cases in which the inflation rate is less than or equal to the discount rate the lump sum cost never exceeds \$3 million. By contrast, without discounting, the 12 percent inflation rate yielded a lump sum cost of \$21.3 billion, which is over 30 times the comparable sum with the 4 percent discount rate assumed.

The next step in computing the revenue requirement is to find an annual payment during the 15 years of mill operation that will be equivalent to the lump sum cost, when both are compared at the company's reinvestment rate. For

* In actuality mill output will vary year to year. In addition, projected M&M costs and inflation rates will change. Therefore, it would be expected that provisions would be made for renegotiating R periodically during the active mill life.

TABLE 4-3. Discounted Lump Sum Post-Operation
M&M Costs for a New Mill Starting in 1978

BASIS: Study mill assumptions
 15-year operations (abandoned in 1992)
 M&M costs \$5,000 in 1977 dollars
 M&M must be provided for 100 years
 Constant inflation rate occurs for M&M costs

Discount Rate	Lump Sum M&M Costs (\$ million)				
	Inflation Rate				
	4%	6%	8%	10%	12%
4%	0.900	3.632	18.224	104.098	633.248
6%	0.399	1.198	4.696	22.753	125.243
8%	0.229	0.537	1.586	6.048	28.329
10%	0.156	0.310	0.720	2.089	7.756
12%	0.117	0.211	0.420	0.959	2.737

the previous case of 10 percent discounting and 6 percent inflation, operations must contribute \$9,748 annually to offset future M&M costs. Finally, we can divide this amount by the annual study mill production of 730,000 tons to obtain a cost of 1.34¢ per ton of uranium ore milled. (See the Appendix for details of the compound interest calculations.)

The foregoing calculations illustrate the evaluation procedures that a milling company would undertake to factor 100-year M&M care into its uranium milling cost, if the company had responsibility for administering the M&M program. If a public agency were to administer the M&M, however, the procedures would be only somewhat different. Recalling that we assumed that the M&M cost burden would be wholly financed from mill operations, we can postulate the imposition of a "tax" on the milling company in order to establish an annuity fund from which to pay ultimately for post-operation M&M. To size the required annuity fund, it is only necessary to interpret the company's reinvestment rate used above as the bond interest that the annuity fund can achieve. The tax payments by the uranium miller into the annuity fund are the revenue requirement computed above; for the case of 10 percent bond interest and 6 percent M&M cost inflation discussed above, the tax payment comes to 1.34¢ per ton of ore milled throughout the mill life. Table 4-4 illustrates the required tax (or revenue equivalent) for various annuity interest rates (or company reinvestment rates). Discussion with L. E. Priester, Acting Commissioner of the Department of Health and Environmental Control for South Carolina, produced the estimate that the State Controller General had achieved a 7 percent return on invested long-term M&M funds (provided from low-level burial ground fees).

Rather than base the M&M fund tax on tons of ore milled, we can relate it to production of yellowcake (U_3O_8). To do so, though, it is necessary to assume an ore grade (weight percent U_3O_8). For a nominal grade of 0.2 percent, the tax for 10 percent bond interest and 6 percent M&M inflation is \$0.003 per pound of U_3O_8 .* Table 4-5 presents the tax requirements at the different inflation and discount (i.e., bond interest or reinvestment) rates based on the production of yellowcake from the study mill.

* Average ore grade in 1975 was 0.155 percent as derived by Nuclear Assurance Corporation analyses under ERDA sponsorship.

TABLE 4-4. Uranium Mill Tax Per Ton of Ore
Required to Establish M&M Fund

BASIS: Study mill assumptions
15-year mill operations (abandoned 1992)
M&M costs \$5,000 in 1977 dollars
M&M must be provided for 100 years
Constant inflation rate occurs for M&M costs
End-of-year tax payments
Constant annuity fund interest rate

Discount Rate	M&M Annual Cost Inflation Rate				
	4%	6%	8%	10%	12%
4%	\$0.060	\$0.248	\$1.247	\$7.122	\$43.332
6%	0.023	0.071	0.276	1.339	7.371
8%	0.012	0.027	0.080	0.305	1.429
10%	0.007	0.013	0.031	0.090	0.334
12%	0.004	0.008	0.015	0.035	0.101

TABLE 4-5. Uranium Mill Revenue Per Pound U₃O₈ Produced
Required to Establish M&M Fund

BASIS: Study mill assumptions
15-year mill operations (abandoned 1992)
M&M costs \$5,000 in 1977 dollars
M&M must be provided for 100 years
Constant inflation rate occurs for M&M costs
End-of-year tax payments
Constant annuity fund interest rate
0.2% grade U₃O₈

Discount Rate	M&M Annual Cost Inflation Rate				
	4%	6%	8%	10%	12%
4%	\$0.015	\$0.062	\$0.312	\$1.781	\$10.833
6%	0.006	0.018	0.069	0.335	1.843
8%	0.003	0.007	0.020	0.076	0.357
10%	0.002	0.003	0.008	0.023	0.084
12%	0.001	0.002	0.004	0.009	0.025

In summary, the factors that define how M&M financing relates to milling cost, and how a financially adequate tax should be designed are:

- Years of mill production remaining
- Expected inflation rate for M&M costs
- Discount rate for fund sizing (bond interest rate for publicly administered annuity fund, or reinvestment rate for company administered M&M program)
- Mill production rate (ore processed or yellowcake product)
- Number of years for which M&M must be performed after mill abandonment

In the following section we will illustrate how variations in the assumptions affect the tax required.

4.1 IMPACT OF VARIATIONS IN ASSUMPTIONS AND PARAMETERS ON M&M FINANCING

To finance long-term maintenance and monitoring by the combination of tax and annuity fund, more assumptions must be made than in the simple assessment of financial needs for M&M. The possible impact on financial adequacy of uncertainty or errors in planning assumptions are discussed below.

4.1.1. Years of mill production remaining.

The tax requirements for existing mills and projected mills (i.e., starting after 1978) are different from that of a study mill starting in 1978. The requirement changes because the M&M cost for the study mill is \$5,000 in 1977 dollars. For a study mill starting up in 1978, the M&M cost is \$11,983 in the last year of operations (assuming 6 percent inflation). The lump sum requirement is based on the M&M cost in the 15th year of mill operation. If a study mill is now in its eighth year (middle) of operation in 1977, the basic M&M cost for lump sum M&M cost evaluation would be only \$7,518. A study mill starting up in 1982 would have a basic M&M cost of \$16,036 at close (still assuming 6 percent inflation). The problem is further compounded for older mills because a processing tax must be assessed against their remaining production, not their total lifetime production. Table 4-6 shows the revenue rate requirement to establish the M&M annuity fund for existing, new (just starting), and projected mills. The variability of tax rates from 3¢ per ton to 16¢ per ton for the lower inflation rates of 4 percent and 6 percent

TABLE 4-6. Uranium Mill Revenue Rate Per Ton of Ore
Required for Mills of Various Ages (6% Bond Interest)

BASIS: Study mill assumptions:
 15-year operations for mills
 M&M costs \$5,000 in 1977 dollars
 M&M must be provided for 100 years
 Constant inflation rate occurs for M&M costs
 Constant 6% interest rate earned on annuity

Year Mill Activated	Taxable Years of Production Remaining	Inflation Rate			
		4%	6%	8%	10%
1967	5	\$0.065	\$0.163	\$0.529	\$2.132
1972	10	0.034	0.093	0.332	1.468
1977	15	0.023	0.071	0.276	1.339
1982	15	0.029	0.094	0.406	2.157

illustrates the range which must be built into funding mechanisms in order to accommodate remaining plant lifetime and termination date.

4.1.2. Expected inflation rate for M&M costs.

The calculation of tax required to establish a M&M annuity fund assumes a constant inflation rate. In the past five years, the inflation rate has varied between approximately 4 percent and 12 percent; though the general inflation rate would not necessarily be related to the inflation rate for M&M cost, the volatility of wholesale prices of goods and services (among which would be M&M costs) tends to be much greater than the general inflation rate.

Suppose an annuity fund is established for a study mill based on 4 percent inflation and 6 percent bond interest. The mill is abandoned in 1992. The required annuity fund is \$398,547. Assuming that the 4 percent inflation rate prevails in the first through third years of post-operation M&M, the fund transactions are:

Year	Fund at Start of Year	M&M Cost	Interest	Fund at End of Year
1	\$398,547	\$ 9,365	\$23,913	\$413,095
2	413,095	9,740	24,786	428,141
3	428,141	10,129	25,688	443,700

Suppose further that in the fourth and fifth years of M&M the cost inflation jumps to 10 percent. The transactions in those years are:

Year	Fund at Start of Year	M&M Cost	Interest	Fund at End of Year
4	\$443,700	\$11,142	\$26,622	\$459,181
5	459,181	12,256	27,551	474,475

If the M&M cost inflation rate then continues at the original 4 percent level, the annuity fund is short by \$58,494 in necessary value at the end of the fifth year. The annuity fund will be exhausted in the 76th year of the M&M program.

The inflation rate is thus a critical parameter in designing an annuity fund for long-term M&M. Of course, if the inflation rate drops below the "planned" rate, the fund will gain value. Analyses of the possible scenarios for deviations in inflation rates and/or discount rates is certainly not practical. It would be beneficial to examine historical data on M&M cost escalation and additionally its relationship to general inflation indicators. It is to be expected that conservative assumptions would be used to establish fund requirements.

By way of facilitating comparison with existing tax rates, the revenue requirements per pound U_3O_8 presented by Table 4-5 may be expressed as a percent based upon a specified yellow-cake price. For \$40 per pound uranium and inflation and discount rates of 8 and 6 percent, respectively, the \$0.069 cost per pound of Table 4-5 corresponds to approximately 0.17 percent. Current states with severance taxes on uranium (based on \$40 per pound) are given below along with rates.

- New Mexico 4.55 percent
- Utah 1.0 percent
- Wyoming 5.5 percent

Although tax bases are defined individually in each state, some perspective is gained in comparing these raw percentage rates.

4.1.3. Discount rate for fund sizing.

The discount rate for annuity fund sizing, and especially the rate's relative value against the expected inflation rate, has a profound effect on the tax rate. Table 4-4 illustrates these impacts. Note that both the difference between the inflation and discount rates and also the absolute level of the inflation rate are important in determining the tax rate. This can be seen by noting the increase in tax rate going down the diagonal from left to right; the tax rate still increases with the inflation rate, even though there is no difference between the inflation and discount rates.

The discount rates for private vs. public M&M planning will be quite different. Reasonable bond interest rates could probably average around 6 to 8 percent, depending on the condition of the bond markets, what rules govern

management of the public annuity fund, the proficiency of the fund manager, etc. As noted previously, South Carolina averaged 7 percent earnings on its invested fund. The discount rate for a private company with M&M responsibility, however, would be considerably higher; minimum acceptable rates-of-return for firms in mining are generally not less than 10 percent, and some companies' rates are as high as 15 percent.* However, this more preferable relationship between inflation and discount rate must be counterbalanced against the desirability of long-term administration of the annuity fund by a mining and/or milling company. Such company control would undoubtedly be disallowed for a number of reasons. Government body self-administration and control or that of a suitable designated financial institution are the more appropriate management approaches. Even a publically administered annuity fund should be able to earn at a rate near or above the prevailing general inflation rate, though not necessarily above the M&M cost inflation level.†

4.1.4. Mill production rate.

The mill production rate of 2000 tons per day for the study mill is a reasonable "average" value for most U.S. uranium mills. Average across the 16 active mills in 1976 was 1500 tons per calendar day. It seems somewhat unlikely that the base M&M cost of \$5,000 in 1977 dollars is independent of mill production rate, for larger mills will naturally require larger tailings piles with correspondingly more extensive M&M programs. Certain economies of scale, however, undoubtedly favor M&M for the larger mills; for example, the number of monitor wells required may not necessarily be a direct function of mill capacity at all. Thus M&M costs should be assessed on a case-by-case basis with little chance for uniformity amongst mills.

4.1.5. Number of years for which M&M must be performed.

Since the half-life of the controlling radiological isotopes within tailings piles is much longer than 100 years, it is desirable to compare the cost of providing perpetual care to the 100-year discounted cost of M&M. Based upon the preceding analysis, two cases exist: (1) the expected inflation rate is less than the annuity fund interest rate, a fund can be established at mill abandonment that can provide truly perpetual care; (2) if the inflation rate

* F.J. Stermole, Private Communication

† M.S. Cole, "Optimum Service Life of Specific Equipment," Decision Making: Cost Productivity. Am. Assoc. of Cost Engrs. and Am. Inst. of Ind. Engrs., Houston, Texas, April 10, 1975.

exceeds the interest rate, there is no limit to the lump sum cost of M&M with increasing program length. Since the second case has no answer, and since we suspect that, on the average, the inflation rate will be less than the fund interest rate, we will consider the cost of perpetual care.

The earnings of the annuity fund for perpetual care must satisfy two objectives: finance current outlays for annual M&M, and build fund value to offset future inflation in M&M cost. Thus, each year a portion of the annuity fund will always be reinvested. This perpetual reinvestment is unlike the 100-year case, in which eventually the reinvestment of interest begins to decline, so that M&M costs are drawing down the fund principal. Table 4-7 gives the required tax per ton milled for various rates of discounting and inflation. Table 4-8 gives the same tax requirements, but based on tax per pound U_3O_8 produced from 0.2 percent grade ore. In both tables, the tax differs only slightly from that required for the 100-year M&M, as shown in Tables 4-5 and 4-6.

4.2 ALTERNATIVE APPROACHES FOR LONG-TERM FINANCING

The alternatives will be discussed in the following sections. The basic mechanisms involved will be described along with principal observations of their fiscal adequacy, applicability, compatibility with existing framework (legal-regulatory-land ownership), and conclusions on preliminary acceptability. Classes of approaches have been established as shown in Table 4-9. Any significant differences within a class will be discussed in the text.

A prioritized listing is developed based upon the analyses and the financing alternatives considered suitable are subsequently examined by a set of broader non-fiscal evaluation criteria. Fiscal criteria considered in the assessment of preliminary acceptability are given in Table 4-10. Issues of compatibility with existing framework are discussed in Section 4.2.7. Conclusions on compatibility were utilized in the analyses of this section.

4.2.1. Generic Uranium Tax on the Mill Operator

Currently mill operators pay a variety of taxes to numerous governmental jurisdictions. These revenues generally are directed to the general fund. The state or federal jurisdictions are likely to be the only bodies with sufficient

TABLE 4-7. Uranium Mill Tax Per Ton of Ore Required
to Establish M&M Fund for Perpetual Care

BASIS: Study mill assumptions
15-year mill operations (abandoned 1992)
M&M costs \$5,000 in 1977 dollars

Constant inflation rate occurs for M&M costs
End-of-year tax payments
Constant annuity fund interest rate

Discount Rate	M&M Annual Cost Inflation Rate				
	4%	6%	8%	10%	12%
4%	--	Perpetual care cannot be financed when inflation rate equals or exceeds the discount rate.			
6%	\$0.028	--			
8%	0.012	\$0.032	--		
10%	0.007	0.014	\$0.037	--	
12%	0.004	0.008	0.016	\$0.042	--

TABLE 4-8. Uranium Mill Tax Per Pound U_3O_8 Produced Required
to Establish M&M Fund for Perpetual Care

BASIS: Study mill assumptions
15-year mill operations (abandoned 1992)
M&M costs \$5,000 in 1977 dollars

Constant inflation rate occurs for M&M costs
End-of-year tax payments
Constant annuity fund interest rate
0.2% grade U_3O_8

Discount Rate	M&M Annual Cost Inflation Rate				
	4%	6%	8%	10%	12%
4%	--	Perpetual care cannot be financed when inflation rate equals or exceeds the discount rate.			
6%	\$0.007	--			
8%	0.003	\$0.008			
10%	0.002	0.003	\$0.009	--	
12%	0.001	0.002	0.004	\$0.011	--

TABLE 4-9. Financing Alternatives

- 4.2.1 Generic Uranium Tax on Mill Operators - state or federally imposed.
- 4.2.2 Surety Bonds and Other Performance Guarantees - including letters of credit, self-insurance, secured interests in mill operator's assets, etc. - in all cases the company directs or performs M&M duties.
- 4.2.3 Generic Uranium Tax on Downstream Fuel Cycle Facility Operator
- 4.2.4 Mill Operator Funded Earmarked Annuity - state, federal or trustee collected and administered.
- 4.2.5 Mill Operator Purchased Investment Securities - revenue producing bonds, or cash deposited to either a trustee or company administered fund - transfer to governmental body prior to need.
- 4.2.6 Mill Operator Lump Sum Payment - to establish the M&M fund - surety bond posted during active mill lifetime for security.

TABLE 4-10. Fiscal Evaluation Criteria

- adequacy to generate funds
- degree of risk
- possibility of non-compliance
- company insolvency
- account of inflation
- flexibility to changes
- administrative costs to regulatory body or mill operator
- possibility of civil suit

taxation authority and appropriations capability to administer this responsibility. Since revenues are deposited to the general fund and appropriated each year for various needs, this approach can certainly not be considered as pay-as-you-go. That is, in the absence of earning interest on mill-generated revenues the state or federal government will be faced with lump sum 100-year costs following Table 4-1. Therefore, in terms of revenue considerations, collection of taxes from mills during 15 years to support M&M services during 100 subsequent years is probably unsound unless fund integrity is established, annual appropriations from a governing body are avoided, and interest on fund revenue is developed. It would be expected that currently active mills would in effect be assessed for M&M of inactive sites.

There appears to be no question that state and federal authority exists to tax mill operations in order to generate such revenues. However, the risk from mill operator insolvency is great since interruption of mill activity before total revenue has been collected would leave an additional deficit between M&M costs and funds. Finally, since taxation rates and methods are not able to be directed and varied specifically to each mill case, this method is extremely inflexible to individual mill requirements and changes.

4.2.2. Surety Bonds and Other Performance Guarantee Approaches

This class of approaches grants the mill operator the authority to guarantee that M&M services will be performed over the 100-year period. It is apparent that the NRC recognizes its authority to enter into this approach for mills in non-agreement states since this method is being applied in Wyoming over a guaranteed "greater than" 50-year period.* Although performance is being assured by bond, it is difficult to accept the guaranteed performance of a private company over such an extended time period. Furthermore, based upon the \$500,000 value of the surety bond over the time period at an assumed \$5,000 M&M cost in 1977 dollars, it appears the inflation rate is projected to be minimal. Thus the consequences of default are likely to be significant even over a 50-year M&M period. Notwithstanding this particular situation, surety bonding and allied approaches can be established in sufficient amounts to cover projected M&M over 100 years with assumed discount and inflation rates. However, this approach certainly doesn't qualify under the groundrule restriction that excluded financing methods which are not suitably structured to provide funding for perpetual care. There is no realistic expectation that a commercial firm can undertake a perpetual obligation or secure bonding.

* Final Environmental Statement, Bear Creek Project, NUREG-0129, Appendix J, June, 1977.

4.2.3. Generic Uranium Tax on a Downstream Fuel Cycle Facility Operator

This approach is included for discussion separately from the tax on the mill operator to explore the potential advantages of taxing another component of the fuel cycle. The possible options range from reducing the number of facilities being taxed, i.e. there may be on the average five mills to one UF_6 conversion plant, to distributing the tax over a wider base such as the utilities with nuclear reactors. In either case only the federal government could assume responsibility for collecting such a tax. In order to maintain the integrity of incoming revenues, the funds would have to be earmarked for accumulation. Options for administering the disbursement of funds for the performance of M&M would include the state being granted allocations.

This approach explicitly recognizes the national character of the tailings management problem. Implicit in its conduct appears to be high administrative costs and no mill pay-as-you-go obligation. Legislative requirements to create a federal earmarked fund appear formidable, especially with NRC authority over post-license tailings pile inspection unresolved.

4.2.4. Mill Operator Funded Earmarked Annuity

The mechanics of this approach require the mill operator to contribute revenue to develop a fund to be used for M&M activities at the mill. A variation of this basic approach might involve more than one mill contributing to a single annuity fund. The fund could be administered by state, federal or government-designated trustee. The group of mills could be those within a state or the entire national population of non-agreement state mills. Based upon discussion with state regulatory personnel in the most active agreement and non-agreement state, the prevailing opinion seems to be in favor of state control of long-term M&M responsibility. As discussed in Section 3, several states are currently involved in establishing perpetual care funds. Historically, the federal government has not assumed responsibility for long-term care of shallow land waste burial sites. The only exception is the Hanford site located on federal land. The typical procedure is for a state to possess (or gain) ownership and responsibility for the long-term site management. Funds are generated by per-cubic-foot burial charges and paid by the site operator to the state. With the exception of Illinois, all monies are accumulated in earmarked state managed funds. Provision for renegotiating fee charges exists. Contingency funding appears insufficient for correcting major site deficiencies or accident consequences. Rather the basic estimated M&M costs are provided from the interest generated on the fund.

There appears to be little doubt that a state may require the mill operators to fund long-term M&M of tailings piles. Thus compatibility with existing framework appears good. This can be most directly accomplished by assessing the mill operator an annual charge based upon mill ore processing capacity or yellow production at a rate sufficient to generate the projected annuity fund at time of need. No additional surety bonding appears necessary since funds will be generated throughout the period of licensed operation and at a rate determined to be proportional to a third party performing the necessary M&M required should the operator become insolvent. Risk due to noncompliance should be minimal since collection occurs during the mill's licensed productive lifetime. The impact of inflation and changes in projected baseline M&M costs can be considered directly by periodically reevaluating the fee rate. This could become part of the relicensing procedure.

In order to facilitate conducting M&M it is desirable to simulate the commercial burial ground policy of requiring the land title transfer to the state. The mill situation is somewhat less difficult in this regard. Not all of the site needs to be transferred but rather just the final tailings areas. Additionally, title transfer need not take place during the initial licensing. Discussion of the general authority of a state to require title to land is presented in Section 4.2.7.4.

This approach could be implemented by the federal government in non-agreement states or responsibility delegated to such states as may request this authority. This is consistent with the Bear Creek Mill licensing in Wyoming. There would appear to be no problem associated with requiring title transfer to the state in such cases under the state's authority to acquire land by condemnation for a public purpose - namely public health and safety.

4.2.5. Mill Operator Purchased Investment Securities.

This concept does not differ in a fundamental way from the preceding one. There may be less administrative costs assumed by the regulatory body. Requirements for the type of trustee and investment categories would need to be established. Additionally, both a final annuity fund value and allowable deviations from interim period balances would be needed. There would be a direct incentive for the mill operator to efficiently manage (or evaluate the management of) this fund in order to minimize their direct contribution. The mill operator would be required to make additional contributions to the fund if interim balances were not met.

This approach allows the mill operator somewhat more flexibility in developing the M&M fund. The total projected administrative responsibilities of the regulatory body may, in fact, be negligibly reduced since during the longer time interval after mill production, control may be transferred back to the body.

4.2.6. Mill Operator Lump Sum Payment

This method differs from the preceding two in that the mill operator will have complete control of revenue-generating methods and rate of accumulation with only the amount of the lump sum payment stipulated. This places the burden of financial planning entirely upon the mill operator. The required annuity fund value at M&M start is shown in Table 4-3 as a function of discount and inflation rates. Conservative practice might require a lump sum payment of greater than \$1 million even for assumed mill startup of 1978. No continuous financial monitoring or interim goals are considered in this approach in order to make it totally distinct from a collected annuity fund or dictated purchase of investment securities. Security is provided by requiring a surety bond or any of the applicable equivalent short-term financing methods of Section 3. This approach can be made more flexible by allowing the amount of bond to be varied according to an estimation of third party costs to perform M&M. Since the amount of tailings created increases during the active mill life, the obligated M&M projected costs needed to be secured would also increase during the period.

As discussed in the analysis of short-term financing alternatives, the degree of risk assumed by the regulatory body is low. The surety company must assume the risk after granting the bond. Because of this they will be likely to continually monitor the milling company's financial position and/or the adequacy of provisions and state of accomplishment of the developing annuity fund. Such a performance bond would not be difficult to obtain for a typical prospective mill operator. Therefore, the governmental body will be adequately protected against company insolvency, have a low probability of non-compliance, and can expect the method adequate to generate the funds. The approach is relatively flexible to changes in required funding due to inflation or other reasons. Administrative costs to the regulatory agency are reduced during the active mill lifetime.

4.2.7. Fiscal Evaluation Summary

Comparison of the six financing alternative classes with respect to fiscal criteria and compatibility with existing legal-regulatory and land ownership framework is presented in Table 4-11. This table draws upon the

Table 4-11. Intercomparison of Alternative Long-Term Financing Approaches

Financing Alternatives	Fiscal Conditions							Rating*	Compatibility with Existing Framework		Rating*
	Adequacy to Generate Funds	Provision for Company Insolvency	Possibility of Non-compliance	Overall Degree of Risk Industry (Non-Performance)	Account for Inflation	Flexibility to Changes	Administrative Costs (Including Civil Suits)		Amount of Legislation Required	Applicability to Land Ownership (Including Ease of Inspection)	
(1) Generic Uranium Tax on Mill Operators	-1	-1	+1	0	-1	-1	-1	-4	-1	0 (a) -1 (b)	-1 (a) -2 (b)
(2) Surety Bonds and Other Performance Guarantees	0	+1	-1	-1	-1	-1	-2	-4	+1	0 (a) -1 (b)	+1 (a) 0 (b)
(3) Generic Tax - Downstream Operator	-1	-1	+1	-1	-1	-1	-1	-5	-1	0 (a) -1 (b)	-1 (a) -2 (b)
(4) Mill Operator Earmarked Annuity	+1	0	+1	+1	+1	+1	-1	+4	+1	+1	+2
(5) Mill Operator Investment Securities	+1	0	+1	+1	+1	+1	0	+5	0	+1	+1
(6) Mill Operator Lump Sum Payment	+1	+1	0	+1	0	0	+1	+4	0	+1	+1

* +1 Favorable
0 Neutral
-1 Unfavorable

(a) State supervision
(b) Federal supervision

discussion and conclusions expressed in Sections 4.2.1-4.2.6. Furthermore, certain considerations were basic to the analyses of all long-term financing methods. These are presented below in the form of questions and discussion.

4.2.7.1. May a state require bonding appropriate to guarantee development of revenue to fund M&M as a pre-condition to uranium milling operations within the state?

The adequacy of existing state statutes or regulations to support a bonding requirement have been examined within Section 3. Consideration here is to the power of a state to impose such a requirement assuming it to be duly authorized.

A state's power to impose a bonding requirement to milling operations on privately-owned land is regarded as an exercise of its general "police power" to protect the life, health and safety of the public. Therefore, the appropriate state authority (legislative or administrative agency) need only reasonably conclude the requirement will promote public health and safety. For milling operations on state-owned land, the state has an even broader and established authority.

The question of state authority to impose bonding requirements on federal land is more complex. It is assumed that the federal government itself will not operate the mill nor will a private concern operate it under instrumentality status to produce products solely for the federal government. Federally-owned land located within the boundaries of a state is a part of the political territory of that state.

The bulk of federally-owned property is held, under Article IV, §3, clause 2 of the Constitution, the general "property power" clause. It has never been suggested that such property, which includes the vast acreages of federal land in western states, is outside the political territory of the states within whose boundaries it lies. However, there has been a good deal of controversy over the question whether or to what extent the governmental or regulatory jurisdiction of a state extends over this federal land even though it is within the political territory of the state.

The traditional rule has been that state governmental jurisdiction extends over the land to the same extent as it does over private land within a state's boundaries, except as limited by the doctrine of inter-governmental immunities and by the right of the United States to use such land as a means to effectuate its constitutional powers, and except that state law could not affect the conveyance of acquisition of property interests in federal land. (See Engdahl, State and Federal Power over Federal Property, 18 Arizona Law Review 283, 1977, for an analysis of the precedents.) However, the situation with regard to some particular tracts of federal land is clouded by cessions of varying degrees of governmental jurisdiction from states to the federal government -- cessions sufficient to affect the application of general property power principles to those particular tracts of land. There is no uniformity to these cessions or their effect, and they do not materially alter the principles applicable to most federal land in the west where milling operations are likely to occur. It must be borne in mind that as to any particular tract of federal land one would have to consider the possibility of a cession of some measure of state jurisdiction which might affect the appropriateness of the conclusions which would otherwise be drawn from the principles herein discussed.

The traditional principle of state jurisdiction over most western federal land would clearly support state imposition of an appropriate bonding requirement upon a uranium mill operator operating on federal land. Indeed, under the traditional doctrine a state would have power to impose such a requirement on the private operator even if it was contrary to the will of the federal government. However, in a recent decision, Kleppe vs. New Mexico, 426 U.S. 529, 1976, the Supreme Court, while expressly affirming that states enjoy concurrent governmental jurisdiction over federal property, observed that the states' power is subject to federal preemption. (426 U.S. at 543.)

Even if the revision of doctrine which occurred in Kleppe is not reversed, however, so that state bonding requirements imposed on private mill operators operating on federal land may be preempted, it would take a significant change in federal law to accomplish that preemption.

Even under Kleppe, a state is not necessarily required to secure federal approval before imposing on users of federal property a requirement which exceeds, but does not otherwise conflict with, existing federal license or permit requirements. There are cases in which various state requirements have been held implicitly preempted by various federal statutes in the absence of any explicit contradiction between them, but courts have generally been slow to find such implied preemption where the state law at stake is adapted to an important public health or safety objective. It therefore seems unlikely that an appropriate state bonding requirement could be defeated as to a mill operator operating on federal land.

While what has been said in the foregoing paragraph is equally applicable whether or not the state involved in an "agreement state" under the Atomic Energy Act, the case is even stronger for state power to impose a bonding requirement where the state, in addition to its own constitutionally inherent power, has the sanction of federal endorsement inherent in "agreement state" status.

To the extent that the Nuclear Regulatory Commission or any other federal agency positively authorizes a state, whether or not an "agreement state", to require such bonding, the legal basis of the state requirement is, of course, further enhanced.

"Indian land" as here used means land on Indian reservations the legal title to which is held by the federal government in trust for Indians or Indian tribes. (Land which has been patented in fee under the allotment acts* is subject to state law by virtue of 25 U.S.C. §349, even where the fee owner is an Indian.) Since this land is federally owned, the principles discussed under the previous question are applicable here. There are, however, also other considerations which apply peculiarly to Indian land. These are only important to deal with if milling is to be conducted by the Indians themselves. A review of these considerations is contained in Appendix B.

* Fee title gained by Indian and possibly conveyed to others.

Milling operations by Indians themselves on Indian land, however, are not as likely a prospect as milling operations by non-Indian lessees of Indian land. Whatever doubts may persist as to the applicability of state law requirements, such as appropriate bonding, to Indians themselves, no such doubts exist with respect to non-Indians.

The applicability of state law to non-Indians within Indian reservations is well settled. A tax imposed by Oklahoma territory (before statehood) upon non-Indian lessees of reservation land was upheld in Thomas vs. Gay, 169 U.S. 264, 1898. Oklahoma state gross production taxes and excise taxes were upheld as applied to a lessee of mineral rights in allotted and restricted Indian lands in Oklahoma Tax Commission vs. Texas Co., 336 U.S. 342, 1949. More recently, the Court of Appeals for the Ninth Circuit held that a California tax on possessory interests could validly be imposed on a non-Indian lessee of Indian land. Agua Caliente Band vs. County of Riverside, 442 F.2d 1184, 9th Cir. 1971, cert. denied, 405 U.S. 933, 1972. And in 1976, in Moe vs. Confederated Salish & Kootenai Tribes of the Flathead Reservation, 44 U.S.L.W. 4536, the Supreme Court held not only that a state sales tax applied to retail cigarette purchases by non-Indians on a reservation, but also that the state law could validly impose on the Indian merchants the duty to pre-pay the tax to the state and collect it in turn from the non-Indian purchasers at the time of retail sale.

4.2.7.2. May a state require uranium mill operators to contribute to a fund for long-term or perpetual monitoring and maintenance of tailings piles?

The basic answer to this question is in the affirmative, for basically the same reasons discussed in the previous section as to various categories of operators and land. There are additional considerations, however, affecting the choice among alternative designs for such a funding system.

4.2.7.3. May a tax be imposed to create a special fund for this purpose, or may such a fund be created other than by taxation?

Special excises are commonly used to create funds for restricted purposes, and there do not appear to be credible state constitutional impediments

to this scheme in the states affected. However, statutory provisions in some states which require all revenues to be transmitted to the state treasury, coupled with constitutional restrictions against disbursements from the treasury except pursuant to appropriation, may create a needless inconvenience in administration of an M&M program. Even though the necessary money is available and earmarked for the purpose, it may not be able to be expended because of a failure of appropriation. Another drawback of funding through taxation is that it requires new legislation in every affected state to impose the necessary tax.

On the other hand, most states whose appropriate agency finds power under existing law to impose a bonding requirement for short-term tailings control concerns, by comparable reasoning will be found authorized to impose a requirement that mill operators contribute appropriate amounts to a trust or endowment fund for long-term or perpetual maintenance. Unlike a tax, such a requirement would not necessitate new legislation. If the fund were held by a depository other than the state, as trustee, expenditures would not be subject to control by appropriation. While there would doubtless be a charge against the fund for management by a trustee,, it is also true that state treasurers in some states are authorized or required to assess a percentage fee for management of earmarked funds in their care. State statute would ordinarily define the suitable class of financial institutions which are authorized trustees.

4.2.7.4 May a state require that title to land on which tailings piles stand be transferred to the state at the end of active mill life, as a condition to conducting mill operations?

This matter must be discussed with particular attention paid to the ownership of the land. As to privately owned land, as distinguished from federal land or Indian land, conveyance to the state can be required; but the mechanism to be used depends upon whether the land is owned by the mill operator or another. If the land is owned by the mill operator, whose right to operate is contingent upon a state license or permit -- and if the state law establishing the licensing scheme contemplates or authorizes such a requirement as a condition to the permit or license, then there is no due process impediment to the state conditioning issuance

of the necessary permit or license upon the operator's agreement to convey such land to the state at the end of the term. Such a requirement in Federal Power Commission licenses was upheld in *United States v. Appalachian Electric Power Co.*, 311 U.S. 377, 427-28 (1940). This mechanism would not work, of course, where the operator was merely a lessee of the land, because the operator could not convey a title which it did not have. Private property may be acquired by the process of condemnation by a state, however, where the acquisition is for a public purpose. There is no basis on which to question the public purpose nature of an acquisition of tailings lands to facilitate monitoring and maintenance for the public health and safety.

Conveyance required as a license condition could be required without monetary consideration, or at least at well below market cost, because the permission to operate the mill is itself adequate consideration for the transfer of title. Cf. *United States v. Appalachian Electric Power Co.*, supra. Acquisition by condemnation would entail payment by the state of fair market value as determined by agreement or judicial evaluation. The fact that the land involved was rendered unfit for most economic uses by the presence of the tailings, however, would tend to minimize the land's value and thus the acquisition cost.

As to federally owned land, conveyance of title to a state cannot be compelled by a state. One of the oldest and most consistently adhered to rules concerning federal property is that nothing a state can do can in any way affect the title or rights of itself or any person in federal land; the creation of rights in federal land is exclusively under the control of Congress. See, e.g., *Humble Oil Refining Co. v. Calvert*, 478 S.W. 2d 926 (Tex.), cert. denied, 409 U.S., 450 (1839). It is within Congress' power, of course, to authorize state acquisition of federal land on which tailings piles are located; but it would take federal legislation beyond that now on the books to do so.

Because Indian land is federal land, the same rule applies to it. In addition, P.L. 280 (25 U.S.C. sec. 1322(b)) expressly provides that Indian land rights cannot be affected by state law or state courts.

State acquisition of federal, including Indian, land should not be necessary, however, to accomplish the needs of long term tailings M&M . The federal government enjoys all the powers of a proprietor in those lands, and therefore is not limited on those lands to the use of its legislative powers or the statutes enacted pursuant to those powers. See United States v. Midwest Oil Co., 236 U.S. 459, 474 (1915). The more rigorous standards normally applied to determine whether an administrative agency has power to impose a regulatory requirement are therefore inappropriate to the question whether the agency upon which the general function of proprietary care has been conferred -- the Department of Interior -- can take particular measures with regard to tailings on such land. Cf. United States v. Grimaud, 220 U.S. 506 (1911). As agent for the proprietor, the Department can make ample provision for monitoring and maintenance, even without any specific legislative authorization. This can involve the use of state monitoring resources, if that seems desirable to the Interior Department. With respect to Indian lands, there is a specific statutory provision guaranteeing state agents and employees entry upon tribal lands, reservations, or allotments for the purpose of making inspection of health conditions. 25 U.S.C. sec. 231.

Using Table 4-11 to survey the general concept strengths and weaknesses, the following observations can be drawn: The taxation alternatives ((1) and (3)) suffer from the unfavorable amount of legislation needed to augment regulatory and legally based inadequacies. This is combined with their relative inflexibility and lack of protection against mill operator insolvency. Concept (2), long-term performance bonding does not facilitate site access for the and most fundamentally involves bonding duration of such an extended period as to be nearly incompatible with a credible obligation by a private company. Concepts (4), (5), and (6), the mill operator generated annuity funds, do not differ significantly in their overall ratings. Possible differences in their administrative costs have been emphasized. These three concepts will be further evaluated in the next section against a variety of general non-fiscal criteria.

4.3 General Evaluation Criteria of Alternative Approaches

A considerable amount of attention has been directed by various state, federal and non-governmental bodies at defining the appropriate M&M programs and jurisdictional responsibility for long-term care of low-level nuclear waste commercial burial grounds*. Although it is not possible to benefit directly from the operational experience of decommissioned burial sites, state programs to develop burial ground M&M funding are more advanced than for mills and contribute directly to this research. Based upon this experience the following observations are made:

- o Although deficiencies have long been noted in the adequacy of particular state programs (both in agreement and non agreement states), federal agencies have not moved to assert regulatory jurisdiction over the commercial burial sites or taken assignment of the facilities and the governing leases.
- o There seems to be no clear existing authority for the NRC to regulate decommissioned facilities in agreement states after the license has expired. This lack of enforcement authority extends to the question of regulation of mill tailing after license expiration for both agreement and non-agreement states.
- o Historically the Federal government has permitted the States to accept the commitment of ownership and long-term M&M for the commercial waste burial sites.
- o In an examination of perpetual care requirements for both mills and commercial burial grounds, the Conference of Radiation Control Program Directors recommended the establishment of a similar perpetual care fund for both facilities.

Based upon this experience, the remaining financing alternatives will be viewed as operating under a similar framework as commercial burial grounds. Therefore it will be assumed that responsibility for collecting and managing perpetual care funds will reside with the State.

A number of factors directly affecting uranium milling can be postulated to be influenced by the selection of a particular long-term financing method. These are briefly described below. Table 4-12

* See for example NUREG-0217, NRC Task Force Report, March 1977.

summarizes the interrelationship between the financing approach and each factor. The +1 rating indicates the most positive interrelationship.

1. Effect Upon The Quality Or Supply Of Uranium Resource - The method should not have a strong deterrent effect on the exploitation of low grade ore resources. Currently supply is heavily dependent upon average ore grades of $< 0.1\% \text{U}_3\text{O}_8$. Therefore revenue requirements based upon a pay-as-you-go approach will tend in general to negatively impact low grade operations. (However it should be noted that this penalization will tend to encourage development and production from other methods and sources such as solution mining and phosphorites, respectively).
2. Uncertainty of Collection - Since the collection of the revenues should be certain, any possibility of establishing loopholes in regulations would cause an adverse impact. This general criteria relates to the degree of complexity and departure from ordinary procedure or experience the method entails.
3. Impact On Yellowcake Price And Price of Nuclear Power - The impact should be low. This can be put into the perspective of the contribution of milling cost to the fuel cycle costs and/or the total generation costs including the capital investment for the nuclear reactor.
4. Fairness to Company - It might be considered fair not to obligate the company beyond its own "fair share" for M&M. Additionally the timing of requirements could be unfair; for example, establishing a fund at the start of mill operations, before any tailings are produced.
5. Uniformity Of Application - This criterion tests the expectation that various mills' will be treated uniformly. However no implication is made that revenue obligations would be equal. This statement should be further tempered with the realization that mills in different states face marked non-uniformity in tax rates and bases. Therefore the potential uniformity of treatment for two mills operating in the same state are the prime consideration.
6. Adequacy To Correct For Accident Consequences - Consideration is only given to accidents occurring during the M&M period with no mill operator under license.
7. Ease and Feasibility Of Implementing For Currently Operating Mill - This is considered apart from the desirability of taking this action. No one may wish to impose a large lump sum and performance land requirement near the end of a mill operation. However, will the financing method essentially require that currently active mills be grandfathered and therefore take

away the choice of implementation?

8. Impact On Competition - Is the method neutral to large and small firms? Does it place certain firms which may specialize in particular ore types or processing schemes, in hardship?
9. Private Sector Participation - Would financial and other institutions be expected to participate under the method?

4.4 Conclusions

The evaluation summarized in Table 4-12 is only a beginning at assessing the indirect influence and preferability among the remaining alternatives. This subjective rating can be utilized to indicate the relative strengths and differences among approaches. None of the factors or differences in rating are sufficient to recommend or eliminate a concept. It is suggested therefore that the range of such choices should be considered by each state. It may be desirable to allow more than a single approach - just as is currently done in options for short-term bonding.

Principle study conclusions for long-term financing alternatives are summarized below:

- o Taxation methods to raise revenue through the general fund and subsequent appropriations are undesirable.
- o Methods which raise revenue from sources other than the mill operator are generally less suitable since they don't relate to site-by-site accountability.
- o All methods may have some problem incorporating currently active mills on a pay-as-you-go basis.
- o None of the methods offers protection against major accident liability. An independent superimposed insurance pool or another federally legislated approach would be needed.
- o A variety of earmarked funding approaches administered by each State seem suitable for establishing adequate M&M funding for all categories of land ownership and agreement state status. Guidelines for uniform inflation factors and procedures for developing M&M cost estimates should be constructed by the Federal

Table 4-12 General Long-Term Financing Intercomparisons

Evaluation Criteria

	Quality & Liquidity	Collection Uncertainty	Price Impact	Fairness	Uniformity	Accident Contingency	Active State Participation	Competition Impact	Private Sector Participation
Insured Annuity	(0) All methods tend somewhat to discourage low use content use since production revenues are decreased but HMM costs are unchanged for a given volume of use. However, unless use grade is very low this factor shouldn't drive the economics.	(+1) There appears to be little possibility of this if states authorize appropriate agency to impose and receive funds. Agreement state status is irrelevant.	(+1) The revenue rates per ton are or pound yellowcake are much smaller than existing taxes.	(+1) All are based upon pay as you go approach and phased funding.	(+1) Uniformity seem likely since revenue needed based on mill's O&M requirements. Mills started in the future will be higher charge but will expect inflated prices for yellowcake	(-1) Only possibility for adequacy is if mill pools are lumped together. In that case, in the event of an accident, all active mills would receive higher revenue assessments. Satisfactory solution likely only under separate provision. See text.	(0) Direct revenue rate levy into State control on producing mill; may be the easiest approach to implement on an active mill. All approaches will suffer problem because license renewal may be only suitable time.	(+1) Firms engaged in milling at the "typical mill" size are already a select or restricted set of mining companies. It is unlikely that these requirements will further reduce competition	(0)
Investment Securities	(0)	(0) Risk is probably low but mechanisms to establish are more unusual and possibly complex.	(+1)	(+1)	(+1)	(-1)	(-1) May be slightly more difficult than above since interest should be required to allow company to set up investment approach. Additionally some securities are suitable only to longer range investment.	(+1)	(+1) Management of annuities funds should be sought after by private institutions. Competition should promote effective management.
Lump Sum	(0)	(+1) Performance bonding places obligation on surety with little risk of uncertainty.	(0) This method has unlikely potential for impact if circumstances and lack of planning dictate price increases near final milling.	(+1)	(+1)	(-1)	(-1) It may be difficult to get a surety bond for an operation which has been underway for a significant period.	(+1)	(0) It is not clear based upon experience whether any particular firm may be unable to secure large bonds.

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regulatory agencies to assure uniformity and adequacy of M&M.

- o The cost to finance M&M for a model mill (expressed as a percentage of yellowcake price) is relatively low in comparison to existing revenue taxation and therefore should not significantly influence uranium milling.

APPENDIX A

DETAILS OF COMPOUND-INTEREST CALCULATIONS

1. Inflation of M&M costs and lump sum requirement. Base cost in 1977 is \$5,000. Assuming a constant inflation rate i (decimal), the M&M cost n years after 1977 is $\$5,000 \times (1 + i)^n$. For a study mill starting in 1978 with 6 percent inflation, the M&M cost at abandonment is

$$\$5,000 (1 + .06)^{15} = \$11.983$$

For a study mill abandoned n years after 1977, the lump sum, 100-year cost with inflation rate i is

$$L = 5,000 (1 + i)^n \times \sum_{m=1}^{100} (1 + i)^m$$

We may simplify this expression to avoid the summation.

$$L = 5,000 (1 + i)^{n+1} \left[(1 + i)^{100} - 1 \right] / i$$

For 6 percent inflation and $n = 15$,

$$L = 5,000 (1.06)^{16} (1.06^{100} - 1) / .06 = \$71.617,190$$

2. Discounted lump sum requirement with inflation. Let C_n be the annual M&M cost n years after mill abandonment. For a discount rate d (decimal) the lump sum required at mill closing is

$$L = \sum_{n=1}^{100} \frac{C_n}{(1 + d)^n}$$

With inflation rate i (decimal), the M&M cost in year n after abandonment is

$$C_n = 5,000 (1 + i)^{n+15}$$

We may thus write

$$L = \sum_{n=1}^{100} \frac{5,000 (1 + i)^{n+15}}{(1 + d)^n}$$

$$L = \sum_{n=1}^{100} \frac{5,000 (1+i)^{15}}{\left(\frac{1+d}{1+i}\right)^n}$$

$$L = \sum_{n=1}^{100} \frac{5,000 (1+i)^{15}}{1 + \left(\frac{d-1}{1+i}\right)^n} = \sum_{n=1}^{100} \frac{5,000 (1+i)^{15}}{(1+r)^n}$$

These algebraic manipulations show analogy to standard bond-interest formulas in which $r = (d - i)/(1 + i)$. The lump sum requirement discounted at d and inflated at i is

$$L = \frac{5,000 (1+i)^{15}}{r} \left[\frac{(1+r)^{100} - 1}{(1+r)^{100}} \right]$$

where $r = \frac{d - i}{1 + i}$

For a discount rate of 10 percent and an inflation rate of 6 percent,

$$r = \frac{.10 - .06}{1.06} = 0.0377$$

$$L = \frac{5,000 (1.06)^{15}}{0.0377} \frac{1.0377^{100} - 1}{1.0377^{100}} = \$309.725$$

For the special case of $r = 0$, we must take limits. Let $f(r)$ denote the numerator and $g(r)$ the denominator.

$$f(r) = (1+r)^{100} - 1$$

$$g(r) = r(1+r)^{100}$$

Then

$$\frac{(1+r)^{100} - 1}{r(1+r)^{100}} = \frac{f(r)}{g(r)}$$

By L'Hospital's Rule,

$$\begin{aligned}\lim_{r \rightarrow 0} \frac{f(r)}{g(r)} &= \frac{\lim_{r \rightarrow 0} f'(r)}{\lim_{r \rightarrow 0} g'(r)} \\ &= \frac{\lim_{r \rightarrow 0} 100(1+r)^{99}}{\lim_{r \rightarrow 0} [(1+r)^{100} + 100r(1+r)^{99}]} \\ &= \frac{100(1+0)^{99}}{(1+0)^{100} + 0} = 100\end{aligned}$$

3. Revenue requirement. The discounted lump sum is to be distributed across the 15 production years as an equivalent annual cost. For discount rate d (decimal), the annual cost A is given by

$$A = L \left[\frac{d}{(1+d)^{15} - 1} \right].$$

For $d = .10$ and $L = \$309,725$ (as above)

$$A = \$9,748$$

To obtain the revenue requirement (or tax), divide by the annual production of 730,000 tons

$$\frac{\$9,748}{730,000} = 1.34\text{¢/ton}$$

To obtain the tax per pound U_3O_8 , multiply the grade times 2,000 pounds per ton to obtain pounds U_3O_8 per ton. In the ore with 0.2 percent grade, there are $0.002 \times 2,000 = 4$ lb. U_3O_8 per ton ore. Then the tax per pound of yellow-cake is

$$\frac{1.34\text{¢/ton}}{4 \text{ lb. } U_3O_8/\text{ton}} = 0.33\text{¢/lb. } U_3O_8$$

4. Revenue requirements for perpetual care. Let P be the annuity fund level for perpetual care. Then

$$\begin{aligned} P &= \lim_{N \rightarrow \infty} \frac{5,000(1+i)^{15}}{r} \left[\frac{(1+r)^N - 1}{(1+r)^N} \right] \\ &= \frac{5,000(1+i)^{15}}{r} \lim_{N \rightarrow \infty} \left[1 - \frac{1}{(1+r)^N} \right] \\ &= \frac{5,000(1+i)^{15}}{r} \end{aligned}$$

where $r = \frac{d - i}{1 + i}$

Note that P is meaningful only for $r > 0$; i.e., $d > i$, that is, the discount rate must be greater than the inflation rate.

APPENDIX B

CONSIDERATIONS AFFECTING STATE JURISDICTION TO REGULATE MILLING BY INDIANS ON INDIAN LAND

The early rule was that the laws of a state could have no effect within the boundaries of Indian territory. Worcester vs. Georgia, 31 U.S. (6 Pet.) 515, 561 (1832). A century later, however, in Surplus Trading Co. vs. Cook, 281 U.S. 647 (1930), the Supreme Court held that an Indian reservation is "part of a state . . . and her laws, civil and criminal, have the same force therein as elsewhere within her limits, save that they can have only restricted application to the Indian wards". The apparent conflict between these two propositions is due less to changes in the original concept than to refinement of expressions of the concept as varied facts have required elaboration in successive cases. In particular, there are differences between the application of state law to Indians within a reservation, and the application of state law to non-Indians within a reservation. The status or character of the person to whom the law is sought to be applied and not merely the location of the place with respect to which the law is sought to be applied, must be considered. The issue of jurisdiction has a personal as well as a territorial aspect.

As to Indians on reservation land, state power is clearly subject to congressional control. Prior to the enactment of Public Law 280 in 1953 (now, as amended, 25 U.S.C. §§1321 et seq.), there was authority for the proposition that a state law would bind reservation Indians unless there were a federal law conflicting with it. "Enactments of the Federal Government passed to protect and guard its Indian wards only affect the operation, within the colony, of such state laws as conflict with the federal enactments", United States vs. McGowan, 302 U.S. 535, 539 (1938). Under this principle, one could have argued that in the absence of any contrary federal law, and without the necessity of any authorizing federal legislation, state law would be applicable to Indians on reservations.

The situation is somewhat different, however, under P.L. 280 as amended in 1968, 25 U.S.C. §§1321 et seq. The principal effect of this statute is to express the consent of Congress, with certain conditions, to the assertion by states of jurisdiction over criminal court proceedings (§1321) and civil

court proceedings (§1322) involving Indians in Indian country. To exercise such jurisdiction, a state must comply with the conditions contained in the act, as amended, including securing the consent of the tribe or tribes affected, and (in the case of states whose constitutions or statutes foreclosed such jurisdiction) appropriately amending state law. Since this statute was adopted by Congress, it has been held that a state court cannot exercise jurisdiction over Indians with respect to acts taking place on a reservation, even with tribal consent, unless all of the conditions prescribed by the statute have been satisfied. Kennerly vs. District Court, 400 U.S. 423 (1971).

It is not clear, however, under P.L. 280, whether the applicability of substantive state law to Indians on reservations is as restricted as the applicability of state judicial process and court jurisdiction. The last clause of the single long sentence which comprises 25 U.S.C. §1322(a) states,

"those civil laws of such state that are of general application to private persons or private property shall have the same force and effect within such Indian country or part thereof as they have elsewhere within that state."

while the preceding clauses of the subsection -- which deal with court jurisdiction and not with substantive law -- are expressly contingent on tribal consent, and are premised on the states' courts theretofore lacking jurisdiction over such "civil causes of action", as a matter of grammar the last clause stands alone. It is equally, if not more, compatible with grammatical usage to view the last clause, therefore, as simply declaratory. It may be declaratory of a rule already existing, prior to enactment of the statute, although statutes are not normally utilized to confirm the status quo. Or it may be declaratory of a new rule (or newly clarified rule) which, however, is independent of the court jurisdiction provisions of the statute, and unlike the court provisions, is not subjected to preconditions such as tribal consent.

There appears to be no judicial authority clearly determining whether the last clause of §1322(a) is declaratory and therefore authorizes the application of substantive state law to Indians on Indian land regardless of tribal consent or affirmative state action (although of course subject to federal preemption, see 25 U.S.C. §1322(b); U.S. Const. Art. VI, clause 2). The closest this issue has come to judicial decision was in McClanahan vs. State Tax Commission of Arizona, 41 U.S.L.W. 4457 (1973), a case which involved

application of a state tax to an Indian with respect to acts on a reservation. The Supreme Court noted that the state had not shown any way in which its substantive law imposing the tax could be enforced against the reservation Indian except through state judicial process, which was unavailable because Arizona had not fulfilled the prerequisites to state judicial power prescribed by P.L. 280. The Court therefore observed: "Unless the State is willing to defend the position that it may constitutionally administer its tax system altogether without judicial intervention, (citation omitted) the admitted absence of either civil or criminal jurisdiction would seem to dispose of the case". 41 U.S.L.W. at 4461.

While there are not means to enforce state taxes without recourse to state judicial process in the event of recalcitrance, however, there are means other than state judicial process for enforcing other substantive state laws. Specifically, for example, the federal government, when called upon to approve a proposal for milling on Indian land, may require compliance with applicable substantive state law as a precondition to its approval. By this means, an effective enforcement mechanism can be provided -- without recourse to state judicial process -- for substantive state law requirements, even where the persons on whom the requirements are imposed are themselves Indians. This result seems consistent with the terms of 25 U.S.C. §1322(a), and also consistent with the modern case law which indicates that, in the absence of any congressional directive to the contrary, the criteria for the applicability of state law to Indians on Indian land is "whether the state action infringed on the right of reservation Indians to make their own laws and be ruled by them". Williams vs. Lee, 358 U.S. 217, 220 (1958). The will of Congress as to whether substantive state law should control over any contrary Indian ordinance or custom is clearly expressed in 25 U.S.C. §1322(c), which says that in the judicial determination of cases,

"any tribal ordinance or custom heretofore or hereafter adopted by an Indian tribe, band, or community in the exercise of any authority which it may possess shall, if not inconsistent with any applicable civil law of the State, be given full force and effect . . . (Emphasis added).