



Hardrock Reclamation Bonding Practices in the Western United States

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Forward

For more than 150 years, America's quest to locate and extract copper, lead, silver, gold and other precious metals from the mountains of the West dramatically influenced the way the region was settled and developed. We've all seen images of the California Gold Rush in the 1800s C just one example of the part that mining played in our country's Western history, a role that still affects the region today.

While Americans have enjoyed short-term economic prosperity from mining, we now know that it has come at a terrible cost. Once teeming with big game and sage grouse, the majestic mountains and rolling grasslands of the West have been ravaged by hard rock mining. The sight of waste rock dumps, tailings piles, mined pits, and tunnels into mountainsides is all too common. While these sights are alarming, historic and even present day mining operations have another less obvious, but far more ominous legacy: air and water pollution that threatens human health.

Despite more than 25 years of progress under the Clean Water Act, many Western waters remain dangerously polluted from active, inactive and abandoned mine runoff. Mining companies too often walk away from the pollution they've created, without restoring or "reclaiming" the land they've damaged, forcing taxpayers to pick up the tab for the clean-up.

This report has been produced as part of the National Wildlife Federation's (NWF) work to restore our nation's grasslands and keep the great rivers of the American West healthy for people and wildlife. It investigates why a key mechanism designed to address mine pollution problems B *Reclamation Bonding* B has proven inadequate and explores how it can be fixed.

Reclamation bonding is meant to serve as an insurance policy@ against pollution problems. It is a cache of money that mining companies are required to put down before beginning work, and which can be used for clean-up down the road, if needed. But the system is badly in need of reform.

In A*Hardrock Reclamation Bonding Practices in the Western United States*,@ NWF presents a new reclamation bonding model that offers a common-sense alternative to current procedures. It holds companies, not taxpayers, accountable for mining damage and works to conserve habitat and sensitive resources.

The toll that mining has taken is dramatic. But we can begin to restore our country's historic Western grasslands and waterways and to curb future damage, if we act now. This report is a tool for making those changes happen. With the help of concerned citizens, it can help us ensure a better future for people and wildlife across the west.

Mark Van Putten
President and CEO
National Wildlife Federation

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The author also wishes to thank the sponsors of this study for the opportunity to prepare a technical review of this important topic to promote environmental awareness of mining issues. By funding research into a relatively unknown and isolated subject relative to mine regulation, with significant impacts in terms of public liability, NWF and its sponsors have successfully contributed in a substantive manner to both scientific foundation and public awareness.

Author Biography

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Comments and Questions:

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Executive Summary

Hardrock mining has had a major impact on the social landscape and environment of the western United States. In the past, hardrock metal mining for gold and silver, copper, molybdenum and other metals were largely conducted in smaller high-grade operations. These operations produced a legacy of one time riches for a few individuals and abandoned mines, broken towns, and environmental impacts that will forever remain a part of the western United States.

Today, modern mining companies employ advances in technology that have led to massive mining operations such as those that employ open pit mining and leaching methods to exploit lower-grade ores. At the same time, the increased size, techniques used, and proactive environmental standards result in significantly increased costs to restore lands and waters damaged by mining operations, which is required to varying extent by all the western states. In addition, all the states require some form of “reclamation bonding” to ensure that mining operations are conducted responsibly and reduce their liability in the event mining companies fail to fulfill their responsibilities.

Today's major hardrock mining operations in the western U.S. typically range in disturbance area from 100 acres to more than 10,000 acres. At the same time reclamation costs, which vary significantly from state to state and mine site to mine site, range from less than \$1,000 per acre to more than \$20,000 per acre.

The total, potential reclamation bonding liability of all the western states presently exceeds one billion dollars.

At the same time, the financial failure of numerous mining companies has exposed shortcoming in both bond methods and bond amounts.

American taxpayers are faced with significant liability for mines left unreclaimed, shifting the economic burden from the companies that profited from the mines and leaving environmental disasters behind for the public to clean up. The number of bankrupt or abandoned mines has increased significantly, with state and/or federal agencies presently potentially responsible for at least some portion of the cleanup costs of 13 mines in Nevada, five in Montana, and additional mines in South Dakota, Alaska, Idaho, Colorado and New Mexico. Given the potential for a major collapse within the gold and copper mining industry (as demonstrated by recent metals prices at 20-year lows), the potential for public liability of an even greater magnitude certainly exists. The relatively obscure regulatory principal of reclamation bonding has recently become more important and warrants both public and regulatory scrutiny.

Reclamation Bonding

This study provides a comprehensive examination of hardrock reclamation bonding as it applies to major base and precious metals mines in the western United States. It is based upon detailed examination of the existing state and federal reclamation bonding statutes and practices of the western U.S. This information is used to illustrate and compare the various features and methods used to determine reclamation and closure bonding amounts, and compare the practices employed by the various state and federal agencies in affecting reclamation and closure bonding. Based on examination of the existing state and federal practices, a regulatory model for reclamation and closure bonding is recommended, and is the basis of a critique of individual state and federal statutes and practices.

Part I of the study, Hardrock Reclamation and Closure Bonding, explains and compares information on the features of hardrock metals mine reclamation and closure bonding statutes and practices. Reclamation and closure bonding cost estimation methods are also examined, and the estimated costs for various reclamation and closure tasks as contained in 18 case studies is discussed. Comparison is then made between estimated reclamation and closure cost estimates on a disturbed area, cost by task and cost per acre basis.

The information shows that although the basic intent of most state's hardrock mine reclamation and closure statutes is the same, as a result of the specific rules and regulations and political influence, the practices of each state vary significantly. The estimated costs for nearly identical tasks can vary significantly between states. The lowest estimated reclamation costs exist in those states and on federal land where the statutes and regulations are general and limited in scope, and afford the regulators substantial discretion as to their interpretation and application. This observation becomes even more dramatic where industry political influence has resulted in apparent underestimation of reclamation costs. In other states the statutes and regulations are more specific and comprehensive in scope, allowing the regulators less discretion as to their use. In addition, various states have unique and explicit features or have developed specific guidelines to deal with reclamation and closure issues, usually as a result of lessons learned from adverse circumstances.

The study demonstrates reclamation and closure cost estimation as a complicated and to a great extent site-specific task. However, the information from the case studies reveals a significant disparity between the inclusion of and/or costs for various reclamation and closure activities, as well as cost estimation methods. The most significant difference in cost estimates for individual items as well as total reclamation and closure costs can be seen where the mine operator is allowed to estimate their costs, and where the estimate is performed based on the potential costs if reclamation is performed by the State. In the event the state is required to perform cleanup, an increase of costs above that estimated by the operator of from 50% to more than 500% might be expected to occur. One of the primary factors affecting reclamation and closure costs is the presence of acid mine drainage at many of the mine sites, requiring costly mitigation of related environmental impacts. At many mines the presence of acid mine drainage is either underestimated or ignored until it becomes evident, at which time the costs often exceed the operators financial resources, leading to bankruptcy or abandonment of the site in many cases.

State and Federal Statutes and Practice

Parts II and III of the study, An Analysis of Present Reclamation Bonding Mechanisms in the Western United States, includes the disturbed acreage and reclamation bond for each state's major hardrock mines, and contains each state's relevant reclamation and closure statutes. In addition, selected case studies from major mines in most states are included, which examine their reclamation and closure plans and bonds in more detail.

Part II, Southern Region, contains information on the states of Arizona, California, Colorado, Nevada, New Mexico and Utah. Part III, Northern Region, contains information on the states of Alaska, Idaho, Montana, Oregon, South Dakota, Washington and Wyoming. In addition, information on federal reclamation and closure bonding statutes relating to the Bureau of Land Management and U.S. Forest Service authority on public lands is also provided.

The study shows approximately 150 major hardrock metals mining operations in the western United States, with a total disturbance acreage of approximately 250,000 acres, and a reclamation and closure bonding level in total of approximately \$1.1 billion. The average bond level for all the major mines is approximately \$4,400 per acre, however the range of cost varies at the various mines studied from less than \$1,000 per acre to greater than \$50,000 per acre.

The state's statutes and regulations pertain to key areas of reclamation and closure bonding, including authority, exemptions, planning requirements, bonding requirements, oversight, public participation, and other significant features. These areas are addressed by statute in either a general manner or more explicit manner. Some state's statutes are a general prescription providing limited authority, while other state's statutes are specific and comprehensive, and provide for broader authority. The case studies graphically demonstrate the different approaches taken by the states for various mine sites and the resulting disparity in reclamation bond amounts.

A Recommended Regulatory Model for Reclamation Bonding

Part IV of this study, A Recommended Regulatory Model for Reclamation and Closure Bonding and Critique of Individual State Mechanisms, contains analysis of the various features of reclamation bonding regulation and suggests a recommended regulatory model in order to ensure responsible mining and protect against public liability. Based on this model, present state statutes and practices in comparison with those recommended in the model are critiqued and recommendations made for their improvement.

The recommended regulatory model is based on consideration of present reclamation and closure statutes and practices in all the western states, and emulation of those statutes which best represent the fundamental overall purpose and objectives of reclamation and closure bonding. The following Recommended Principles of Reclamation and Closure Bonding summarize the recommended regulatory model.

Principles of Reclamation and Closure Bonding

- The following provisions shall be included as requirements for all reclamation and closure plans, and specific performance standards shall be adopted to guide their administration: topsoil salvage and replacement; recontouring; revegetation; slope stability; stream protection; air and water resources protection; geochemical and acid mine drainage considerations; public health and safety; wildlife habitat restoration; and aesthetic impacts, including visual impacts.
- Bonds shall be required as a part of the operating permit for the purpose of assuring completion of the reclamation and closure plan, and other requirements of any laws and rules and any permit conditions.
- State and federal agencies shall determine and set the amount of financial assurance; derive their estimate from only verifiable sources; include consideration of all costs in determining bond amounts; include adequate funding for interim reclamation and closure operations; include indirect and overhead costs; and base the cost of reclamation over the project life.
- The following forms of financial assurance shall only be accepted: (i) cash; (ii) surety bonds; (iii) letters of credit; and limited forms of other financial assurance mechanisms that are readily liquid and can be assumed as cash in the event reclamation and closure by the

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agencies becomes necessary. No type or variety of corporate guarantee or self-bonding shall be accepted as financial assurance.

- Regulatory agencies shall conduct at least yearly on-site inspections of existing and new mining operations and more frequently as necessary to ensure compliance with the terms of the operating permit and the approved reclamation and closure plan.
- Regulatory agencies should review the bond amount at least every five years, and more frequently as conditions warrant, and adjust the bond amount as necessary to reflect actual current conditions and reclamation and closure requirements.
- Regulatory agencies should establish closure and post-closure performance criteria to ensure compliance with applicable state and federal water and air quality standards.
- The regulatory agencies shall cause the bond to be forfeited if: (i) reclamation and closure is not performed as permitted; reclamation and closure activities are not initiated and completed as required; if the surety refuses or fails to perform the work; and in the event the mine operator is unable to maintain the financial surety.
- Regulatory agencies should establish the formation and means to support an emergency response and reclamation action.
- Full and unrestricted public participation should be provided in the process of establishing reclamation and closure plans and bond amounts, and as a part of bond release.

Critique of State Statutes and Practices

Examination of state statutes and practices in comparison with these fundamental regulatory principles shows a wide variance in terms of the need for changes in the states and federal agencies. Arizona and Nevada by far have the weakest reclamation bonding programs – both states allow the company to estimate the cost of reclamation, allow self-bonding or corporate guarantees, and fail to adequately address acid mine drainage, water quality and other key areas. Alaska's statutes have some of the same problems, and although the state's practices result in better adherence to the recommended principles, significant changes to the statutes are recommended in order to provide the state's regulators with more authority. In a similar manner, the reclamation and bonding provisions of the BLM and US Forest Service regulations are generally inadequate, and in many cases negatively compromise state statutes and practices.

In these states and with respect to the federal agencies, significant and urgent reforms are recommended.

Most other western states have comparatively better statutes and/or practices, and require less significant changes to more effectively protect the public and the environment and promote responsible mining practices. However, in all the states at least some critical flaws exist in present regulation or practice.

Because of the critical nature of these issues and the existing shortcomings as demonstrated in this study, it is recommended that all the western U.S. states reform their reclamation planning and bonding statutes and programs.

Introduction

This study of Hardrock Reclamation Bonding Practices in the Western United States is intended to provide a snapshot of reclamation and closure bonding as it has occurred in the modern regulatory era through 1999. By its very nature, reclamation bonding of hardrock mines is dynamic, with the disturbed acreage and bond amounts constantly changing. The data contained herein are accurate as of June 1999.

In obtaining the information for this study, diligent effort was made to solicit the cooperation of the states and federal agencies. In most cases, visits to the various state agency offices, and in some cases federal agency offices, were conducted for the purpose of gathering information and engaging in discussion with agency personnel about the content of the study, and the information being solicited. In all cases, phone calls were made to the state and federal agencies to obtain information. In addition, each state section was submitted to the state and federal agencies in draft form and comments on those sections solicited, and where appropriate, incorporated into the information presented. The author wishes to thank the various agencies for their assistance.

The information contained for each state in the tables of Major Hardrock Mines with Existing Permits and Bonds is based upon information gathered by the author and made available by each state and/or federal agency.

- A Major mine for the purpose of this study was arbitrarily defined as having a reclamation and closure bond amount of \$250,000 or greater. The disturbed acre figures in the tables are in most cases the actual disturbed acreage, however in other cases it may be the permitted acreage.
- The bond amount figures in the tables in most cases are for all forms of bonding (reclamation and environmental), however in some cases the bond amount may not reflect bonding from all agencies or for all disturbed areas.
- All data contained in this report came from existing federal and state governmental sources. There was no attempt to independently produce assessments of reclamation bonding costs from individual mines or existing state programs.

Parts I, II and III of this study have been prepared as technical information about reclamation bonding and the state reclamation programs that govern bonding for hardrock mines. Specific case studies in selected states are identified to further illustrate the application of a state reclamation bonding practice. It is the intention of this study to emphasize comparison, and the presentation of the information has been intended to allow for such comparison to be made.

Part IV of this study includes a model reclamation bonding policy for western states, based on the assessment of the strengths and weaknesses of existing state reclamation efforts. It includes a critique of each state's existing program, and compares the state bonding program against the model created in this study. The study recommends a consistent framework of performance based reclamation standards so as to ensure a favorable outcome and to provide for broad bonding authority by the agencies.

HARDROCK

Reclamation Bonding Practices In the Western United States

Forward by Mark Van Putten

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Introduction

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HARDROCK Reclamation Bonding Practices In the Western United States

Part I – HARDROCK RECLAMATION AND CLOSURE BONDING

1.1 FEATURES AND COMPARISON OF HARDROCK RECLAMATION BONDING STATUTES

This section contains an explanation of the features of hardrock reclamation bonding, and compares those features in each state with that of the other states reviewed in this report. Each state's features are contained in detail in Part II – Southern Region, and Part III – Northern Region. Those sections contain the actual language of the various state statutes and regulations for each feature in each state.

1.1.1 State Reclamation Statutes, Regulations and Guidelines

State reclamation statutes are typically in the form of a law, or a Mining and/or Reclamation Act, that is enacted by the legislative branch of government in each state. Regulations, typically in the form of rules and codes, are promulgated under the requirements and/or intent of the Act. The responsible state or federal agencies may sometimes develop guidelines implementing the Act. These guidelines provide definition, clarification, instruction and other explanations in order to facilitate the reclamation permitting and bonding processes.

Tables 1.1.1 **Comparison of Reclamation and Closure Bonding Features by State–Southern Region** and Table 1.1.2, **Comparison of Reclamation and Closure Bonding Features by State–Northern Region**, summarize each state's hardrock mining reclamation and financial assurance statutes. The year the statutes were enacted and the year of any major revisions are indicated in parentheses.

1.1.1.1 General

Since 1994, all states in the western U.S. have had hardrock mining reclamation and financial assurance legislation in various Acts. They have also promulgated regulations for the administration and enforcement of these Acts. Some states have recently passed significant revisions to their statutes. However, most states continue to use their original statutes, typically enacted in the 1970's, with only minor modification.

The Acts vary greatly in scope, running from a less comprehensive and general approach as exemplified by Utah's 1975 act to a relatively comprehensive approach exemplified by New Mexico's revised Act of 1993. However, the relatively recent age of a state statute does not dictate the nature of its scope, as exemplified by Arizona's statute, which, despite being passed in 1994, is less comprehensive than many Acts passed in the 1970's.

**Table 1.1.1 - Comparison of Reclamation and Closure Bonding Features by State
Southern Region**

Feature	Arizona	California	Colorado	Nevada	New Mexico	Utah
Reclamation Bonding Statute	Mined Land Reclamation Act [1994]	Surface Mining and Reclamation Act [1975, 1980]	Mined Land Reclamation Act [1973]	Mined Land Reclamation Act [1989]	New Mexico Mining Act [1978, 1996]	Mined Land Reclamation Act [1975]
Governing State Body	Board of Governors	State Mining and Geology Board	Mined Land Reclamation Board	State Environmental Commission	State Mining Commission	Board of Oil, Gas and Mining
Lead State Agency	Department of State Mine Inspector	Office of Mine Reporting and Reclamation Compliance ¹	Office of Mined Land Reclamation, Div. of Minerals and Geology	Div. of Env. Protection, Dept. of Natural Resources	Mining and Minerals Div. of the Energy, Min. and Nat. Res. Dpt.	Dept. of Natural Resources, Div. of Oil, Gas and Mining
State Requires Bonding On Federal, Lands On State Lands On Private Lands On Tribal Lands	Yes Yes Yes (limited) No	Yes Yes Yes No	Yes Yes Yes No	Yes Yes Yes (limited) No	Yes Yes Yes No	Yes Yes Yes No
Memo. of Understanding With Forest Service With BLM	No No	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
Exemptions to Bonding	<5 acres	< 1 acre, < 1000 cu yds	None	<5 acres	<2 acres, <200 cu yds/yr	<5 acres
Reclamation Plan Required	Yes	Yes	Yes	Yes	Yes	Yes
Bonding Required	Yes	Yes	Yes	Yes	Yes	Yes
Bonding Required for Surface Disturbance Geochemical Hydrological Chemical Worst-Case	Yes Yes ² Yes ²	Yes Yes Yes Yes ³ Yes ³	Yes Yes Yes	Yes	Yes Yes ⁴ Yes	Yes Yes ⁵ Yes
Bond Amount Calculated by	Company	Company	Company/Agency	Company	Company/Agency	Company/Agency
Types of Bonding Allowed Surety Irrev. Letter of Credit Trust Funds/Deeds CD's, Savings, or Cash Corporate Guarantee or Self-Bonding Other	Yes Yes Yes Yes Yes Yes ⁶	Yes Yes Yes Yes ⁷ Yes ⁸	Yes Yes Yes Yes	Yes Yes Yes Yes Yes ⁹	Yes Yes Yes No ¹⁰ Yes ¹¹	Yes Yes Yes Yes Yes ¹²
Monitoring and Compliance	As required	As required	As required	As required	At least Annual	Variable
Bond Review	5 years or less	Annual	As necessary	3 years	As necessary	5 years
Closure Regulations	Yes ¹³	Yes ¹⁴	Yes	Yes	Yes	Yes
Bond Forfeiture	Yes	Yes	Yes	Yes	Yes	Yes
Bond Release	Agency sign-off	Agency sign-off	Agency Sign-Off	Agency Sign-Off	Agency Sign-Off	Agency Sign-Off
Reclamation Fund/Pool	No	No	Yes ¹⁵	Yes	Yes	No
Public Participation in bond Determination and release	No specific provisions	No specific provisions	No specific provisions	Yes	Yes	Provisions for public comment on permit only
Other Significant Features	Arizona Aquifer Protection Permit	Regional Water Quality Control Boards	Environmental Protection Plan Requirements	Emergency Response Fund	No Treatment in Perpetuity ¹⁶	

**Table 1.1.2 - Comparison of Reclamation and Closure Bonding Features by State
Northern Region**

Feature	Alaska	Idaho	Montana	Oregon	South Dakota	Washington	Wyoming
Reclamation Bonding Statute	Reclamation Act [1963]	Surface Mining Act [1971]	Metal Mine Reclamation Act [1971]	Mined Land Reclamation Act [1971]	Mined Land Reclamation Act [1971]	Surface Mined Act [1970]	Environmental Quality Act [?]
Governing State Body	Commissioner of Natural Resources	State Board of Land Commissioners	Board of Env. Review	Gov. Board, Dept. of Geol. & Mineral Ind.	Board of Minerals and Environment	Commissioner of Public Lands	Environmental Quality Council
Lead State Agency	Dept. of Natural Resources, Div. Of Mining	Director Department of Lands	Department of Environmental Quality	Department of Geology and Mineral Industries	Department of Environment and Natural Resources	Dept. of Natural Resources	Dept. of Env. Quality, Land Quality Division
State Requires Bonding							
On Federal Lands	Yes	Yes	Yes	Yes	Yes	Yes	Yes
On State Lands	Yes	Yes	Yes	Yes	Yes	Yes	Yes
On Private Lands	Yes	Yes	Yes	Yes	Yes	Yes	Yes
On Tribal Lands	No	No	No	No	No ¹⁶	No	No
Memo. of Understanding With Forest Service	Yes	Yes	Yes	Yes	Yes	Yes	Yes
With BLM	Yes	Yes	Yes	Yes	No ¹⁷	Yes	Yes
Exemptions to Bonding	<5 acres, <50,000 cu yds	None	<5 acres, <36,500 tons/yr	<1 acre, <5,000 cu yds per yr	<10 acres, <25,000 tons/ yr	<3 acres, <30 ft pit walls	<10 acres
Reclamation Plan Required	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bonding Required	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bonding Required for							
Surface Disturbance	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geochemical	Yes		Yes	Yes	Yes	Yes	Yes
Hydrological		Yes	Yes	Yes	Yes	Yes	Yes
Chemical				Yes		Yes	
Worst-Case							
Bond Amount Calculated by	Company/Agency ¹⁸	Company/Agency	Company/Agency	Agency	Company/Agency	Company/Agency	Company/Agency
Types of Bonding Allowed							
Surety	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Irrev. Letter of Credit	Yes	Yes	Yes	Yes		Yes	Yes
Trust Funds/Deeds			Yes			Yes	
CD's, Savings, or Cash	Yes	Yes		Yes	Yes	Yes	Yes
Corporate Guarantee or Self-Bonding							Yes
Other			Yes ¹⁹	Yes ²⁰	Yes ²¹		
Monitoring and Compliance	As required	As required	At least Annual	Yes	At least Annual	Quarterly	No provisions
Bond Review	As necessary	Annual	5 years	No provisions	Periodic	2 years	As necessary
Closure Regulations	Not Specified	Yes	Yes	Yes	Yes	Yes	Yes
Bond Forfeiture	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bond Release	Agency Sign-Off	Agency Sign-Off	Agency Sign-Off	Agency Sign-Off	Agency Sign-Off	Agency Sign-Off	Agency Sign-Off
Reclamation Fund/Pool	Yes	No	Yes	No	Yes	No	No
Public Participation in bond determination and release	No specific provisions	No specific provisions	Limited Provisions	No specific provisions	No specific provisions	No specific provisions	No specific provisions
Other Significant Features	Solid Waste Bonding – Alaska DEC	Dam Safety Act, Cyanidation Rules	Ban on Open Pit Cyanide Leach Mines		Regulations specific to Black Hills Region	Metal Mining and Milling Act	

Footnotes to Table 1.1.1 and 1.1.2

¹ In California the “lead agency” means the city, county, or the State Mining and Geology Board. Counties serve as the lead agency in most cases.

² Not required by the Act, but bonding for geochemical and hydrological impacts can be required by ADEQ under the Arizona Aquifer Protection Permit program.

³ Bonding for worst-case release of chemicals from process facilities can be required under California Regional Water Quality Control Board authority.

⁴ Bonding for geochemical impacts to water quality is performed by the New Mexico Environment Department.

⁵ Not required by the Act, but bonding for geochemical impacts can be required by UDEQ under the Utah Water Quality Act.

⁶ Any other financial assurance mechanisms that are acceptable to the Inspector.

⁷ Although not specified, California also accepts various forms of cash.

⁸ Project equipment and fixtures salvage value can be counted towards reclamation.

⁹ Insurance.

¹⁰ New Mexico’s Act explicitly excludes “any type or variety of self-guarantee or self-insurance for the required financial assistance.”

¹¹ Collateral bonds and third party guarantees.

¹² Escrow accounts.

¹³ The Arizona Aquifer Protection Permit program specifies closure regulations.

¹⁴ The California Regional Water Quality Control Board regulations specify closure regulations.

¹⁵ Emergency Response Cash Fund.

¹⁶ Applies to new mining operations only.

¹⁷ Does not include where State jurisdiction over Black Hills region treaty rights.

¹⁸ No hardrock mining operations currently being conducted on BLM lands.

¹⁹ The company may calculate the bond amount, or elect to have the agency apply the \$750 acre statutory limit.

²⁰ “. . . other surety acceptable to the department.”

²¹ See “blanket bonding” provisions.

²² The Board may consider other forms of surety.

1.1.1.2 Southern Region

California, Colorado, New Mexico and Utah all enacted mining reclamation statutes in the 1970's. Nevada enacted legislation in 1989, followed by Arizona in 1994. California revised its statutes in 1980 with only minor modifications since that time. Colorado has not conducted a major revision since its statutes' enactment in 1973, although minor revisions were made following the problems associated with the Summitville mine in the early 1990's. Utah's original Act remains essentially the same, as does Nevada's and Arizona's. New Mexico's Act was passed in 1978. Extensive revisions to the Act were made in 1993, which included new provisions for reclamation bonding.

1.1.1.3 Northern Region

Alaska, which instituted a mining reclamation Act in 1963, was the earliest state to do so. The 1963 Act, which did not contain substantive requirements for reclamation bonding, was revised in 1991 to include provisions for reclamation and closure bonding.

Idaho, Montana, Oregon, South Dakota and Washington all enacted mining reclamation statutes in 1970-1971. Only minor revisions have been made to each of these state's statutes since they were originally written.

1.1.2 Governing State Body

The governing state body, established in each state's statute, is typically responsible for the following:

- Review of the status and problems of mining reclamation and bonding.
- Development and promulgation of regulations and standards for reclamation and bonding.
- Performance of other duties as required by the statute.

The governing bodies take the form of a board or commission. The members of the board or commission may consist of the director or his representative from the state agency, members of other regulatory agencies (such as those concerned with soil conservation, fish and game or environmental quality) and persons (typically with substantial experience in agriculture or conservation, mined land reclamation or mining academics) appointed by the governor. In some cases, the governor might also appoint representatives from the public and stakeholder groups including education, environmental, conservation and wildlife organizations or tribal governments.

1.1.2.1 General

All state regulatory bodies are overseen by a board or commission of representatives and appointees. These bodies can be dominated by regulatory and pro-mining interests (Arizona, California and Nevada, for example) or by a very purposeful mixture of representation (as is the case in New Mexico).

1.1.3 Lead State Agency

The lead state agency is typically responsible for the execution, enforcement and administration of each state's Act. The lead agency is also responsible for coordination, review and issuance of reclamation permits and bonding.

In some cases, the lead state agency also may be responsible for statutes in addition to those concerning mining. These statutes may include water and air quality, and public and occupational safety. Mining regulation is frequently administered in the same agency as oil, gas and energy, or within a State's Department of environmental resources or environmental quality.

1.1.3.1 General

The major difference between lead state agencies is whether mining reclamation Acts are integrated with water quality protection or if they are treated as a separate function in a different administrative bureau. In some states, the administration of both environmental protection and mine reclamation regulation are unified in the same department, as in the Montana Department of Environmental Quality or the Nevada Division of Environmental Protection. In other cases the administration of mine closure and mine reclamation regulation is entirely separate. This is the case in Arizona, where the State Mine Inspector's Department is responsible for mine reclamation regulation and bonding and the Arizona Department of Environmental Quality is responsible for water quality, and related closure issues.

1.1.3.2 Southern Region

Of all the states, Arizona maintains the greatest distinction between its various state agencies. The State Mine Inspector's Department is responsible for administration of Arizona's Mined Land Reclamation Act on private land while the State Lands Department is responsible for state land. The Arizona Department of Environmental Quality (ADEQ) is responsible for administration of the Aquifer Protection Permit (APP) Program, which includes mine closure regulations and provisions for applicable bonding to surface disturbances on private, state and federal land. ADEQ can also include provisions for bonding with respect to geochemical and hydrological impacts as part of the APP program.

Nevada is the only state in the southern region that combines mining reclamation with environmental protection—the Nevada Division of Environmental Protection oversees the state's Mined Land Reclamation Act. In Arizona, the reclamation Act is administered by the State Mine Inspector's office, which is primarily involved in the regulation of public and occupational safety, as it relates to mining. Colorado, New Mexico and Utah have all established mining or minerals divisions within their Natural Resources Departments for the purpose of administering mining reclamation programs.

California is unique among all the states in that the Department of Conservation's Office of Mine Reporting and Reclamation Compliance administers the Surface Mining and Reclamation Act without an assigned "lead agency" role. In California, the county or counties where the mining operations are located typically serve as the lead agency, with the Department of Conservation acting as overseer. The California Regional Water Quality Control Boards, for various regions in the state, are responsible for enforcement of the state's water quality and environmental protection laws.

1.1.3.3 Northern Region

Montana, South Dakota and Wyoming combine the administration of their mine reclamation Acts with that of environmental protection (water quality). The administration is carried out by the Department of Environmental Quality or Department of Environment and Natural Resources, typically with coordination between several different divisions (i.e., mine permitting, water quality, compliance and enforcement, and mine reclamation and closure).

Alaska, Idaho, Oregon and Washington all have separate departments responsible for different aspects of mine reclamation and water quality. In Alaska, the Department of Natural Resources is responsible for surface reclamation of mine facilities, while the Department of Environmental Conservation is responsible for solid waste permitting (including reclamation and closure bonding as it pertains to water quality). In Idaho, the Department of Lands is responsible for surface reclamation, and the Idaho Department of Water Regulation is responsible for permitting under the Idaho Dam Safety Act, which includes reclamation and closure bonding provisions pertaining to tailing impoundments and some heap leach pads (with in-pad solution storage). In addition, the Idaho Department of Environmental Quality is responsible for administration of the state's Rules for Ore Processing by Cyanidation.

Oregon's Department of Geology and Mineral Industries is responsible for surface reclamation, while its Department of Environmental Quality is responsible for reclamation and closure bonding specific to water quality regulation. Washington's Department of Natural Resources is responsible for administration of reclamation bonding and the Department of Ecology is responsible for bonding for environmental protection, including water quality related to mining operations and closure.

1.1.4 Lands Bonded by State

According to statute or regulation, each state may require reclamation and closure bonding on federal, state and private lands. In some particular cases states may require bonding on tribal lands. However, in general, tribal lands are treated as belonging to sovereign nations, which implies the right of those nations to either create their own regulations, adopt state or federal regulations or utilize state and federal agencies to assist in regulating mining on those lands.

1.1.5 Relationship with Federal Agencies

Most states enjoy formalized relationships with the U.S. Forest Service and Bureau of Land Management (BLM), which are the federal agencies responsible for the administration of public lands. The relationships are typically memorialized in a Memorandum of Understanding (MOU) between the federal agency or agencies and the state agency or agencies, depending on the state.

MOU's are agreements between federal and state agencies that dictate the respective authority each has in the permit approval and bonding process. MOU's also outline methods of ensuring cooperation between agencies. In accordance with the MOU's, in cases where federal land is involved, the state may require and hold a bond acceptable to the federal agencies, or vice versa. Where private, state and federal lands are involved, the state and/or federal bond may be extended to cover all lands, thus keeping the bond as a single instrument. If there is no agreement between the state and federal agencies, separate bonds are typically required by each agency for the lands under their jurisdiction.

While almost all states require bonding on state and private lands, some states allow for different bonding provisions on private land than they do on federal or state lands. In those cases reclamation and closure bonding requirements are typically less restrictive and may exclude some requirements such as bonding for closure.

1.1.5.1 General

With the exception of Arizona, all states have current memoranda of understanding with both the BLM and U.S. Forest Service, except for South Dakota, which has an MOU with the Forest Service only. The requirements of Arizona's Mined Land Reclamation Act are superseded if an operation or a mining unit is located on land administered by a federal agency that has an approved federal

reclamation and closure plan and a financial assurance mechanism that is consistent with the requirements of the Act.¹ Although many other states relinquish their authority to that of the federal agency, they all retain the right to fully participate in mine reclamation and closure permitting and bonding on federal land within their state's borders.

Because the courts have held that tribal land rights are those of a sovereign nation, state police authority does not extend to these lands, and the states lack the authority to require bonding on tribal lands. However, when the state or federal agency holds public lands in trust to tribal rights, its authority for bonding may include such lands (such as the Black Hills Region in South Dakota).

1.1.5.2 Southern Region

Arizona and Nevada may relinquish bonding authority on federal land to the administering agency, either the BLM or U.S. Forest Service. Nevada may also relinquish its bonding authority over state and private lands that adjoin BLM lands, with bonding for adjoining lands included in the amount of bond held by the BLM.

In California, both the state and federal agencies relinquish their bonding authority on state and federal land to the county. Colorado, New Mexico and Utah all retain their authority over bonding on federal land, with the federal agency relinquishing its authority to the state.

1.1.5.3 Northern Region

Alaska and Idaho may relinquish their authority over bonding on federal land to the administering agency, either the BLM or U.S. Forest Service. Idaho may also relinquish its bonding authority over state and private land that adjoins U.S. Forest Service lands, with bonding for adjoining lands included in the amount of bond held by the Forest Service.

Montana, Oregon, South Dakota, Washington and Wyoming all retain their authority over bonding on federal land, with the federal agency relinquishing their authority to the state in most cases.

1.1.6 Exemptions to Bonding

Exemptions to bonding usually apply to operations of a limited size or extent, and are intended to differentiate between small miners or operations, and their larger and typically more significant industry counterparts. A few states allow exemptions for operations that disturb less than 10 acres and that produce or move less than 70,000 tons per year. Bonding of small operations may still be required, but it is most often based on a fixed amount per acre disturbed or permitted, and is significantly less stringent than bonding for larger operations.

Exemptions to bonding might also include mining operations conducted prior to the establishment of the Act or regulations. Most states do not require mining operations conducted prior to passage of their Acts or regulations to obtain a reclamation bond. Existing operations may not be required to bond for operations conducted prior to the date of enactment, or a date otherwise specified, and are usually granted a period of several years from enactment to develop and submit a reclamation plan.

¹ ARS §27-903, -932

1.1.6.1 General

All the western states, with the exception of Colorado and Idaho, allow exemptions to bonding for “small” operations, within the aforementioned range (from less than one to less than 10 acres and from less than 200 to less than 70,000 tons produced per year). Idaho’s statutes do not contain specific exemptions for small operations, and Colorado repealed its exemption in 1993. Many states, in addition to an expedited permitting process, require either no bonding, or per-acre bonding of less than \$1,000 per acre, for surface disturbances only. Some states exclude operations that might impact aquifers, water quality or hydrology from the exemption, regardless of size. Other states, such as Montana, require bonding for cyanide operations of any size separate from the exclusion granted to small miners for surface disturbance.

1.1.7 Reclamation and Closure Planning

State statutes and regulations typically require that a reclamation and closure plan be included in the Plan of Operations for an existing or proposed mining operation. The reclamation and closure plan is usually required to describe the anticipated post-mining condition of the land, and sometimes the condition of water and air resources, as well as the means by which these resources are to be affected. The plan is typically developed on a conceptual or preliminary basis by the mine operator and undergoes a review and approval process conducted by state and/or federal agencies. The reclamation plan or parts thereof are usually either referred to or incorporated in a Record of Decision issued by the agencies responsible for the permitting and oversight process.

Each state’s reclamation and closure plan requirements (as they are contained in state statutes) are included in their respective sections of this study (Part II and Part III). However, this study is not intended to be an evaluation of the various reclamation statutes in the form of standards, guidelines and rules that are employed by state and federal agencies. Instead, this study focuses on how and to what extent reclamation statutes, standards and guidelines influence reclamation costs, and thus reclamation bonding. However, some state statutes contain detailed language with regard to reclamation standards, including what type of impacts bonding is required for, and even what type of operations or subsequent impacts might be allowed. For example, New Mexico explicitly disallows any reclamation and closure plan option that could result in a need for perpetual treatment to meet applicable state requirements. The statute applies only to new mining operations proposed since 1993, when the Act was promulgated.

1.1.7.1 General

While all states require a reclamation and closure plan as a part of the Plan of Operations, the scope and requirements of the plan as contained in the statutes differs significantly from state to state. As a result, reclamation and closure plans vary from preliminary or conceptual in nature (with only a cursory discussion of reclamation methods and costs, primarily pertaining to surface reclamation), to containing greater detail (including the whole range of mining activities at the site, the expected outcomes with respect to surface, geochemical and hydrological features that pertain to reclamation and water quality issues, a detailed proposal of the means that will be used to mitigate potential outcomes, and detailed cost estimates for the tasks associated with both reclamation and water quality activities).

In general, it can be assumed that the more brief the state’s statutes, the more simple and brief the corresponding reclamation and closure plan and bond estimate will be. In practice however, nearly all the reclamation and closure statutes allow the regulator substantial discretion as to interpretation and

application. The actual way in which each state treats its statutes is best determined by examination of the final reclamation and closure plan and applicable permit document and record of decision (ROD).

Further discussion of reclamation statutes as they pertain to bonding practices is included in the next section on Bonding Mechanisms and Costs. Case studies summarizing the reclamation and closure plan and cost estimate at selected operations in each state are included in Part II and Part III.

1.1.8 Reclamation and Closure Bonding

Reclamation and closure bonding is a means wherein a governmental agency, through promulgated regulations, can require a financial guarantee from the project proponent that lands disturbed by hardrock exploration or mining activities will be reclaimed consistent with applicable regulations and permits. Financial assurances, or bonds, are a form of insurance, ensuring that reclamation and closure of a project after mining, and in at least some cases ensuring reclamation and closure in the event mining operations are closed or otherwise suspended due to market conditions or accidents and catastrophes. Reclamation and closure bonding is intended to provide that insurance regardless of the financial standing of the responsible company.

1.1.8.1 General

All states currently require bonding for all new operations, and most pre-existing active operations in accordance with individual state statutes. However, not all states require bonding for closure on all lands. Closure activities might include long-term maintenance and operation, environmental monitoring and water quality treatment from either a geochemical or hydrological basis.

With the exception of New Mexico, all states currently have at least some level of bonding at their permitted major hardrock mining facilities.

1.1.8.2 Southern Region

Nevada's Department of Environmental Protection does not have the statutory authority to bond for closure on private lands. As a result, heap leach operations in Nevada are frequently sited on private lands to avoid closure requirements. These sites may be directly adjacent to the state or federal lands used for mining or waste rock storage where Nevada has the authority to bond for detoxification.

New Mexico has only required reclamation bonding since revision of its Act in 1993. Mining operations have been given up to six years to propose a closure and reclamation plan and to provide financial assurance consistent with the New Mexico Mining Act. As of early 1999, none of the significant active mining operations in New Mexico had submitted a closure and reclamation plan. The State recently extended the deadline for submission of these plans until Dec. 31, 2001. The New Mexico Environment Department is establishing interim bonding on some of the more significant mining operations.

1.1.8.3 Northern Region

Alaska has a statutory limit of \$750 per acre for reclamation bonding under its reclamation Act, although most mines are voluntarily bonded at higher levels. In addition, not all mines have obtained solid waste disposal permits or the financial guarantees associated with those permits.

Idaho has made substantial changes to its reclamation statutes and rules in the past three years, and the Department of Lands is in the process of evaluating its reclamation and closure bonds. Most mines in

Idaho are located on federal (U.S. Forest Service or BLM) lands, so their bonds have been more substantial than past Idaho statutes would have allowed.

1.1.9 Bonding Requirements

Reclamation bonding is generally required for all surface disturbances. Some states set limits on bond per acre amounts, while others set the amount based on whatever is necessary to affect the proposed reclamation. States may also bond for water quality effects such as: geochemistry (most often associated with acid mine drainage or AMD), hydrology (changes in surface flow direction or volume), chemical (process chemical spills or leaks), and worst-case situations (ranging from accidents to catastrophic failure).

1.1.9.1 General

All the states have statutes that require bonding for surface disturbance as an integral part of their reclamation statutes. States may also require bonding for geochemical and hydrological impacts as a part of their reclamation statutes or as a part of other state statutes (most typically water quality protection statutes). However, bonding for hydrological impacts does not appear to extend to water loss or other flow impacts due to pit dewatering or other operations that might indirectly impact hydrologic balance in any existing cases. A few states require bonding for potential chemical spills or worst-case circumstances, to various degrees.

1.1.9.2 Southern Region

In addition to surface disturbance bonding, California and Colorado, by referencing compliance with state water quality standards, imply that bonding for geochemical impacts to water quality may be required by the state. Arizona, New Mexico and Utah, by virtue of their respective state water quality laws, might also require bonding for geochemical impacts. Nevada does not have the authority to bond for closure as it impacts water quality on private lands.

California, Colorado, New Mexico and Utah's statutes all infer the state has authority to require reclamation of and to bond for various hydrological impacts. Arizona might also require bonding for hydrologic impacts under its Aquifer Protection Permit Program. Neither Nevada nor the BLM appear to have authority to bond for hydrologic impacts.

1.1.9.3 Northern Region

Montana, Oregon, South Dakota and Washington all reference state water quality standards and related geochemical and hydrologic impacts in their reclamation statutes, inferring the authority to require reclamation and closure bonding for these impacts. While Alaska's reclamation statutes clearly reference AMD-related geochemical impacts, hydrologic impacts do not appear to be referenced. Chemical bonding is required by Idaho, Oregon, South Dakota and Washington statutes.

1.1.10 Reclamation Bond Calculation

1.1.10.1 Agency Calculated Bonds

Agency calculated bonds typically assume estimated costs, including profit and overhead, based on the use of third-party contractors to complete reclamation. In addition, management costs and costs for post-reclamation and closure activities may be included. Some states use standardized labor wage rates, such as those established by the conservative Davis-Bacon Law, which requires each state's

highest prevailing wage rates to be utilized. Other states allow operating costs provided by the company or a submittal of a cost estimate from a third-party contractor to determine bonding amounts.

1.1.10.2 Life of Project Bond

A Life of Project Bond is an up front, lump sum amount to cover all mining operations planned under the permit, at the time of issuance of the bond. In general, this allows the mining operation to take place without the need to reevaluate the bond incrementally other than for inflation or any changed conditions.

This means of calculating bonding is generally most effective from an environmental standpoint. It requires that a company obtain sufficient bonding to cover all anticipated phases of the operation up front, rather than relying on perceived future profits to enable the company to eventually obtain a larger bond. Also, should a company become insolvent or should operations otherwise cease, it can more easily be ensured that the bond will be sufficient to complete the necessary reclamation and closure activities.

1.1.10.3 Phased Bonding

Phased bonding allows the bond to be incrementally increased on an annual basis for expansion of operations to cover any additional disturbance from the next year's proposed activities. This results in limiting the size of the bond, thus minimizing the cost of bond premiums.

1.1.10.4 General

By statute states may themselves estimate the cost of reclamation. However, the state relies on the company for most of the reclamation bond cost information. As a result, the greatest differences in the estimate occur in the various labor rates, administrative and contingency costs rather than in the extent of the reclamation to be conducted. States that allow the company to estimate the cost of reclamation typically do a minimum review of the basis of the cost estimate. Calculation of the bond then takes the form of a combination state-company calculation.

The calculation basis and methods are best analyzed by examining actual case studies from each state. Case study information for the various states contained in Part II and Part III provides additional detail and discussion on this subject. Phased bonding is also discussed further in the section on bonding mechanisms and costs.

1.1.11 Forms of Financial Assurance

1.1.11.1 Surety

A surety reclamation bond is the most common and simplest type of bond. An insurance or bonding company typically issues this type of assurance. A premium is paid by the company to the insuring institution to guarantee that funds will be available if reclamation is not completed according to the requirements of the permit and applicable regulations.

The insurance company may require a Letter of Credit to back up the bond, making it more expensive. Also, a demand letter is often attached, requiring the mining entity to repay the insurance company in case the surety is needed to provide funds for reclamation activities.

The cost of premiums for surety bonds typically runs from one to 3.5 percent, depending on the relative risk of the company being bonded and, more significantly, what in particular is being bonded.

1.1.11.2 Irrevocable Letter of Credit

A Letter of Credit is a financial document issued by a bank that guarantees payment to the state or federal agency for reclamation performance. Normally it guarantees reclamation performance in accordance with the applicable Record of Decision, and it includes the terms upon which payment would be made to the state if reclamation is not completed. A Letter of Credit is typically issued by a bank, which requires that the company be in good financial standing.

An Irrevocable Letter of Credit obligates the issuing bank to pay the agency when the payment terms have not been met. None of the terms and conditions may be changed without the consent of all parties to the letter of credit.

A demand letter is attached to the Letter of Credit. Letters of Credit are typically for larger reclamation bond amounts, and generally have a lower premium cost.

1.1.11.3 Trust Fund/Deed to Property

A trust fund or deed to property is rarely used to provide for reclamation bonding. Use of a trust fund or deeds requires that the company has funds or saleable property that can be tied up until the bond is released. The company must deposit the necessary funds in the trust, or convey the property deed to the state, which acts as beneficiary until reclamation is completed and the bond is released.

A trust fund or deed generally costs the company little or no money and allows it to collect interest on the fund or take advantage of increased property value as long as it meets the reclamation requirements of its permit. In some cases value, which can be applied to additional reclamation liability if necessary, is allowed to accrue within the fund or property.

1.1.11.4 Certificate of Deposit, Savings Account and Cash

The purchase of certificates of deposit (CD's), savings accounts, cash and bonds is rarely used as financial assurance except by small or limited-duration operations. These assurances are sometimes used in cases where states allow companies to set aside funds for reclamation as production occurs (such as setting aside a pre-determined amount per unit produced into a reclamation reserve).

This form of financial assurance is relatively low-cost to companies that are cash-rich and otherwise do not require the use of the set-aside assets. In general, these assurances are the lowest risk to the agencies, as they are readily liquid (as long as they are properly assigned to the agency and can be easily tapped in the event of reclamation non-compliance or non-performance).

1.1.11.5 Corporate Guarantee and Self-Bonding

Corporate guarantees and self-bonding are based upon certified financial statements that evaluate a company's assets and liabilities and its ability to pay the cost of reclamation. The company is typically required to demonstrate a specified ratio of assets to liability indicating the ability to pay for reclamation. The agency frequently requires regular submittals of corporate financial statements and may also require the company establish a cash reserve to be used for reclamation.

Corporate guarantees reduce the amount of premium or cost required for bonding to little or none; thus they are heavily favored by industry. However corporate guarantees do little or nothing to insure the agencies and public against potential liability in the event of the company's financial failure. In the

event of bankruptcy, the agency becomes just another creditor. These assurance mechanisms are considered unacceptable to most states and are not allowed by either the Bureau of Land Management or the U.S. Forest Service, except where allowed by some states.

1.1.11.6 Government Bonds/Bills and Assignable Bonds

Some states allow government bonds/bills and assignable bonds to be used as financial surety. Although they are not commonly used as financial assurance, government bonds/bills are generally considered equivalent to a CD, savings account or cash. These bonds sometimes have an added advantage, particularly where bonding “in-perpetuity” might be necessary, if the bond interest rate is tied to the inflation rate to provide financial assurance over the long term.

1.1.11.7 Insurance

Insurance is a rarely used type of bond. It involves the signing-over of an insurance policy with the state as a beneficiary to ensure reclamation.

1.1.11.8 General

All states approve of surety bonds and irrevocable letters of credit as acceptable forms of financial assurance. Similarly, most states accept trust funds and deeds and various forms of cash or savings as financial assurance. These forms of financial assurance are considered either to be highly certain and/or relatively liquid, and are thus universally accepted, even if not specifically approved by statute. Corporate guarantees, or self-bonding, are a bonding mechanism most common to states where mining industry influence is the greatest (Arizona, Colorado, Nevada, Utah and Wyoming). The other states do not consider self-bonding an acceptable form of financial assurance, and New Mexico’s statutes explicitly disallow them.

1.1.11.9 Southern Region

Arizona and Nevada, the largest copper and gold mining states respectively, also allow corporate guarantees and self-bonding as means of financial assurance—over 50 percent of the mines in those states are self-bonded.² Colorado and Utah also allow self-bonding as a means of providing financial assurance. California statutes do not provide for self-bonding as an acceptable means of providing financial assurance, and New Mexico’s statutes explicitly prohibit corporate guarantees and self-bonding.

1.1.11.10 Northern Region

Wyoming is the only state in the northern region to allow self-bonding, mimicking the self-bonding statutes common in coal mining regulations administered by the federal Office of Surface Mining and its state agency counterparts.

1.1.12 Monitoring and Compliance

States may perform reclamation and closure monitoring and compliance activities to verify performance of mining and reclamation operations, review projected conditions versus actual conditions, or to conduct monitoring activities within the scope of their authority. All states and federal agencies allow the regulator to enter the property for the purpose of conducting monitoring and

² Personal conversations with ADEQ, ADSMI and NDEP.

compliance inspections. Typically the states provide the operator with a copy of any inspection report produced as a result of any inspection of the mining facility, with those same documents being available, in most cases, for public review. States typically mandate at least annual inspections, with some states allowing inspections as determined necessary.

While all states require that the company allow the state representative to conduct inspections, the states vary on the means by which such inspections are allowed. Some states allow for inspection on demand, while others require 24 hours notice for inspections or that they be conducted at the convenience of the company.

1.1.12.1 General

Most state statutes allow for monitoring and compliance inspections and reports on an “as required” basis, up to the discretion of the agency. The stated intent of most states, regardless of statute, is to conduct inspections at least annually. But annual inspections become programmatically difficult to achieve in a state such as Nevada, which has 73 major mining operations in either reclamation or post-reclamation. According to the Nevada Division of Environmental Protection, the state probably inspects the most active operations at least several times per year and the least active sites (post-reclamation) every three years.

1.1.13 Bond Review Period

Review of the bond is performed by all agencies on a periodic basis, ranging from annually to every 3-5 years or as determined necessary. The purpose of bond review is typically to examine the proposed mining and reclamation plan in contrast to actual mining activities, to consider any new information, and to re-estimate reclamation and closure costs accounting for inflation and other factors since the previous reclamation and closure cost estimate.

Re-calculation of the reclamation and closure cost estimate takes various forms from state to state. Some states require re-submittal or re-calculation of the reclamation and closure costs based on the performance of individual tasks, whereas others simply apply cost-adjustments based on inflationary factors.

Recalculation of the bond amount is discussed further in Section 1.2 of this study – An Examination of Reclamation and Closure Bonding Mechanisms and Costs.

1.1.13.1 Southern Region

California reviews the reclamation and closure bond amount annually, Nevada every three years, Arizona and Utah every five years or less, and Colorado and New Mexico as necessary at the discretion of the responsible Department.

1.1.13.2 Northern Region

According to new statutes, Idaho is to review the reclamation and closure bond amount annually, Washington every two years, and Montana at least every five years. South Dakota reviews reclamation bonds on a periodic basis (2-5 years). Alaska and Wyoming bond amounts are reviewed as necessary. Oregon does not have provisions for bond review, although annual reviews are inferred in the cost estimate procedures.

1.1.14 Closure Regulations

In most states reclamation and closure are considered synonymous, although some states specifically require that separate closure plans be adhered to. All states have what could be termed, “closure regulations.” Specifically, closure regulations typically go beyond surface reclamation and require that the operator of the project provide information concerning their intentions and plans to ensure post-reclamation stabilization of the site and long-term protection of air and water resources.

1.1.14.1 Southern Region

Colorado, Nevada, New Mexico and Utah all have closure regulations integral to their mining reclamation Acts. Closure regulations in Arizona and California are not included in their mining acts, but are based respectively on the Arizona Aquifer Protection Permit Program and California Water Quality Control Board regulations.

1.1.14.2 Northern Region

All the northern region states, with the exception of Alaska, have closure regulations integral to their mining reclamation Acts. Closure regulations have yet to be developed for most Alaska mines.

1.1.15 Noncompliance and Bond Forfeiture

States typically have specific regulations dictating when and how noncompliance with approved reclamation and closure plans is determined, how the company is notified and under what circumstances and by what mechanism bond forfeiture can occur. Most states require that the company or project be significantly in non-compliance with reclamation and closure plans for a period of time. Also, the agency must make substantial efforts to inform the company of non-compliance and to encourage, through various levels of enforcement action, its performance of reclamation and closure tasks. In the event of non-performance over a specified period of time and after due notice, states are generally able to perform the necessary reclamation and closure activities as specified in the permit Record of Decision, and to collect the costs from the applicable financial assurance instrument.

1.1.16 Bond Release

1.1.16.1 Bond Release Criteria

A critical and somewhat controversial aspect of bonding is bond release criteria. Bond release criteria allows for the release of bond funds once a required standard is met. The most common bond release criteria is based on revegetation success, in which revegetation establishment is measured over a specified period of time (ranging from two to 10 years) after reclamation seeding is completed. Revegetation success is measured by assessing various factors including density, diversity, productivity and cover. Typically the revegetated area is compared with similar undisturbed areas in the vicinity and a goal is established to obtain nearly similar conditions in the reclaimed area. In addition to revegetation, slope stability and erosion measurements may also be factored into determining reclamation success. The measurement of success can be highly subjective and is often dependent upon the interpretation of specialists hired by the mining company.

Another reason for the controversy over bond release criteria deals with the fact that nearly all criteria are related directly to the prescribed post-mining land use. On public lands, the post-mining land use is decided by the responsible managing agency. In the case of private lands, the post-mining land use is determined by the private landowner. On public lands, the pre-mining land use of most areas is for

grazing, wildlife and/or recreation, and these same uses are commonly designated for post-mining land use. Most public lands managed by federal agencies have land use management plans for specific areas. These plans may be widespread for an entire Forest or BLM district or resource area or may be specific to the use and management of smaller areas which typically exhibit definable characteristics such as being roadless, or containing riparian areas or wildlife winter range areas. Typically the mining company is required to ensure that the designated post-mining land use and the reclamation and revegetation plans are consistent with the resource management objectives. However, frequently the disturbance caused by mining operations, particularly those resulting in massive waste rock dumps, heap leach piles, tailing ponds or most noticeably, unreclaimed open pits, result in severe compromise of the land use designations.

On private lands, most states provide that the landowner can determine the post-mining land use. Private landowners are typically allowed to change the land use from pre-mining wildlife or grazing use to post-mining development or industrial use. Re-designation of private land use is commonly done to preclude the performance of more stringent reclamation measures. The permitting process often fails to adequately address this outcome, although private lands still have to meet the requirements of any federal and state laws such as the Clean Air Act and Clean Water Act. These laws typically do not recognize private land boundaries and may also apply to activities that affect adjoining private and/or public lands.

1.1.16.2 Project Bond Release

A project bond release mechanism holds all bonds until final reclamation is completed and the bond release criteria is met. At this time, the entire sum of the bond is released. The bond must be maintained in its full amount until final bond release for the entire project.

1.1.16.3 Phased Bond Release

Phased bond release applies to either complete phases of work, or for reclamation of a specific area. The bond is reduced or released in part upon completion of different activities in the reclamation and closure plan.

Bond release by phase of work area recognizes the cost of performing reclamation and closure activities in distinct areas. Once reclamation of a particular feature such as a waste rock dump or tailings impoundment is performed, the bond money allocated to that specific area is released. This type of bonding is commonly used in larger multiple-operation mines where a particular facility is completed and reclaimed while other activities are continuous.

Bond release by phase of work type recognizes the cost associated with doing different phases of reclamation and closure activities. For example, 75 percent of a bond amount would be released for a specific area once the dirt work (resloping and regrading) has been completed in accordance with the permit and accepted by the agency. Following the next phase of revegetation and stabilization of a specific area, another 15 percent of the bond amount would be released. The last increment of the bond, 10 percent in this example, is typically held for a period following final reclamation in the event that revegetation does not succeed, and additional revegetation is required.

1.1.16.4 General

All state mine reclamation and closure bonding statutes require that the responsible state agency or its governing state body sign off or approve the release of any bond. Most states require that the

responsible agency conduct an inspection of the reclaimed property prior to approval of bond release. However, most states also require that the agency or governing body release the bond within 60 to 120 days of the release request.

1.1.17 Reclamation Fund or Pools

Some states encourage the creation of reclamation funds or pools to facilitate reclamation bonding or the creation of emergency response funds. For the most part, such reclamation funds are allowed to assist small mining operations (although larger mining operations are not generally excluded from participation) in complying with the requirements for financial assurance adopted by each state.

In general, reclamation funds or pools require each participant to pay an amount into the pool each year that (at least in theory) is actuarially determined to enable the reclamation fund to be self-sustaining. In some cases, the participant may be required to provide collateral or other security to ensure against the forfeiture of a reclamation performance bond. Most reclamation pools provide a limit on the total bonded liability of any participant covered under the program. In the event reclamation is not performed, the fund or pool may be used by the agency to perform reclamation and cover the bonded liability of the participants in the program.

Funds or pools have also been used to cover emergency response to accidents, provide for unforeseen circumstances, or to provide for long-term liability to water quality or other resources.

1.1.17.1 Southern Region

Nevada is the only state in the southern region with a state mining reclamation bond pool. Although primarily used by smaller operators, the pool is on occasion used by start-up and cash-strapped companies for medium sized operations where the reclamation bond amounts are less than \$500,000 per project.³

Colorado has an emergency response cash fund that is made up of funds from fines and applicable fees, as well as a contribution of 5 percent from all financial assurances forfeited under the authority of the Act. The intent is to allow immediate action at the discretion of the Department in the event of a site accident or catastrophe, or to maintain interim operations in the event of company insolvency. In 1998, the Nevada Division of Environmental Protection, in response to recognition that they lacked funds to conduct emergency response measures at several bankrupt or near-bankrupt mining operations, asked for and received a special appropriation of \$600,000 to establish their own emergency response fund.

1.1.17.2 Northern Region

Alaska, Montana and South Dakota all have state mining reclamation bond pools. Most are applicable to smaller operators, although, on occasion they are used by start-up and cash-strapped companies for operations that otherwise would be considered major. A gross example is the Nixon Fork mine in Alaska, a small but significant fly-in fly-out operation with approximately 100 acres of disturbance area. The owner is allowed to contribute approximately \$10,000 per year to the bond pool, which otherwise would have required a reclamation bond of more than \$500,000 at the \$750 per acre statutory limit, and likely would be in excess of \$1 million in most other states. Incidentally, the Nixon Fork mine closed, and the company declared bankruptcy, in 1999. Costs to the state for reclamation and closure might potentially exceed \$1.5 million.

³ See Alta Gold owned projects, Nevada Major Mines Reclamation Bonding, Part II.

1.1.18 Public Participation

Provisions for public participation typically include hearings and comment periods, followed by a response to the public in the decision process document (i.e., Record of Decision) with respect to the issues raised. Typically, the public is given notice and a hearing is held where the public can submit verbal and/or written comments.

Public participation is limited in most states to applications for bond release. However, no opportunity is typically presented for public participation in setting the original amount, although inclusion of reclamation bonding forms and amounts in Environmental Impact Statements and other documents prepared pursuant to the National Environmental Policy Act (NEPA) is becoming more common. The public is sometimes presented an opportunity to participate when the bond is reviewed, but only if the party is considered “affected” by the proposed revision.

1.1.18.1 General

None of the states have provisions for public participation in mine inspection and monitoring.

None of the states have provisions that the reclamation cost and bond be explicitly included in the NEPA or the respective state Environmental Protection Act. However, various state and/or federal agencies have recently included such information on reclamation and closure costs for either the alternatives considered or the agency-preferred alternative.⁴

Although the states are all required to give the public notice as to the granting of any permit and acceptance of the associated reclamation bond, most contain no specific provisions for public comment when the bond is calculated, reviewed or released. A few states have provisions for public comment at the time the permit and bond are approved or at the time of bond release.

New Mexico is the only state with explicit provisions for public comment when the reclamation bond is calculated and approved, reviewed and released. Other states do allow various forms of limited public participation during the permitting and bond release processes.

⁴ See Golden Sunlight Mine, MT, Draft EIS (1997), Imperial Project, CA, Draft EIS (1997), Rock Creek Project, MT, Draft EIS (1997).

1.2 AN EXAMINATION OF RECLAMATION AND CLOSURE BONDING MECHANISMS AND COSTS

This section describes the mechanisms by which reclamation and closure plans are formulated, and how consideration of the various reclamation and closure plan requirements leads to the determination and calculation of bonding costs. The determination of bonding is directly related to the reclamation and closure plan, which in turn is intended to incorporate the required features and considerations of each state's reclamation and closure standards. Those standards generally require the following: provisions for site characterization, reclamation of any surface disturbance, protection of water quality (including source control or treatment, maintenance of the hydrologic balance and potentially treatment in perpetuity), bonding for chemical release and worst-case scenarios and post-reclamation monitoring, operation and maintenance bonding.

Bonding costs are based on the tasks involved in reclaiming the various features that occur at mining operations. Those costs, further described in this section, are determined by a variety of cost-estimating methods which take into consideration labor, equipment, materials and administration, engineering, procurement and construction management and overhead, profit and contingency costs associated with performing the required reclamation and closure measures. The companies and/or agencies then take several different approaches in calculating the reclamation and closure costs to be used in determining the amount of financial assurance necessary, which this section demonstrates by examining several reclamation bonding case studies. Also, the actual costs of reclamation and closure bonding to the company and/or agency of obtaining or maintaining the various types of financial insurance mechanisms are discussed.

1.2.1 Reclamation and Closure Standards

Each of the western states have promulgated reclamation standards, in various forms, as contained in each state's respective Act, adopted rules, regulations or guidelines. The U.S. Forest Service and BLM have also adopted standards or guidelines for mine reclamation and closure performed on public lands. In addition, mine closure requirements may be contained in separate state or federal laws that may be enforced by the agency responsible for mine reclamation and closure, or a different environmental protection agency.

The reclamation and closure standards used by each state vary widely both in terms of scope and content. They range from a brief description of less than 100 words regarding what the reclamation plan must provide to a detailed comprehensive listing of performance and reclamation standards and requirements.

Reclamation and closure plans are typically required to address standards or requirements for at least some, if not all of the following:

Public Safety	Surface Configuration
Wildlife	Riparian and Wetland Areas
Stream Diversions	Roads
Hydrologic Balance	Revegetation
Impoundment Safety	Water Treatment
Erosion Control	Monitoring
Site Stability	Post-reclamation operation and maintenance

It is important to note that the reclamation standards used by the various state and federal agencies are similar to reclamation bonding statutes in that they typically afford substantial discretion to the regulator as to interpretation and application of the guidelines. This is particularly true where the reclamation standards or regulations attempt to cover a large range of highly site-specific considerations in simplified terms. In such cases, the regulator and company actually negotiate interpretation and application of those terms in order to create some form of a plan that addresses mine closure and reclamation.

In addition to reclamation plans, many states have closure requirements not contained in their mine reclamation statutes. These additional closure requirements may be contained in water quality or aquifer protection laws and regulations. Because state regulatory structures and statutes differ considerably, it is possible that mine closure and reclamation standards are contained in the same regulations and administered by the same agency; that mine closure and reclamation standards are contained in the different regulations but still administered by the same agency; or that mine closure and reclamation standards are contained in different regulations and administered by different agencies. This can take place at both the state and federal level.

1.2.1.1 General

The various states have very little in common with regard to reclamation and closure regulations, standards and guidelines contained in the hardrock mining reclamation statutes. As a result, the various reclamation and closure standards play a highly influential role in determining the actual reclamation and closure tasks that will be required, as well as the amount of the bond.

It is not possible to accurately consider reclamation and closure bonding in the various states without examining both their reclamation and closure plan requirements and their individual way of fulfilling those requirements in terms of actual reclamation and closure planning and cost estimates. The sections of this study examining the individual states (Part II and Part III) contain both the actual reclamation and closure requirements as contained in each state's mining reclamation Act, as well as case studies of reclamation and bonding plans for actual major mine sites in most states.

1.2.2 Site Characterization

Site characterization is an increasingly important consideration in mine reclamation and closure planning. It is considered a useful tool for characterizing surface resources to facilitate post-mining reclamation land use of similar utility and is becoming increasingly utilized to predict impacts to both air and water quality.

Site characterization consists of a suite of studies involving sampling and examination of the site's geology, geochemistry, hydrology, aquatic and wildlife biology and water and air quality resources. The studies are then used to establish the conditions of the pre-existing site, and to predict the conditions both during proposed operations and following post-mining reclamation and closure. In addition to pre-disturbance characterization and prediction, site characterization generally is continued through operations and reclamation, and can be extended into the indefinite future if conditions or interests warrant.

In an ideal sense, site characterization is a tool by which the mine proponent, regulatory agencies and interested public can assess the existing condition, apply the proposed action to the site, and then predict what consequences will occur. From this prediction, it can be determined what actions will be necessary to protect natural resources and return the site to a useful condition. Unfortunately, while site characterization is certainly a useful tool to consider potential impacts, it is neither certain nor

unbiased in its results, and is all too often subject to manipulation in support of a proposed action, rather than used as a more purely scientific tool to provide an objective scientific analysis of proposed actions and their possible consequences.

While it has its drawbacks, adequate and conscientious site characterization, with the intent of assessing future reclamation and closure requirements, is an important aspect in facilitating reclamation and closure from the standpoint of both cost effectiveness and technical success.

Inadequate site characterization can lead to unforeseen consequences and costs including difficulties and inefficiencies in site reconfiguration and grading, revegetation, and long-term surface reclamation efficacy. There are also the more complex and expensive consequences, such as acid mine drainage generation and discharge of chemical or toxic metals into ground and surface water resources. On the other hand, comprehensive and analytical site characterization can lead to a high level of understanding of the pre-mining conditions. An appreciation can also be gained for the impact of mining operations upon the surface features and air and water resources, and what actions will be necessary during all stages of the process. Finally, site characterization gives a clearer picture of whether such actions are capable of dealing with the impacts to the degree required by law and what the cost of those actions will be. In the end, this helps to insure the agencies and public against future liability should the company not fulfill its responsibilities to permanently protect our natural resources.

Site characterization is an important aspect in reclamation and closure bonding because it drives the determination of what tasks will be necessary to achieve reclamation and closure in accordance with the applicable regulations. For both planned and existing mines, site characterization is the driving process that determines how mine operators propose to close and/or reclaim open pits with or without pit lakes, waste rock dumps and heap leach piles, and achieve surface stability and revegetation, in accordance with each state or federal agency's requirements. It is often a determining factor in whether pit backfill is required or pit lakes are allowed, or what type of cover is used in reclaimed areas.

Two mines, both located in Montana, serve as particularly good examples of how site characterization may, or may not, play a critical role in determining the level of financial assurance required at a mine site. Discussed in more detail in Part III, and used elsewhere in this study as an example, the Golden Sunlight Mine was originally bonded at a level of approximately \$1,000 per acre disturbed. In 1990, site characterization studies indicated that acid mine drainage (AMD) issues might require additional surface reclamation measures, increasing the average bonding level to approximately \$13,000 per acre disturbed. By 1996, when site characterization studies inferred that AMD contamination of the local groundwater aquifer was probable as a consequence of both past and future mining, the average bonding level had increased to approximately \$20,000 per acre, and an additional \$20 million bond was required to provide for "water treatment in-perpetuity."

The Zortman-Landusky Mine was similarly approved and bonded originally by the Montana Department of Natural Resources, the precursor to the present day Montana Department of Environmental Quality. In 1982, the bond amount was approximately \$750 per acre disturbed. In 1990, at approximately the same time AMD was recognized, the agency increased the bond, on an interim basis, to approximately \$8,700 per acre. In 1993, as a result of litigation and other matters involving groundwater and surface water impacts evident in site characterization studies, the bond was increased to approximately \$12,500 per acre. In addition, the Zortman-Landusky Mines entered into a consent decree that included bonding a \$32 million commitment to provide facilities for wastewater treatment in-perpetuity. In May of 1998, following announcement of the bankruptcy by Pegasus Gold, the owner of the Zortman-Landusky mines, the Montana Department of Environmental Quality and BLM issued a cost estimate for reclamation and closure of the mine and established a new bond

amount. The bond for surface reclamation was increased to approximately \$37,000 per acre for leach pad reclamation and \$20,000 per acre for waste rock dump reclamation. In addition, \$8.5 million was estimated for pit backfilling and \$32 million was allotted for wastewater treatment in perpetuity. Additional information on the Zortman-Landusky mine reclamation bond history is contained in Part III.

Also included as a case study is the Richmond Hill mine in South Dakota, which similarly underwent a revision of the reclamation and closure bond from \$1.2 million to \$10.7 million, as a result of the discovery of AMD potential and significant alterations to the reclamation and closure plans and subsequent financial assurance. The medium-scale Richmond Hill mine is not expected to require water treatment in perpetuity in addition to the measures taken to affect source control of AMD from the mine. Additional information on the Richmond Hill reclamation bond is contained in Part III.

1.2.3 Surface Reclamation

Surface reclamation is the feature most common to all hardrock mining reclamation and closure plans and bond calculations. It generally consists of the application of various regrading, recontouring, topsoil application, surface preparation, revegetating, weed control and maintenance activities relative to establishing reclamation of the surface features to the extent required by the approved reclamation plan.

From state to state, and literally from site to site, surface reclamation requirements, and thus costs, vary considerably. In at least one state (Arizona), surface preparation (ripping) and hand-broadcasting a seed-mixture over as little as 20 percent of the total disturbed acreage, is considered adequate surface reclamation. In most other states, regrading and recontouring, replacement of salvaged topsoil or another suitable medium, and revegetation, which must meet certain revegetative success criteria, are standard and relatively accepted tasks in surface reclamation.

Regrading consists of reducing or otherwise altering the slopes of the various leach pad, tailings dam, mine waste dump, and other features common to hardrock mining operations, to slopes or configurations considered acceptable for reclamation. Generally, regrading is done to achieve slope stability, decrease erosion, and facilitate revegetation. Acceptable reclamation slopes are generally no steeper than 3H:1V. However, slopes of 2.5H:1V, 2.0H:1V, and even angle of repose, have been approved in some cases. Regrading is usually accomplished using dozers or graders, and in some cases may require a certain amount of hauling waste or other materials to achieve the required slopes. A number of novel methods have been devised to facilitate regrading on different slope aspects.

Recontouring consists of shaping the graded land to achieve erosion control, improve visual characteristics, provide variation in surface features, and to improve the overall efficacy of surface reclamation. Recontouring is generally done in tandem with regrading, using the same equipment and being accomplished at the same time. Recontouring might also consist of the arrangement of man-made features to emulate those found in nature, including strategic use of boulders and other means of breaking up the regular contours of unreclaimed pit walls, waste rock dumps and other surface features.

The application of **topsoil or a suitable growing medium** is performed to varying degrees in surface reclamation in most of the states. Most states require topsoil salvage as an integral part of mining operations, which is then used in the post-mining reclamation of disturbed areas. In states or cases where topsoil is not available, or has not been salvaged, the importation of a suitable growing medium from a nearby source is often required. The depth of growing medium required ranges from six (6) to twenty-four (24) inches, and the application of at least one foot of topsoil or growing medium is fairly

common practice. Topsoil application generally follows regrading and recontouring, and is typically accomplished using scrapers or trucks to move the material onto the desired area, where it is spread by dozing and grading.

Following topsoil application, the soil is usually ripped or otherwise prepared so as to create an adequate seed bed and otherwise facilitate revegetation. Various methods of surface preparation are employed, ranging from fine grading to rough ripping, to obtain the desired soil surface prior to revegetation. Soil surface preparation is usually performed in conjunction with topsoil or growth medium application, or regrading and recontouring, using essentially the same equipment.

Revegetation is the task of reseeding or replanting forbs, grasses, legumes and other plants (sometimes including shrubs and trees) so as to provide cover to decrease erosion, provide for soil stability and provide forage for wildlife or livestock or to otherwise return the site to a useable state. Seed, shrub and tree mixtures are applied both by hand and machine at varying rates in accordance with the approved reclamation plan. Most states have vegetative success criteria that must be met within a given number of years before revegetation is considered to be successful. In addition, some revegetation methods and standards require additional treatment with fertilizers, weed control, reseeding or other measures to obtain the required result.

In the same way that actual surface reclamation methods vary significantly from state to state and site to site, so does the cost of performing surface reclamation. Surface reclamation cost estimates are typically based on the cost of the necessary equipment, materials and labor. Cost estimators use various estimating handbooks and programs that analyze the tasks to be performed and derive an estimated cost on a per unit basis. The data used to make the estimate is typically based on manufacturer information and company derived cost information from the past use of equipment for similar tasks. Those same programs provide equipment and respective labor hour estimates, which are then combined with materials estimates to provide a total cost estimate for each surface reclamation task. Though the methodology is the same, considerable difference may exist between the costs for surface reclamation as determined by agencies using standard cost-estimating procedures and those estimated by the mining companies using their own equipment, labor and methods.

1.2.3.1 Surface Reclamation Costs – Case Studies

The costs of surface reclamation vary greatly from project to project, and state to state, primarily due to the following variables:

- Site-specific Reclamation Considerations
- Differences in State Statutes or Standards
- Type of Area Being Reclaimed
- Method Used in Reclamation

Comparison of surface reclamation costs for the areas to be reclaimed shows tremendous variability. In fact, total cost of surface reclamation can vary from less than \$800 per acre to more than \$20,000 per acre from site to site.

1.2.3.2 Southern Region

The costs of surface reclamation for the mines included as case studies in Part II of this report are shown. Additional information on the reclamation plans and costs for each mining operation cited in this section is also available in Part II. Chart 1.2.1 shows the cost of leach dump surface reclamation

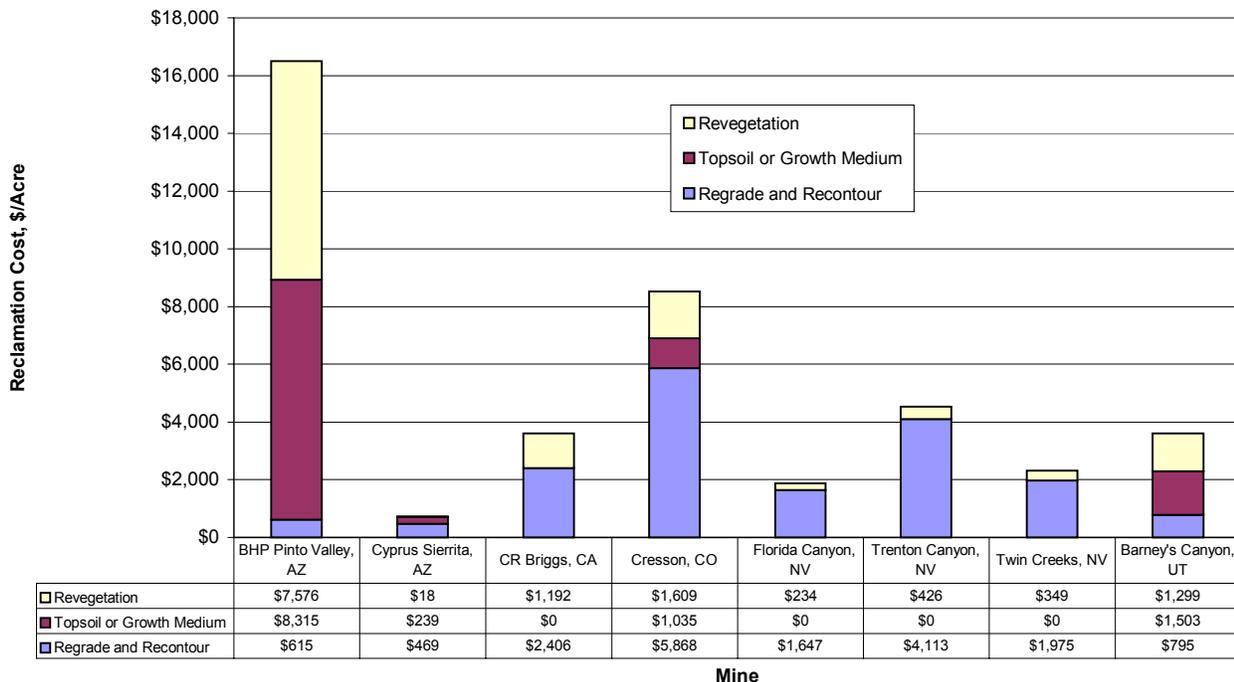
by task on a cost per acre basis. Chart 1.2.2 and Chart 1.2.3 similarly show by task on a cost per acre basis the cost of tailings dam surface reclamation and waste rock dump surface reclamation respectively.

Chart 1.2.1, **Leach Dump Surface Reclamation Costs**, showing total costs ranging from less than \$1,000 to greater than \$16,000 per acre, vividly demonstrates the different approaches and costs associated with leach dump reclamation. **Regrading and recontouring costs** vary from \$469 per acre to \$5,868 per acre, depending on the mine site. The lower end of the cost spectrum reflects those sites where only minimal regrading and recontouring are included in reclamation, whereas the higher cost sites reflect those that require a greater amount of regrading in order to achieve the slopes and footprints specified in reclamation plans. Regrading and recontouring costs can also be influenced if the original cost estimate does not include expenses that the operator could incur prior to reclamation (i.e. regrading and recontouring conducted by the operator prior to reclamation).

Topsoil and growth medium costs are also highly variable, ranging from \$0 per acre (no topsoil or growth medium application) to \$8,315 per acre. No application of topsoil is planned at the cyanide heap leach dumps in California and Nevada. The Barney's Canyon gold cyanide heap leach operation in Utah includes topsoil or growth medium placement to a depth of one foot in its reclamation plan, at a cost of approximately \$1,500 per acre. The Cyprus Sierrita, AZ project's copper acid leach dumps reclamation plan includes some topsoil or growth medium (six inches on 20 percent of the surface area), at a cost of \$239 per acre, whereas the plan for the copper acid leach dumps at the BHP Pinto Valley project, in the same state, requires two feet of growth medium over the entire dump surface area, at an estimated cost of approximately \$8,300 per acre.

Revegetation costs are highly variable as well, ranging from \$18 per acre, to \$7,576 per acre. Revegetation costs for the cited cyanide heap leach dumps ranges from \$234 per acre to \$1,609 per

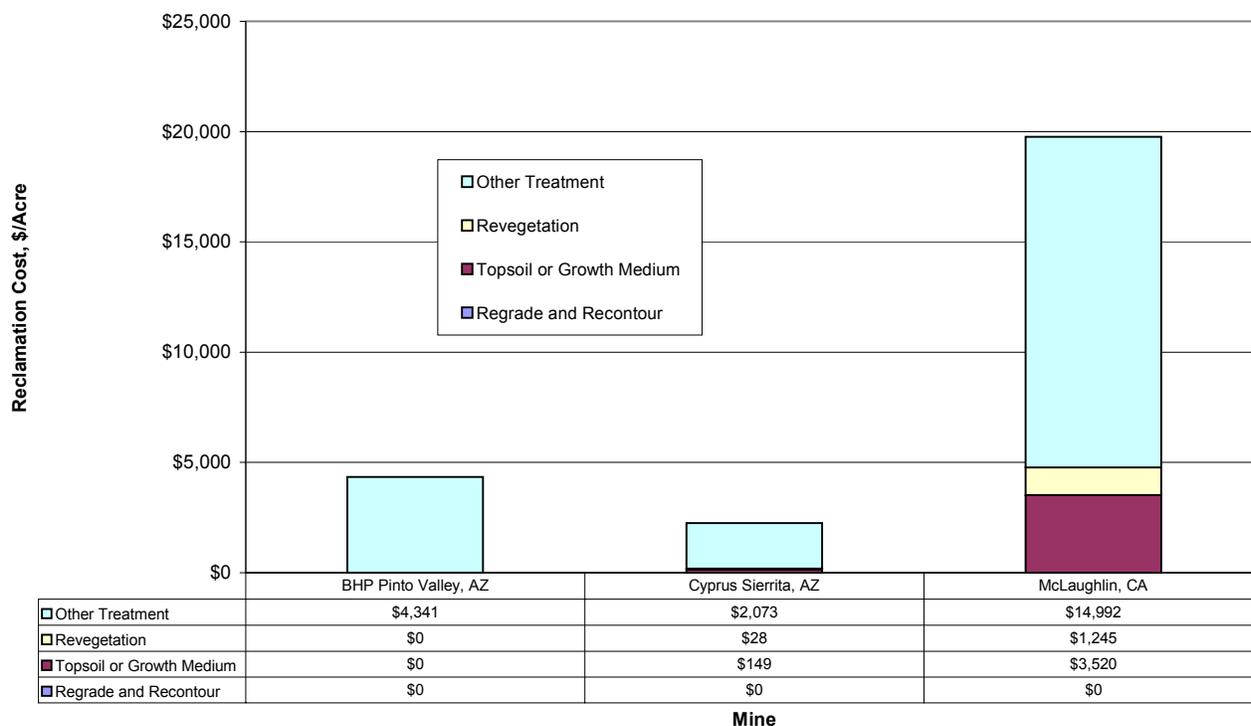
Chart 1.2.1 - Leach Dump Surface Reclamation Costs
Cost per Acre by Task - Southern Region



acre. The variability in cost is based primarily on the amount, type and method of seeding, and on whether fencing to protect vegetation is included in the estimate. Revegetation costs for the cited copper acid leach dumps ranges from \$18 at Cyprus Sierrita (reseeding 20 percent of the surface area), to \$7,576 for revegetation costs at the BHP Pinto Valley acid leach dumps, which is based on the application of the “EMPACT” treatment method. The EMPACT (Environmental Mining Practice and Cattle Treatment) method consists of using cattle grazing practices to promote revegetation.

Chart 1.2.2, **Tailings Dam Surface Reclamation Costs**, showing total costs ranging from \$2,250 per acre to nearly \$20,000 per acre, demonstrates the variation between approaches taken at different mine sites to tailings dam reclamation. **Regrading and recontouring costs** were not included, as none of the reclamation plans cited included those tasks in tailings dam surface reclamation. **Topsoil placement costs** were not included in reclamation of the BHP Pinto Valley tailings dam, while those costs were \$149 per acre at Cyprus Sierrita (six inches over 20 percent of the dump area), and \$3,520 per acre at McLaughlin (one foot depth over entire area). **Revegetation costs** were similar in that they were not included in reclamation of the BHP Pinto Valley tailings dam, while they ranged from \$28 per acre at Cyprus Sierrita (reseeding 20 percent of the surface area) to \$1,245 per acre at McLaughlin.

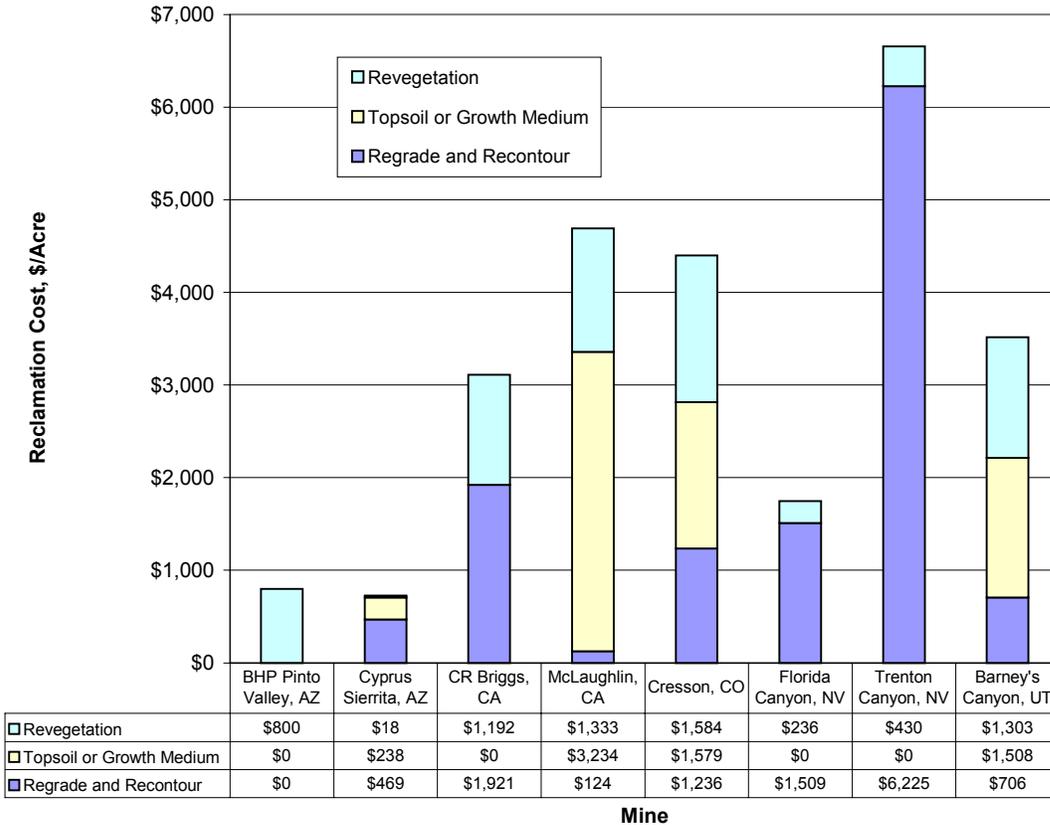
Chart 1.2.2 - Tailings Dam Surface Reclamation Costs
Cost per Acre by Task - Southern Region



Reclamation at the three operations with tailings dams included other treatment costs. **Other treatment costs** included EMPACT treatment at a cost of \$4,341 per acre at BHP Pinto Valley, similar “controlled grazing operations” reclamation at Cyprus Sierrita at a cost of \$2,073 per acre, and “closure treatment,” consisting of an engineered cap of two feet thickness and other methods, at the McLaughlin mine.

Chart 1.2.3, **Waste Rock Dump Surface Reclamation Costs**, demonstrates the various reclamation costs estimated for reclamation of those features at the various operations. **Regrading and recontouring costs** range from \$0 per acre to \$6,225 per acre. Regrading costs for waste rock dumps are similarly influenced by the factors mentioned for leach dump reclamation. **Topsoil and growth medium costs** are influenced in a similar manner, ranging from \$0 per acre for reclamation plans that do not include topsoil or growth medium placement to \$3,234 per acre for placement of one foot of topsoil or growth medium at the McLaughlin mine. **Revegetation costs** range from \$18 per acre (seeding 20 percent of the surface area) to \$1,584 per acre.

**Chart 1.2.3 - Waste Rock Dump Surface Reclamation Costs
Cost per Acre by Task - Southern Region**



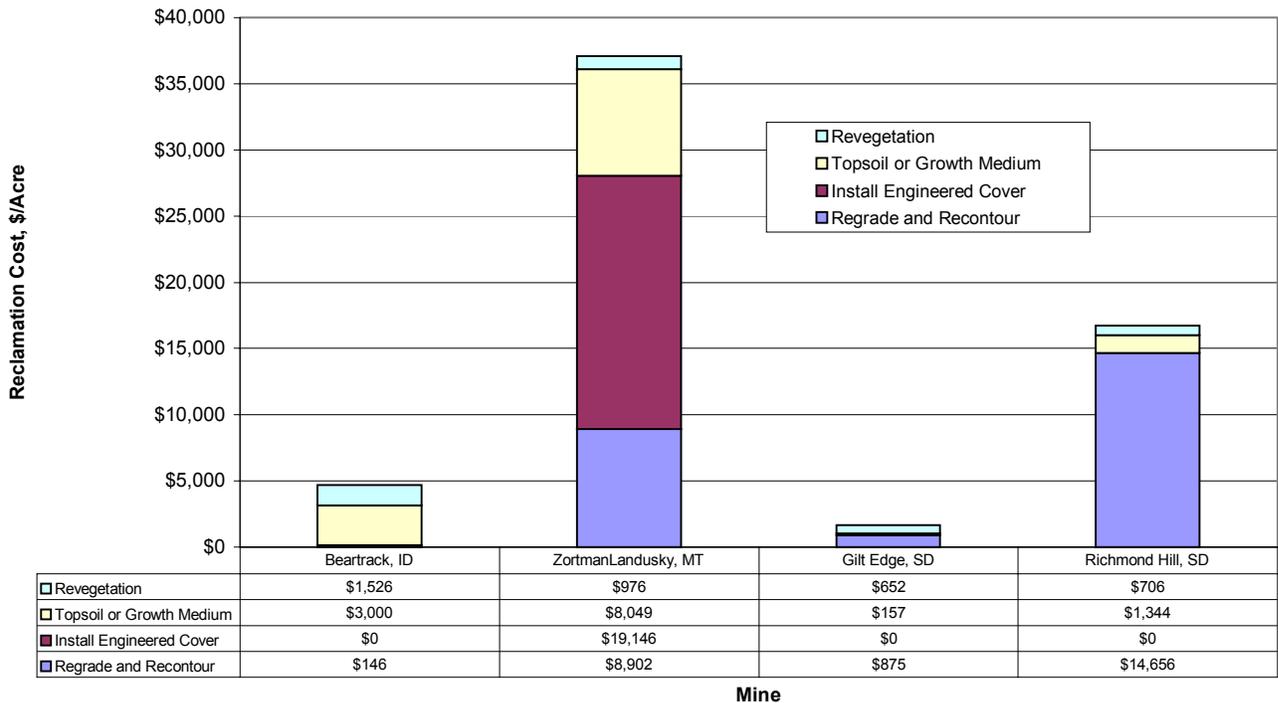
1.2.3.2 Northern Region

The costs for surface reclamation in northern region states are shown below for mines included as case studies in Part III of this study. Additional information on the reclamation plans and costs for each mining operation cited in this section is also available in Part III. Chart 1.2.4 shows the cost of leach dump surface reclamation by task on a cost per acre basis. Chart 1.2.5 and Chart 1.2.6 similarly show by task on a cost per acre basis the price of tailings dam surface reclamation and waste rock dump surface reclamation, respectively.

Chart 1.2.4, **Leach Dump Surface Reclamation Costs**, showing total costs ranging from less than \$1,700 to greater than \$37,000 per acre, vividly demonstrates the different approaches and costs associated with leach dump reclamation. **Regrading and recontouring costs** vary from \$146 per acre to \$14,656 per acre, depending on the mine site. The lower end of the cost spectrum reflects those sites where only minimal regrading and recontouring are included in reclamation. The higher cost sites include regrading and recontouring in the cost of removing heap leach dump material and backfilling the material into an open pit, as a means of AMD source control. Regrading and recontouring costs can also be influenced if the reclamation cost estimate does not include costs that the operator might incur prior to reclamation (i.e., regrading and recontouring conducted by the operator prior to reclamation).

The installation of an engineered cover to address AMD impacts has been specified at the Zortman-Landusky mine in Montana, at a cost of approximately \$19,000 per acre.

Chart 1.2.4 - Leach Dump Surface Reclamation Costs
Cost per Acre by Task - Northern Region



Topsoil and growth medium costs range from \$157 per acre (minimal topsoil or growth medium application) to \$8,049 per acre. Minimal application of topsoil is planned for the Gilt Edge mine, whereas two to three feet of combined topsoil and/or growth medium is planned for the Zortman-Landusky mines.

Chart 1.2.5, **Tailings Dam Surface Reclamation Costs**, which shows total costs ranging from \$750 per acre to more than \$21,000 per acre, demonstrates the variation between approaches taken by

different states at different mine sites to tailings dam reclamation and closure bonding. The lower range of costs was determined by the application of the Alaska statutory limit of \$750 per acre.

Regrading and recontouring costs were only (of all case studies) included in the Thompson Creek mine tailings dam reclamation example. Regrading and recontouring costs were significant at \$8,600 per acre.

Installation of an engineered cover is included at the Golden Sunlight mine and the proposed Crown Jewel mine, in both cases incorporating two feet of neutral capping material, at a cost of approximately \$8,700 and \$3,600 per acre respectively.

Topsoil placement costs were included in reclamation of the proposed Crown Jewel mine and the Golden Sunlight and Thompson Creek mines. The costs ranged from approximately \$1,000 per acre to \$12,500 per acre, for one foot, two feet, and four feet of topsoil placement, respectively.

Revegetation costs ranged from approximately \$500 to \$2,200 per acre. Revegetation was the only reclamation activity included in the Fort Knox reclamation plan.

Chart 1.2.5 - Tailings Dam Surface Reclamation Costs
Cost per Acre by Task - Northern Region

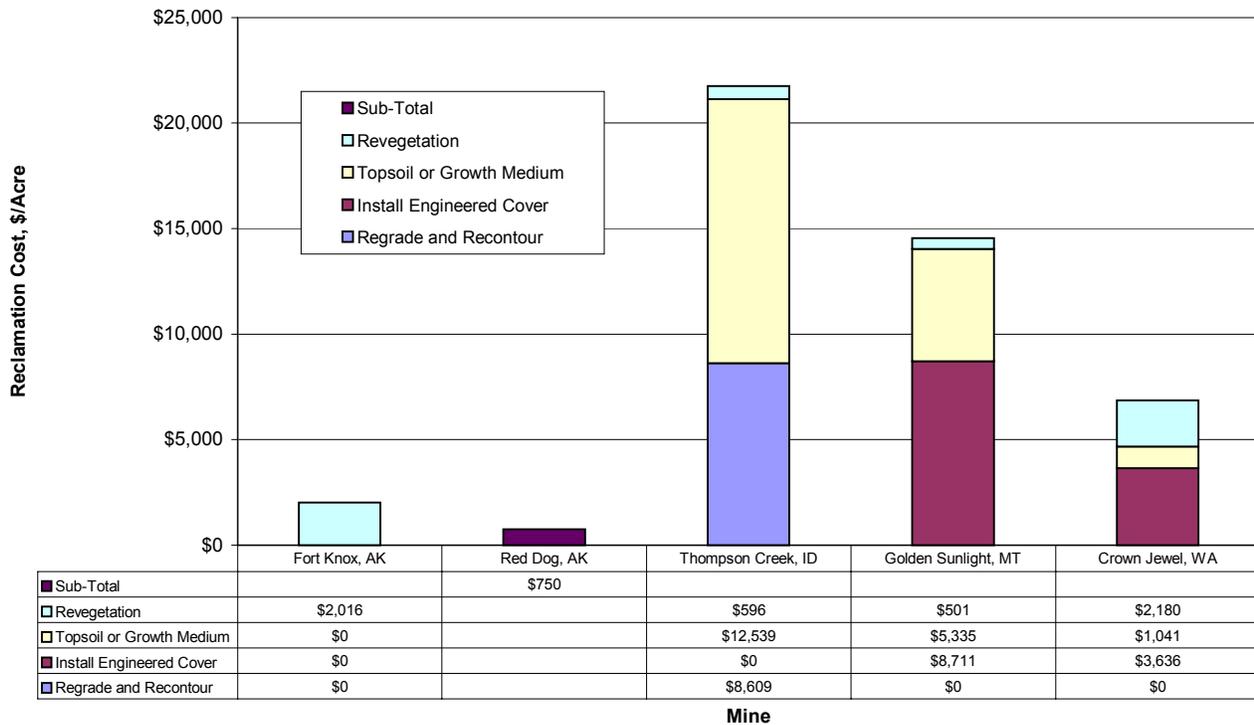
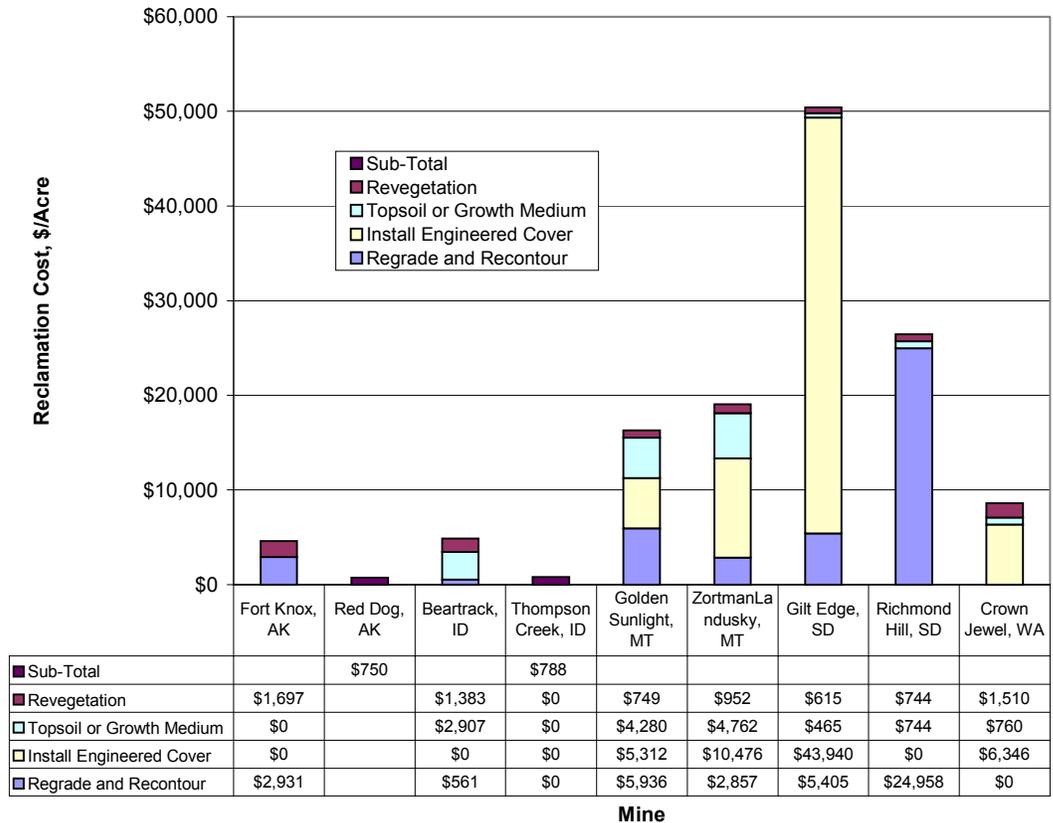


Chart 1.2.6, **Waste Rock Dump Surface Reclamation Costs**, demonstrates the various costs estimated for reclamation of those features at the various operations. **Regrading and recontouring costs** range from no cost to approximately \$25,000 per acre for backfilling of AMD generating waste.

Regrading costs for waste rock dumps are similarly influenced by the factors mentioned for leach dump reclamation. **Topsoil and growth medium costs** are influenced in a similar manner, ranging from no cost for reclamation plans that do not include topsoil or growth medium placement to \$4,750 per acre for placement of one foot of topsoil or growth medium at the Zortman-Landusky mines. **Revegetation costs** range from a low of \$615 per acre to a high of \$1,697 per acre.

**Chart 1.2.6 - Waste Rock Dump Surface Reclamation Costs
 Cost per Acre by Task - Northern Region**



1.2.4 Water Quality

Measures implemented for the protection of water quality are the second most common aspect found in hardrock mining reclamation plans. They can occur as different source control and hydrological balance site-specific aspects (such as engineered covers and stormwater diversions) or as closure requirements to protect water quality including detoxification/neutralization of waste materials, monitoring and maintenance requirements. In some cases, water treatment may be necessary, including permanent or “in-perpetuity” treatment.

1.2.5 Source Control

Source control is often included in reclamation and closure plans where a feature, such as a spent leach dump or waste rock dump, is expected to result in a discharge of solution, such as acid mine drainage,

that could negatively impact nearby ground or surface water quality. Source control is also a common feature to remediation of toxic wastes in Superfund projects and other similar circumstances where there is significant demonstrable risk to either human health or the environment.

Source control most often takes the form of an engineered repository or earthen cover that limits surface water and groundwater infiltration. Where intended to limit surface water infiltration, source control tends to take the form of an engineered cover layer, typically designed to provide either a water barrier cover (zero infiltration) or water balance cover (infiltration = evapotranspiration). The cover thickness and type can range from two feet of neutral or non-acid generating (NAG) material to a composite system consisting of multiple cover materials up to six feet thick.

Regrading and recontouring activities are often conducted at the same time as implementation of source controls. Source control may also be a part of regrading and recontouring activities, if they are conducted to the necessary extent to achieve limitations on surface water infiltration. While limiting infiltration might be the intent of surface reclamation in general, only those activities intentionally distinguished to affect source control have been defined as such in this study.

1.2.5.1 Southern Region

None of the reclamation plans cited in the southern region have distinguishable source control tasks included in their scope of work. However, several features that have previously been identified as a part of surface reclamation in some of the plans were possibly intended to serve as source control. The inclusion of source control is probably a leading reason why higher cost surface reclamation methods were specified in at least some cases.

The BHP Pinto Valley, AZ acid leach dump reclamation and closure plan calls for two feet of topsoil or growth medium, and revegetation, at a respective cost of \$8,315 per acre and \$7,576 per acre, for a total of nearly \$15,900 per acre. Although not specifically mentioned in the reclamation plan, it can be assumed that these extraordinary measures were intended to act as source control from spent acid leach piles that might otherwise degrade water quality.

The McLaughlin, CA reclamation and closure plan specifies construction of a two-foot capillary barrier and transition zone on the tailings dam site, in addition to placement of topsoil and revegetation. The cost of the cover, included as “closure” costs in the plan, is approximately \$14,992 per acre, and combined with a topsoil replacement cost of \$3,520 per acre and revegetation at \$1,245 per acre, the total surface reclamation cost for the tailings dam is approximately \$19,750 per acre. Like the BHP Pinto Valley reclamation plan, the McLaughlin reclamation plan is not specific as to the purpose of the tailings dam cover, but given the design, and the known incidence of acid mine drainage (AMD) associated mineralization at the McLaughlin project, it can be assumed that source control is intended.

1.2.5.2 Northern Region

The Zortman-Landusky, MT reclamation and closure plan relies heavily on source control as a means of addressing water quality problems related to the extensive incidence of AMD generating materials at the mine site. The history of the mine site, the reclamation and closure plan and the cost estimate are discussed in more detail in Part III. From a source control standpoint, the design and costs for engineered covers at Zortman-Landusky serve as a good example.

According to information provided by the agencies and contained in various studies, it can be assumed that most of the waste rock and spent ore heaps at the Zortman-Landusky mine contain potentially

acid-generating materials requiring removal and/or enhanced reclamation covers to minimize surface water infiltration. Most surfaces would be sloped to less than 25 percent (4H:1V) and reclaimed with a water barrier cover. Potentially acid generating pit highwalls in some areas would be backfilled or otherwise reduced in slope to approximately 2H:1V and reclaimed using a water balance cover.

Water barrier covers limit the downward migration of water into the waste zone by using a layered combination of low permeability materials such as clay and geotextiles. The Zortman-Landusky mine reclamation and closure plan calls for a water barrier cover consisting of 12 inches of soil or growth medium above 36 inches of suitable non-acid generating (NAG) material, which is underlain by a geosynthetic clay liner (GCL). With the NAG layer serving as a drainage and capillary break layer, this cover achieves a 4-ft thickness over potentially acid generating materials, and is essentially intended to stop all significant infiltration into potentially acid generating materials.

Water balance covers limit the amount of moisture reaching the waste zone by maximizing evapotranspiration. They are specified in the Zortman-Landusky reclamation and closure plan for steeper slopes such as backfilled, or otherwise reduced, pit highwalls and some other structures.

The top 36 inches of the water balance cover consists of topsoil (12 inches) and subsoils (24 inches) underlain by a geotextile filter fabric and 12 inches of NAG material to provide a capillary break and allow for lateral drainage.

The Zortman-Landusky reclamation and closure cost estimate uses a combination of water balance and water barrier covers for reclamation of the various cyanide heap leach and waste rock dumps. Costs for installation of the geotextile material GCL composite liner are approximately \$8,600 for leach dumps and \$18,000 per acre for waste rock dumps which, combined with the cost of regrading and recontouring, hauling and spreading subsoil, topsoil and NAG and revegetation, totals approximately \$37,000 per acre.

1.2.6 Hydrological Balance

Reclamation to mitigate impacts to hydrologic balance most often takes the form of water controls such as diversions, ditches and barriers. Typically the intent of hydrological balance measures taken as a part of mine reclamation and closure plans is simply to direct surface water from rain and snowmelt away from disturbed areas. In other cases, hydrologic balance measures can be to restore diverted surface flows or mitigate the impact to affected surface flows. The degree to which measures to affect hydrologic balance are included in reclamation and closure plans varies considerably.

1.2.6.1 General

Currently there are no evident measures in any of the reclamation and closure plans examined in this study that affect hydrologic balance as it relates to groundwater or groundwater aquifer drawdown. Groundwater aquifer drawdown typically occurs as mine workings (underground and open pit) extend below the groundwater table, requiring that groundwater be pumped from the site in order for the workings to remain dry. As the groundwater is pumped out, a cone of depression occurs in the groundwater aquifer in the area surrounding the mine, and in some cases this causes surface expressions of water, in the form of springs and streams, to change significantly. Groundwater drawdown and takings of water rights has been the subject of some litigation at mine sites. However, it does not appear that reclamation bonding is currently being undertaken at any active mine site to provide for potential loss of water or mitigation of impacts from groundwater drawdown. The state of Washington has proposed bonding for hydrological impacts related to water rights at the proposed Crown Jewel project.

1.2.6.2 Southern Region

Drainage and stormwater diversions were only identifiable as distinct reclamation and closure costs in the reclamation and closure plans for the Florida Canyon NV, Trenton Canyon NV, Twin Creeks NV, and Barneys Canyon UT mines. The **drainage and stormwater diversion costs** were estimated at approximately \$590,000, \$816,000, \$10,982 and \$46,000, respectively, for these mines. Drainage and stormwater diversion costs may have been included in regrading and recontouring costs in some cases.

1.2.6.3 Northern Region

Drainage and stormwater diversions are significant parts of the Thompson Creek ID, Golden Sunlight MT, and Zortman-Landusky MT (identifiable in other areas) reclamation and closure cost estimates, with total costs of approximately \$3.0 - \$3.5 million. The Fort Knox AK, Beartrack ID, and Gilt Edge SD mines also included drainage and stormwater diversion costs of \$716,000, \$323,000, and \$636,000 respectively. Drainage and stormwater diversion costs may have been included in regrading and recontouring costs in some cases.

1.2.7 Closure Requirements

Closure requirements may be included either as a part of or separate from reclamation planning and bonding. They are required to specifically protect water quality, and include such measures as detoxification/neutralization of waste materials, monitoring and maintenance requirements.

1.2.7.1 Southern Region

Detoxification/neutralization of spent cyanide heap leach dumps is a requirement for closure in California, Colorado, Nevada, and New Mexico. The cost of closure is highly variable. In Nevada, detoxification/neutralization is typically estimated over a three-year period, and may be estimated to cost as much as \$15,000 per acre. However, the Nevada Division of Environmental Protection does not have authority to require bonding for closure on private land, thus many cyanide heap leach dumps in the state are located to a great extent on private land. This scenario is made possible both by the existence of checkerboard railroad lands fortuitously located in the extensive northern gold districts and, until a recent temporary moratorium, by patenting through the 1872 Mining Act in others.

Detoxification/neutralization is included as a part of the CR Briggs, CA reclamation and closure plan. The company reasoned in the plan that during the first two steps of detoxification (circulation of process solution and chemical addition) they would be producing gold, and therefore it would be unlikely that they would abandon the project during that phase of detoxification. So only the step of detoxification involving evaporation of the remaining process solutions was used as the basis of their cost estimate (\$3,487 per acre). In addition, the California Regional Water Quality Control Board, responsible for administration and enforcement of California's water quality laws, included \$105,537 in the bond for the Briggs, CA gold mine to ensure that the administrative overhead and contingency items associated with the direct cost of water quality work were included in the cost estimate.

Closure planning and bonding may be separately required by the Arizona Department of Environmental Quality (ADEQ) Aquifer Protection Permit (APP) program and the Utah Department of Environmental Protection under Utah's water quality statutes. Inquiries made to both departments indicated that no additional bonding for closure, other than indicated, was required by the agency at any of the facilities cited in this study.

ADEQ may or may not require detoxification/neutralization of spent copper acid heap leach dumps, although they do require detoxification/neutralization of spent gold cyanide heap leach dumps. It does not appear from the information made available that detoxification/neutralization will be required in the spent acid heap leach dumps at BHP Pinto Valley, AZ copper mine. But the Cyprus Sierrita, AZ reclamation plan includes provisions for neutralization of the spent acid leach dump. In addition, the plan provides for monitoring and collection of leachate from the tailings ponds and/or leach pad dumps as a provision of closure. The reclamation and closure plan estimates the closure costs relative to the APP program at \$1,383,000. These figures are included in the bond estimate.

The Nevada Division of Environmental Protection (NDEP), together with the Nevada Bureau of Land Management, took the unusual step in 1998 of requiring the Florida Canyon, NV mine to include an additional \$720,000 in its cost estimate and bond as a "solution management contingency" fund. The fund, in the event of shutdown, is to be used for sufficient labor, equipment and materials for continued management of process solutions, for up to six months. NDEP and BLM took this action when the mine's owner, Pegasus Gold Inc., filed for bankruptcy protection in early 1998.

1.2.7.2 Northern Region

Detoxification/neutralization of spent cyanide heap leach dumps is a requirement for closure in Idaho, Montana, Oregon, South Dakota and Washington. The cost of closure is highly variable.

At the Beartrack, ID mine, rinsing is to consist of three pore volumes precipitation and fresh (or treated) water to achieve a <0.2 mg/L WAD cyanide value. Rinsing would take place over a 2.5 year period. The total cost of \$2.0 million includes \$600,000 for solution treatment and \$414,000 for land application of neutralized process solution.

Detoxification/neutralization costs vary greatly among South Dakota heap leach mines. At the Gilt Edge mine, costs were estimated on the basis of \$5 per 1000 gallons of rinse solution, resulting in a cost of \$689,000. At the Richmond Hill mine (which has a heap leach pad of nearly the same size as the Gilt Edge mine), estimated costs were based on time and materials. The result was an estimated cost of \$4.2 million for detoxification/neutralization.

1.2.8 Water Treatment

Water treatment, including water treatment in perpetuity, is a relatively common aspect in the remediation of abandoned mines in the Superfund program. In terms of its application to the reclamation of mines, which are now operating or being reclaimed under modern statutes, water treatment has thus far been limited to only a few sites. Those sites have already been the subjects of investigation by authorities for water quality violations, and existing circumstances or site characterization indicates that water treatment will eventually be required to meet water quality standards or otherwise mitigate potential impacts to water resources.

1.2.8.1 General

At present, only four mines in the western United States are known to be permitted and bonded to include water treatment as integral and discernable parts of their reclamation plans. As time goes by, this situation will no doubt change for at least three reasons. Water treatment will probably become a major aspect of most mine closure and reclamation plans, and will be included as a part of reclamation costs and bonding practices. First, mines probably will require water treatment, many "in-perpetuity," in order to meet applicable closure and reclamation statutes and regulations. The potential liability to

the public with respect to water treatment is enormous, and likely will be realized by industry, regulatory agencies and taxpayers over the coming decades. Second, water treatment is gaining popularity among operators as a means of accomplishing numerous aspects of reclamation. It is now commonly being applied to detoxification and neutralization, directly to specific acid mine drainage and toxic metals water quality contamination, and it has become a long-term means of protecting water quality and accomplishing reclamation and closure when mining operations have otherwise irreparably impacted water resources. Third, site characterization methods presently available can predict water quality impacts well into the future. With the realization of what impacts are likely to occur, it is evident that water treatment will be included as an integral part of some mining operations and reclamation and closure plans in the future.

1.2.8.2 Southern Region

Provisions for water treatment are not included in any of the mines in the southern region cited in this study, and are not known to be required at any mine sites permitted in the southern region under modern statutes. However, it is known that various mine sites currently under investigation may be required to make provisions in their future closure and reclamation plans and bonding for water treatment.

New Mexico's reclamation standards are unique in that they explicitly prohibit any new mining operation from applying "in-perpetuity" water treatment methods to meet water quality standards, by stating "The operation will be designed to meet without perpetual care all the applicable environmental requirements of the Act, this Part and other laws following closure."

1.2.8.3 Northern Region

Provisions for water treatment in perpetuity at the Golden Sunlight, MT and Zortman-Landusky, MT mines serve as examples of water treatment being included in closure and reclamation plans and bond cost estimates. The provisions for water treatment and their corresponding costs at those mines are described in detail in Part III. The water treatment costs for the Golden Sunlight mine, as they relate to bonding "in perpetuity," are also discussed in the following section on calculation of reclamation and closure cost estimates.

1.2.9 Chemical Spills and Worst-Case Situations

Bonding for chemical spills and accidents and worst-case situations is sometimes required by statute.

1.2.9.1 Southern Region

The California Water Quality Control Board required the Briggs, CA gold mine to include costs for a "reasonable worst case release from the processing facilities" in their reclamation cost estimate. The scenario used by the company to calculate the estimate is based on a coupling failure in the piping system that distributes process solution to the leach pad. The coupling failure is assumed to result in the discharge of a 300 gpm flow which washes out heap material and clogs the containment berm, resulting in a flow of both liquids and solids over the containment berm. The company calculated a cost of approximately \$4,000 to clean up the spill.

1.2.9.2 Northern Region

Idaho, Oregon and Washington all provide for bonding related to chemical usage and potential spills, specifically cyanide usage, but in different manners. Idaho has a Chemical Processing by Cyanidation

permit bond limit of \$100,000. Oregon's Chemical Process Mining statutes give it authority to bond for nearly any potential reclamation and closure aspect as calculated by the agency, with no bond limitation. Similarly, Washington's Metal Mining and Milling Act gives the Department of Ecology broad discretion to apply reclamation and closure bonding relative to the use of chemical process facilities.

1.2.10 Facilities, Roads and Other Costs

Most reclamation and closure plans call for demolition and removal of all facilities including process and mill buildings, pumping and power stations and conveyances, maintenance buildings, fueling and explosives facilities and some roads and other features.

Most reclamation and closure cost estimates include a variable amount for facilities demolition, regrading and recontouring, and in some cases topsoil placement and revegetation of areas disturbed by facilities. Demolition cost estimates generally relate to the size and intensity of the process and ancillary facilities. Milling operations, for example, are larger and more process intensive than gold heap leach operations.

In addition, some reclamation and closure plans include provisions and costs for reclamation of exploration roads and sites, depending on the area of disturbance. Another cost estimate included in reclamation and closure plans provides for supervisory and administrative labor during reclamation and closure operations.

1.2.10.1 Southern Region

The reclamation and closure plans for the copper operations at the BHP Pinto Valley and Cyprus Sierrita mines in Arizona include provisions for demolition. The substantial cost estimates, at \$15,521,300 and \$7,793,300 respectively, are indicative of the size of operations involved with the various milling, processing and maintenance facilities at both mines. Facilities demolition provisions are also included in the reclamation plans for the gold heap leach operations at Briggs, CA, Cresson, CO, and Florida Canyon, Trenton Canyon and Twin Creeks, NV mines. Estimated costs range from approximately \$150,000 to \$2,100,000.

The BHP Pinto Valley cost estimate claims a credit of \$18,436,000 for the salvage value of the equipment at the mine site. It is the only facility examined in this study that included a claim for salvage value, although it is likely that other mines do as well, as it is allowed by several states (i.e. Arizona and Colorado).

Reclamation of exploration areas is a feature common to only mine operation, reclamation and closure plans and bonding costs in the state of Nevada, and is required by the NDEP and Nevada BLM. Other states typically have separate calculations of reclamation costs. Many of the states include provisions for supervisory and operations labor in their reclamation and closure cost estimates, ranging from less than \$10,000 (Barneys Canyon, UT) to approximately \$8,880,000 (BHP Pinto Valley).

1.2.10.2 Northern Region

Facilities demolition costs were applied to the reclamation and closure cost estimates to varying degrees. Five projects estimated no costs or insignificant costs for demolition. Four facilities estimated demolition costs of \$181,000, \$578,000, \$785,000 and \$3,334,140 at the Richmond Hill and Gilt Edge heap leach mines, and Golden Sunlight and Crown Jewel cyanidation mill operations, respectively.

No northern region states included credit for salvage value of equipment in the reclamation and closure cost estimate. Similarly, no northern region states included exploration reclamation costs as part of the estimate.

1.2.11 Indirect Costs

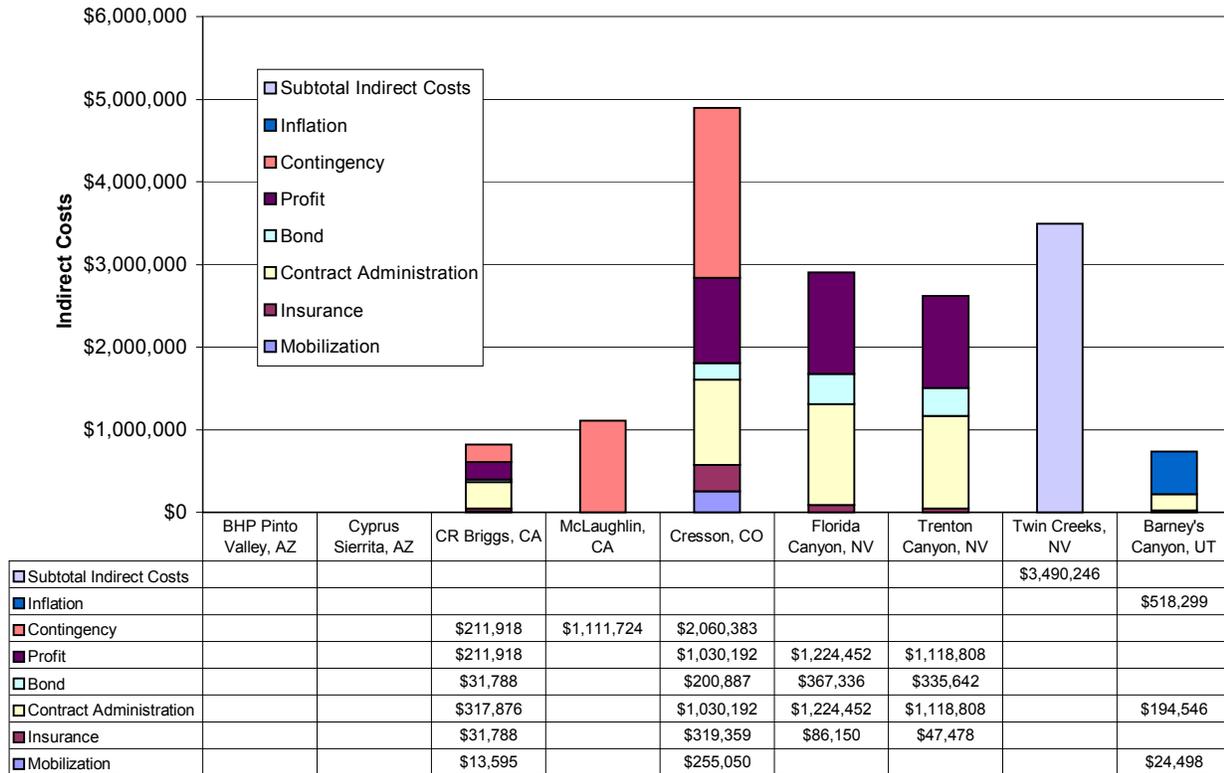
Indirect costs include tasks not directly related to the undertaking of reclamation and closure itself. These ancillary tasks include contractor mobilization/demobilization, contractor liability insurance, contract administration (engineering, procurement and construction management), contractor performance bonding, contractor profit and contingency costs. Inflation may also be included as an indirect cost in some cases.

The application of indirect costs to a reclamation and closure cost estimate is typically intended to show the cost estimate as if the responsible agency was required to take over reclamation and closure, using a contractor to perform the reclamation and closure tasks. It is a required cost in some states; others do not require it.

1.2.11.1 Southern Region

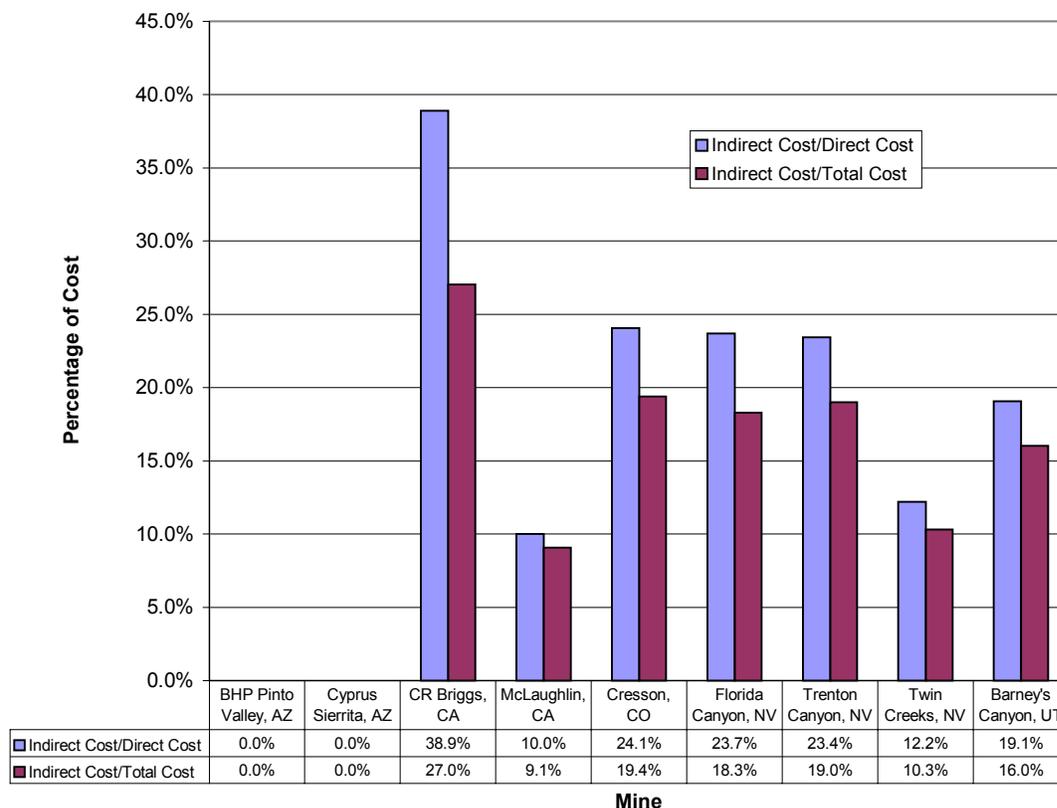
Chart 1.2.7, **Indirect Costs**, shows the components of the indirect costs contained in the various reclamation cost estimates for the southern region mine case studies. Chart 1.2.8, **Indirect Costs as a Percentage of Direct and Total Cost** compares the various provisions for indirect costs to direct and total costs of reclamation.

**Chart 1.2.7 - Indirect Costs
Southern Region Case Studies**



Mine

Chart 1.2.8 - Indirect Costs as a Percentage of Direct and Total Cost
Southern Region Case Studies



Arizona does not require mines to calculate indirect costs into reclamation and closure plans. The other southern region states all have some provisions for indirect costs as a component of reclamation and closure bonding estimates. Indirect reclamation and closure costs range from about 10 percent to nearly 40 percent, and average around 25 percent of direct reclamation and closure costs. These indirect costs range from about nine percent to 27 percent, and average around 19 percent of total reclamation and closure costs.

Components included in indirect reclamation and closure costs vary from state to state, and from project to project. The CR Briggs, CA and McLaughlin CA mines represent the entire range of differences in indirect cost calculations. The CR Briggs mine indirect cost estimate includes provisions for all identified indirect cost provisions with the exception of inflation (contingency, profit, bond, contract administration, insurance and mobilization), with indirect costs equal to approximately 39 percent of the total direct costs. California recalculates reclamation bonds annually, adjusting the amount for inflation. On the other hand, the McLaughlin mine includes only a provision for contingency costs, equal to 10 percent of the total direct costs.

Nevada's reclamation bonding guidelines have a standardized format for estimating reclamation and closure costs that includes provisions for contractor profit, bond, contract administration and contractor liability insurance, which typically accounts for 23 to 24 percent of total direct costs. The Twin Creeks mine reclamation and closure bond estimate does not use the standard format, but

estimates administrative costs at 12 percent of total direct costs, although some other indirect costs may be included in other cost areas.

1.2.11.2 Northern Region

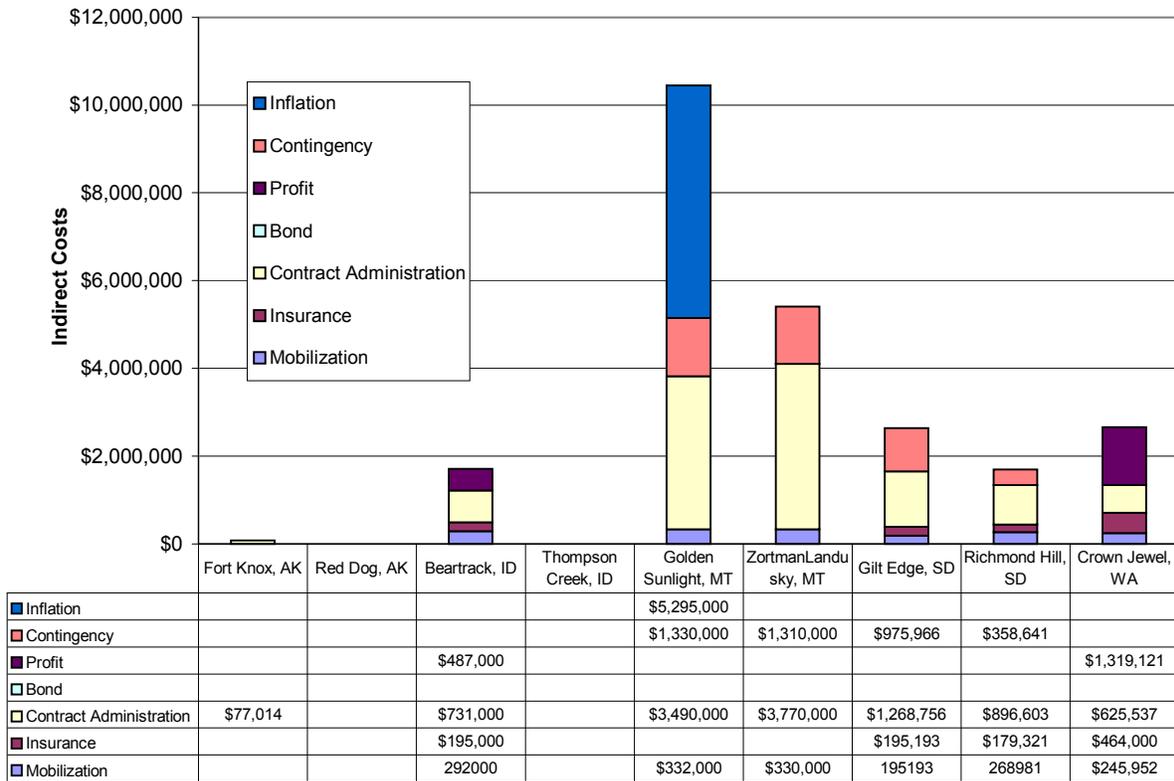
Chart 1.2.9 - **Indirect Costs**, shows the components of the indirect costs contained in the various reclamation cost estimates for the northern region mine case studies. Chart 1.2.10 - **Indirect Costs as a Percentage of Direct and Total Cost** compares the various provisions for indirect costs to direct and total costs of reclamation.

No indirect costs were included in the reclamation and closure bond estimates for the Red Dog, AK, and Thompson Creek, ID mines, and only minimal indirect costs were included in the Fort Knox, AK estimate.

The other northern region states all have some provisions for indirect costs as a component of reclamation and closure bonding estimates. Indirect reclamation and closure costs range from about 16 percent to over 36 percent, and average around 28 percent of direct reclamation and closure costs. Indirect reclamation and closure costs range from about 8 percent to 27 percent, and average around 19 percent of total reclamation and closure costs.

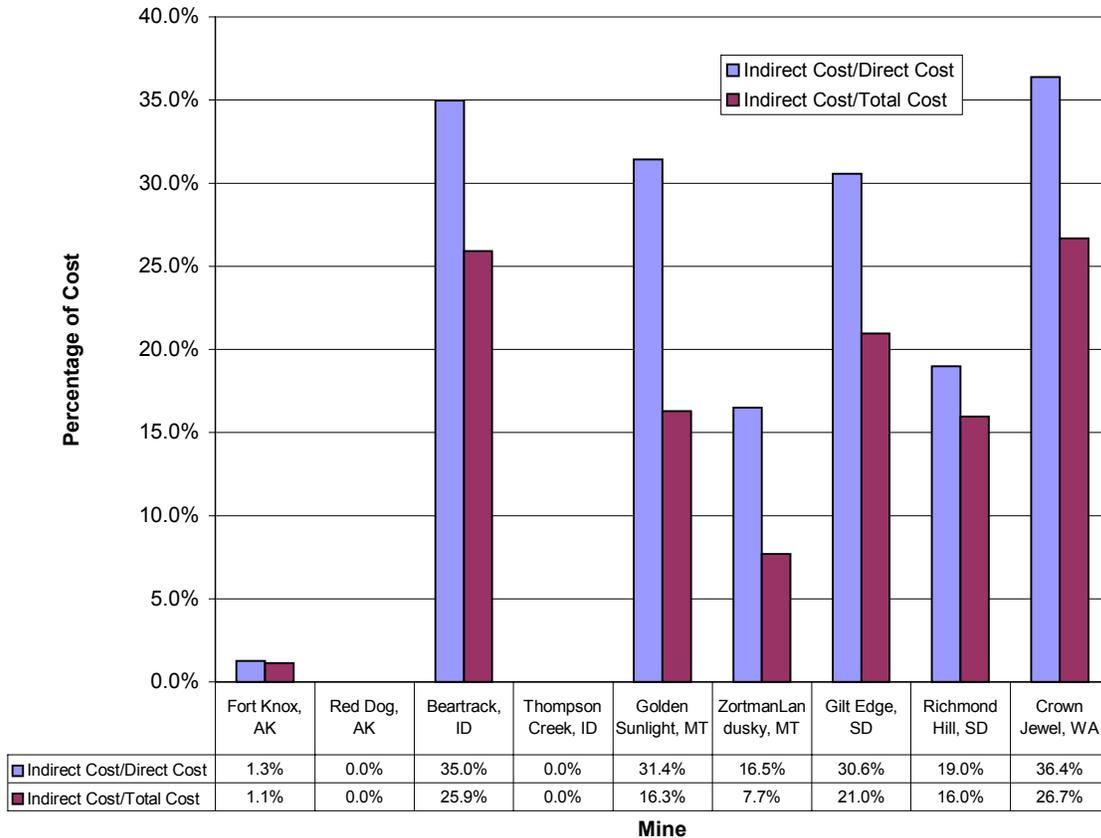
Components included in indirect reclamation and closure costs vary from state to state and, within some states, from project to project.

**Chart 1.2.9 - Indirect Costs
Northern Region Case Studies**



Mine

**Chart 1.2.10 - Indirect Costs as a Percentage of Direct and Total Cost
Northern Region Case Studies**



1.2.12 Calculating Reclamation and Closure Bonds

Reclamation and closure bonding costs, for the most part, are determined by applying present costs (the costs of reclamation and closure today) to the various tasks that will need to be performed in accordance with each mine’s reclamation and closure plan.

1.2.13 Project Life Cash Flow Expenditure Calculation of Reclamation and Closure Costs and Bond Amounts

The costs for the various tasks of mine reclamation and closure are presented in the various mine reclamation and closure plans and bonding case studies. Table 1.2.1, **Reclamation and Closure Schedule**, shows how the reclamation and closure activities might be typically scheduled, using the Golden Sunlight, MT mine as an example. Table 1.2.2, **Reclamation and Closure Expenditure Schedule**, shows the reclamation and closure expenditure schedule for the various reclamation and closure tasks as determined by the mine operator and estimated by the Montana Department of Environmental Quality (MDEQ).

**Table 1.2.2 - Reclamation and Closure Expenditure Schedule
Golden Sunlight Mine, MT**

Task	Year											Total
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	
Reclaim Tailings Ponds	\$4,302,000	\$107,000	\$106,000	\$86,000	\$85,000	\$79,000	\$79,000	\$69,000	\$70,000	\$94,000		\$5,077,000
Reclaim Waste Rock Dumps	\$18,448,000	\$2,394,000	\$891,000	\$549,000	\$440,000	\$203,000	\$91,000	\$6,000	\$414,000	\$286,000	\$148,000	\$23,870,000
Reclaim Pit	\$702,000							\$525,000				\$1,227,000
Reclaim Facilities	\$1,015,000											\$1,015,000
Reclaim Misc. Disturbance Areas	\$633,000	\$23,000	\$246,000									\$902,000
Construct and Maintain Storm Water Features	\$445,000	\$180,000										\$625,000
Monitoring	\$414,000											\$414,000
Interim Maintenance and Shutdown	\$110,000											\$110,000
Sub-Total Direct Costs	\$26,069,000	\$2,704,000	\$1,243,000	\$635,000	\$525,000	\$282,000	\$170,000	\$600,000	\$484,000	\$380,000	\$148,000	\$33,240,000
Cumulative Total Direct Costs	\$26,069,000	\$28,773,000	\$30,016,000	\$30,651,000	\$31,176,000	\$31,458,000	\$31,628,000	\$32,228,000	\$32,712,000	\$33,092,000	\$33,240,000	
Indirect Costs												
Mobilization @ 1%	\$260,690	\$27,040	\$12,430	\$6,350	\$5,250	\$2,820	\$1,700	\$6,000	\$4,840	\$3,800	\$1,480	\$332,400
Engineering and Design @ 3%	\$782,070	\$81,120	\$37,290	\$19,050	\$15,750	\$8,460	\$5,100	\$18,000	\$14,520	\$11,400	\$4,440	\$997,200
Reclamation Management @ 2.5%	\$651,725	\$67,600	\$31,075	\$15,875	\$13,125	\$7,050	\$4,250	\$15,000	\$12,100	\$9,500	\$3,700	\$831,000
Contingency @ 4%	\$1,042,760	\$108,160	\$49,720	\$25,400	\$21,000	\$11,280	\$6,800	\$24,000	\$19,360	\$15,200	\$5,920	\$1,329,600
Administration @ 5%	\$1,303,450	\$135,200	\$62,150	\$31,750	\$26,250	\$14,100	\$8,500	\$30,000	\$24,200	\$19,000	\$7,400	\$1,662,000
Inflation Cost Adjustment @ 3%	\$568,000	\$863,000	\$939,000	\$959,000	\$986,000	\$980,000						\$5,295,000
Sub-Total Indirect Costs	\$4,608,695	\$1,282,120	\$1,131,665	\$1,057,425	\$1,067,375	\$1,023,710	\$26,350	\$93,000	\$75,020	\$58,900	\$22,940	\$10,447,200
Total Yearly Closure and Reclamation Cost	\$30,677,695	\$3,986,120	\$2,374,665	\$1,692,425	\$1,592,375	\$1,305,710	\$196,350	\$693,000	\$559,020	\$438,900	\$170,940	\$43,687,200
Cumulative Closure and Reclamation Cost	\$30,677,695	\$34,663,815	\$37,038,480	\$38,730,905	\$40,323,280	\$41,628,990	\$41,825,340	\$42,518,340	\$43,077,360	\$43,516,260	\$43,687,200	
Yearly Total Water Treatment Bond	\$20,400,000											
Cumulative Combined Bonds	\$51,077,695	\$55,063,815	\$57,438,480	\$59,130,905	\$60,723,280	\$62,028,990	\$62,225,340	\$62,918,340	\$63,477,360	\$63,916,260	\$64,087,200	
Reclamation Bond Requirement	\$64,087,200	\$64,087,200	\$64,087,200	\$64,087,200	\$64,087,200	\$64,087,200						

The expenditure schedule shows disturbances that will require reclamation and closure costs, as they are accrued up to the year 1999, in the first column. As indicated, the bulk of disturbance (and thus, costs) related to tailings pond reclamation and closure activities occur up to 1999. Only relatively minor costs are anticipated for additional areas disturbed by the tailings pond in 2000 through 2009. Similarly, the bulk of disturbance related to the waste rock dumps occur up to 1999, continue through 2000 and then decrease through 2009. The disturbed area of the pit is not expected to increase from 1999 until mining ceases in 2005. Additional expense (for backfill and groundwater pumping equipment) is slated for the year 2006. The disturbance area associated with facilities, and thus the costs for closure and reclamation of those facilities, is not expected to increase beyond the year 1999. Similarly, miscellaneous disturbance areas are expected prior to 1999, and will continue in the year 2000 and 2001. Monitoring costs are shown for one year, as a cost expenditure in 1999. Similarly, interim maintenance and shutdown costs are shown for one year, as a cost expenditure in 1999.

In the first column, indirect costs are shown for each year up to 1999 as a percentage of the total direct costs. The total annual reclamation cost for each year is given. The cumulative reclamation and closure cost for each year is also shown. The cumulative closure and reclamation cost can be considered the total reclamation and closure liability should a call on bonding as a financial assurance become necessary.

Table 1.2.2 also includes yearly costs associated with the water treatment bond at the Golden Sunlight Mine. Because water treatment under the bond is expected to become necessary following reclamation, it is not shown as a potentially incurred expense, but as a bond cost that will be held until necessary. Additional information on the method used to calculate the bond for water treatment is contained in the next section.

1.2.13.1 General

Most states use a similar method, or one with only minor variations, to initially determine reclamation and closure bond amounts. According to the specified bond review periods, changes to bond amounts sometimes take the form of a revised or new cash-flow cost expenditure estimate. In other cases, the previous bond amount is simply adjusted for inflation and new disturbances (based on an average cost for previous disturbances on a per acre basis).

Most states allow phased bonding in various forms. Phased bonding usually is subject to request by the operator. This type of bonding is particularly applicable to new mining operations, where discernable differences in the disturbed acres occur during the first few years of project life. Many modern mining operations disturb 90 percent of the surface acreage in the first five years, although the operations themselves might run for 10 or more years. Open pits, for example, can be dug deeper while not disturbing significantly more area.

1.2.13.2 Southern Region

The BHP Pinto Valley and Cyprus Sierrita, AZ copper mining reclamation and closure plans are based on a cash-flow analysis for all years before the plan, and for the remaining years covered under the current plan. The bond amount is calculated for the total cost of reclamation over the planned project life. According to statute, the bond amount is to be reviewed at least every five years. None of Arizona's current bonds were set prior to 1996, therefore none have met their first five-year anniversary date. Supposedly, the bonds will be recalculated to reflect any new information or changes to the reclamation and closure plan, and to adjust for inflation.

The CR Briggs, CA and Cresson, CO gold heap leach operation bonds are similarly structured, but were originally calculated as new mining operations in 1996. The bond amounts calculated were for the total cost of reclamation and closure over the planned project life, with no provisions for phased bonding. Bond amounts are reviewed yearly in California, and periodically in Colorado, and the amounts are typically adjusted for cost escalation and inflation.

The McLaughlin, CA bond was originally calculated for the project life when the operation was initiated in 1983. The bond originally incorporated phased bonding during the first few years of operation. It was reviewed and recalculated numerous times in the following years with the changes primarily being made based on cost escalation and inflation factors. The present bond for the recently closed mine is essentially the same as that calculated for the original project life. It is only modified by some minor changes in the reclamation and closure plan, and by the application of cost escalation and inflation factors over a 16 year period.

Nevada's estimate structure also calculates the bond on a planned project life basis. It is the only state with a recommended uniform bond estimating and calculating structure. The bond calculation uses a phased approach that includes all previous acreage disturbed plus any acreage projected for disturbance before the next three-year review period. A new review and recalculation of the bond occurs every three years.

New Mexico's means of calculating bonds is still in the process of determination by the agency.

Utah uses a bonding calculation method similar to Nevada, with a uniform phased approach, and review and recalculation of the bond occurring every five years.

1.2.13.3 Northern Region

All the bond calculations for the case studies in the Northern Region are based on a cash-flow analysis for the total cost of reclamation over the planned project life. However, in some cases (Beartrack ID, Thompson Creek ID) the bond is based on an original calculation at project initiation, and the bonds have only been modified by the application of cost escalation and inflation factors since that time. In other cases, both the reclamation plan and bond have been reviewed periodically, resulting in significant changes to both the plan and bond over time (Golden Sunlight MT, Zortman Landusky MT, Gilt Edge SD, Richmond Hill SD).

The Fort Knox, AK bond amount was recently modified based at least partially on the recommendations contained in a Five-Year Independent Environmental Audit that was included as a provision in the original mine permit. This unique measure taken by the mining company and the State of Alaska in response to public interest and concerns may be a highly effective means of ensuring that reclamation plans and bonding levels stay current with the status of operations, and is strongly recommended for consideration by other states and the federal agencies.

1.2.14 In-Perpetuity Cash Flow Calculation of Reclamation and Closure Cost Estimates and Bond Amounts

As previously mentioned, Montana requires bonding for water treatment in perpetuity at the Golden Sunlight and Zortman-Landusky, MT mines. The Golden Sunlight water treatment bond, mentioned in the previous section, is presented here to demonstrate the method used by MDEQ to calculate in-perpetuity water treatment bonds.

Table 1.2.3, **Water Treatment Cost Estimate Schedule**, shows the method used by the state for calculation of the water treatment bond estimate. The method assumes that capital costs, and operating and maintenance costs, are applicable over a 100-year period. Capital costs were determined based on an estimate for plant installation in the existing mill building, and include both direct costs for equipment and indirect costs for EPCM and contingencies. Capital costs for replacement of equipment during intervals of 10 to 30 years are also included in the capital cost estimate. The operating and maintenance costs are based on different types of seepage capture, water treatment in use and flows to water treatment during the years 0 to 10 (water treatment primarily used to treat for cyanide and nitrates), 11 to 25 (less cyanide and nitrates, beginning AMD) and during the years 25 to 100 (AMD treatment). Final reclamation costs of the remaining site facilities in year 100 are also included in the estimate.

MDEQ calculated the bond by taking the costs as shown in Table 1.2.3, and determining the Net Present Value of the costs at a 4.5 percent discount rate. The 4.5 percent discount rate used by MDEQ assumes an inflation rate of 1.5 percent and an investment discount rate of six percent of the value of the bond. The calculation is intended to simulate a situation where the bond amount is claimed by MDEQ, and invested in an account earning six percent interest for 100 years, while inflation continues at a rate of 1.5 percent. Together with capital and earnings this situation should provide the necessary cash flow to pay for the indicated tasks.

The MDEQ estimate is predicated on the assumption that the discount rate and rate of inflation will stay steady over a 100-year period, and that the bond can be rolled over to provide sufficient financial assurance for treatment beyond the 100-year period. Sensitivity analysis of the MDEQ's method shows that in the event neither of these assumptions holds true, the bond amount would likely prove to be insufficient either during or after the 100-year period. So while the MDEQ's method is one way to determine perpetual financial assurance, more secure means should also be considered.

1.2.14.1 Southern Region

There are currently no recognized bonding situations for modern mining operations in the southern region that call for water treatment either following operations or in perpetuity. However, several mines could possibly require provisions for water treatment in perpetuity in the near future.

1.2.14.2 Northern Region

In addition to the Zortman-Landusky and Golden Sunlight, MT mines, bonding for water treatment is also a provision at the Gilt Edge, ID mine, and would be a provision of the proposed Crown Jewel mine in the state of Washington.

**Table 1.2.3 - Water Treatment Cost Estimation Schedule
Golden Sunlight Mine, MT**

Task	Year																									
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Capital Cost																										
Water Treatment Plant Seepage Capture System	\$1,026,766	\$97,487																								\$476,521
Capital Equipment Replacement Cost																										
Water Treatment Plant Seepage Capture System							\$48,440				\$42,778 \$68,130					\$48,440					\$162,356 \$106,380					\$524,961
Operation and Maintenance Costs																										
Water Treatment Plant Seepage Capture System	\$799,916 \$75,173	\$621,839 \$75,173	\$621,839 \$75,173	\$621,839 \$75,173	\$813,447 \$107,933																					
Total Water Treatment Costs (1998 \$)	\$1,999,342	\$875,089	\$875,089	\$875,089	\$875,089	\$923,529	\$875,089	\$875,089	\$875,089	\$875,089	\$807,920	\$697,012	\$697,012	\$697,012	\$697,012	\$745,452	\$697,012	\$697,012	\$697,012	\$697,012	\$697,012	\$965,748	\$697,012	\$697,012	\$697,012	\$1,922,862
Net Present Value (NPV)																										
@ 2.5% Discount Rate	#####																									
@ 4.5% Discount Rate	#####																									
@ 6.5% Discount Rate	#####																									
@ 8.5% Discount Rate	#####																									
	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049
Capital Cost																										
Water Treatment Plant Seepage Capture System																										
Capital Equipment Replacement Cost																										
Water Treatment Plant Seepage Capture System					\$719,248 \$192,688						\$124,713					\$162,356 \$155,478				\$160,713						\$42,778 \$117,228
Operation and Maintenance Costs																										
Water Treatment Plant Seepage Capture System	\$813,447 \$107,933	\$813,447 \$107,933	\$813,447 \$107,933	\$813,447 \$107,933																						
Total Water Treatment Costs (1998 \$)	\$921,380	\$921,380	\$921,380	\$921,380	\$1,833,316	\$921,380	\$921,380	\$921,380	\$921,380	\$921,380	\$1,046,093	\$921,380	\$921,380	\$921,380	\$921,380	\$1,239,214	\$921,380	\$921,380	\$921,380	\$921,380	\$1,082,093	\$921,380	\$921,380	\$921,380	\$1,081,386	\$921,380
	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075
Capital Cost																										
Water Treatment Plant Seepage Capture System																										
Capital Equipment Replacement Cost																										
Water Treatment Plant Seepage Capture System				\$317,703					\$838,826 \$335,621					\$160,713					\$42,778 \$117,228						\$124,713	
Operation and Maintenance Costs																										
Water Treatment Plant Seepage Capture System	\$813,447 \$107,933	\$813,447 \$107,933	\$813,447 \$107,933	\$813,447 \$107,933																						
Total Water Treatment Costs (1998 \$)	\$921,380	\$921,380	\$921,380	\$1,239,083	\$921,380	\$921,380	\$921,380	\$921,380	\$2,095,827	\$921,380	\$921,380	\$921,380	\$921,380	\$1,082,093	\$921,380	\$921,380	\$921,380	\$921,380	\$1,081,386	\$921,380	\$921,380	\$921,380	\$921,380	\$1,046,093	\$921,380	\$921,380
	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	Total	
Capital Cost																										
Water Treatment Plant Seepage Capture System																									\$1,026,766 \$574,008	
Capital Equipment Replacement Cost																										
Water Treatment Plant Seepage Capture System			\$162,356 \$155,478					\$433,386					\$719,248 \$192,688					\$124,713					\$1,406,997 \$155,478		\$4,299,721 \$3,664,892	
Operation and Maintenance Costs																										
Water Treatment Plant Seepage Capture System	\$813,447 \$107,933	\$813,447 \$107,933	\$79,962,164 \$10,190,166																							
Total Water Treatment Costs (1998 \$)	\$921,380	\$921,380	\$1,239,214	\$921,380	\$921,380	\$921,380	\$921,380	\$1,354,766	\$921,380	\$921,380	\$921,380	\$921,380	\$1,833,316	\$921,380	\$921,380	\$921,380	\$921,380	\$1,046,093	\$921,380	\$921,380	\$921,380	\$921,380	\$2,483,855	\$921,380	\$99,717,717	

1.3 HARDROCK RECLAMATION AND CLOSURE BONDING PRACTICES IN THE WESTERN UNITED STATES

This report contains 18 reclamation and closure case studies that include a description of the reclamation and closure plan and the cost estimates based on bond calculations and other available information. The case studies themselves are included in Part II and Part III of this study. This section presents general observations from a comparative standpoint, based on the case studies, about the reclamation and closure bonding practices being conducted in each state.

1.3.1 Major Hardrock Mining Operations and Reclamation and Closure Bonding Comparison by State

The total disturbed acres and total reclamation amounts, for all major mining operations combined, are contained in Charts 1.3.1 and 1.3.2, **Major Hardrock Mining Reclamation and Closure, Total Disturbed Acres Versus Total Reclamation Bonding By State**, for both the Southern and Northern region states. The data used in the charts is from the respective Major Hardrock Mine Permits Tables for each state contained in Part II and Part III.

Comparison of the total disturbed acres to total reclamation bonds may give some indication as to the relative approach to reclamation bonding taken by each state. Those states considered more stringent have a lower disturbed acre to bond ratio, while those considered less stringent having a higher disturbed acre to bond ratio. The ratio may also be influenced by other factors, including the severity of the environmental problems that exist in each state, and the types and size of the operations being permitted.

Chart 1.3.1 - Total Disturbed Acres Versus Total Reclamation Bonding by State Southern Region

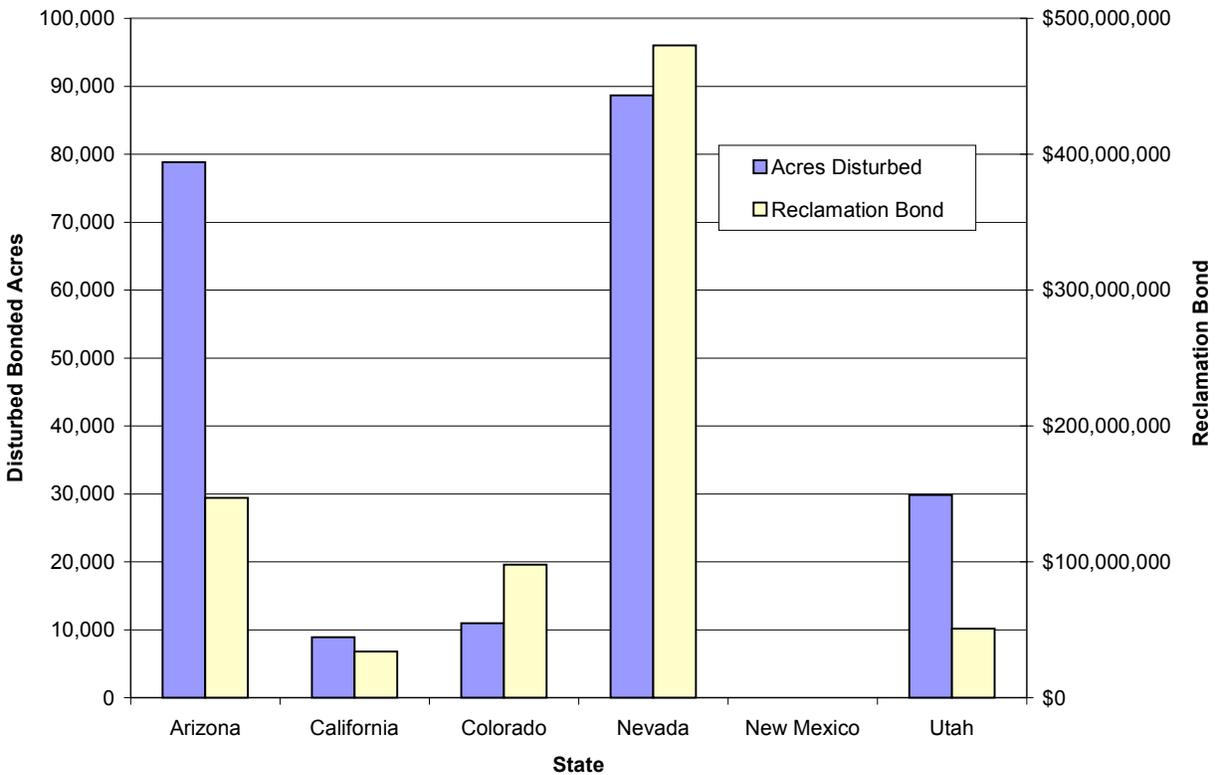
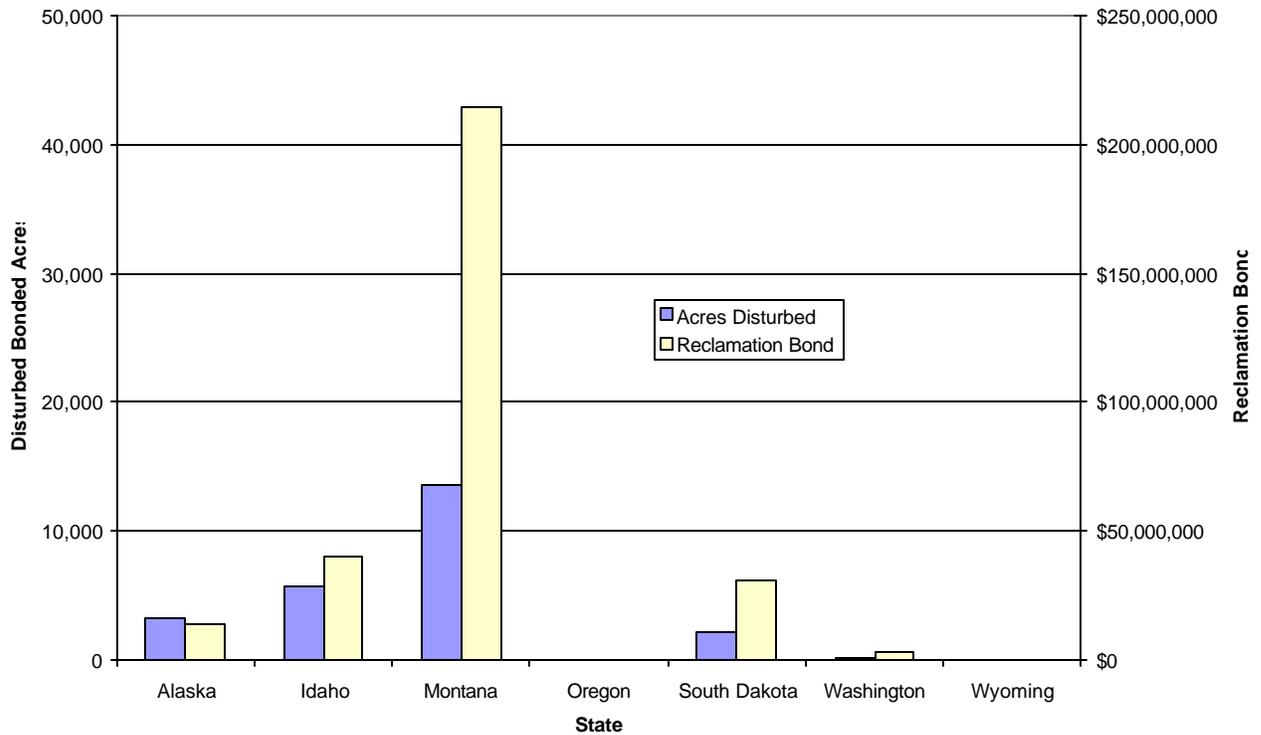


Chart 1.3.2 - Total Disturbed Acres
Versus Total Reclamation Bonding by State
Northern Region



1.3.1.1 Southern Region

Chart 1.3.1, **Major Hardrock Mining Reclamation and Closure, Total Disturbed Acres Versus Total Reclamation Bonding By State**, provides a comparison of the total disturbed acres and total reclamation bond for the southern region states.

Both Arizona and Utah have relatively high disturbed acre to bond ratios. Both states' statutes are generally less stringent with respect to surface reclamation requirements, and Arizona does not add indirect costs to its reclamation bond amounts. The reclamation and closure bonding amounts in both states are also predominated by very large and, in many cases, historic copper mines. Neither state presently requires water treatment as a closure requirement at any of its mine sites.

California, Nevada and particularly Colorado have lower disturbed acre to bond ratios. These states are generally more conservative with respect to surface reclamation requirements, and in all cases require indirect costs to be added to their reclamation bond amounts. In addition, various costs are included in these states' bond amounts for detoxification/neutralization of gold heap leach dumps, as well as other measures intended to address potential water quality impacts. These states presently require limited water treatment and associated tasks as a closure requirement at some mine sites.

Reclamation and closure plans and cost estimates will not be available for New Mexico's Major Hardrock mines until sometime after Jan. 1, 2000. It is probable that water treatment will be required to meet closure requirements at some mine sites in New Mexico.

1.3.1.2 Northern Region

Chart 1.3.2 - **Major Hardrock Mining Reclamation and Closure, Disturbed Acres and Reclamation Bonds**, provides a comparison of the total disturbed acres and total reclamation bond for the northern region states.

Alaska has a relatively high disturbed acre to bond ratio. Alaska statutes are generally less stringent with respect to surface reclamation requirements, and Alaska does not add indirect costs to their reclamation bond amounts. Reclamation and closure issues relative to water quality and potential water treatment costs are not currently addressed in the bond amounts.

Montana has the lowest disturbed acreage to bond ratio of all states. Montana's surface reclamation requirements are generally more stringent, and indirect costs are added to the reclamation and closure bond estimate. Neutralization/detoxification is usually included in the reclamation and closure plan and cost estimate. In addition, there is significant bonding for water treatment at some mines, as discussed elsewhere in this study.

Idaho, South Dakota and Washington have lower disturbed acre to bond ratios. These states are generally more conservative with respect to surface reclamation requirements, and in all cases require indirect costs to be added to their reclamation bond amounts. In addition, various amounts are included in these states' bond amounts for detoxification/neutralization of gold heap leach dumps, as well as other measures intended to address potential water quality impacts and mine closure. These states presently require limited water treatment and associated tasks as a closure requirement at some mine sites.

State Practices as Demonstrated by Examination of Reclamation and Closure Bonding Case Studies

The various case studies include examples of both gold cyanide heap leach projects, and gold, copper and other base metals projects that employ milling and either leaching or flotation. The case studies are broken into those categories and their relative reclamation and closure bonding amounts are discussed in the following sections.

1.3.2 Gold Mining – Heap Leach Operations

1.3.2.1 Southern Region

Chart 1.3.3, **Heap Leach Project Reclamation and Closure Costs, Percent of Total Cost by Area** and Chart 1.3.4, **Heap Leach Reclamation and Closure, Percent of Disturbed Acreage by Area**, show the various costs and areas for the six southern region case studies that involved open pit gold mining and cyanide heap leaching operations.

As demonstrated in Chart 1.3.3, the percentage of total cost by area for heap leach project reclamation varies significantly from project to project. Leach dump reclamation and closure costs range from less than 10 percent to nearly 45 percent of the total cost. Waste rock dump reclamation similarly varies from less than 10 percent to greater than 30 percent of the total cost. Open pit reclamation varies from less than five percent of the total cost, to no cost. Facilities, roads, diversions and other costs are a

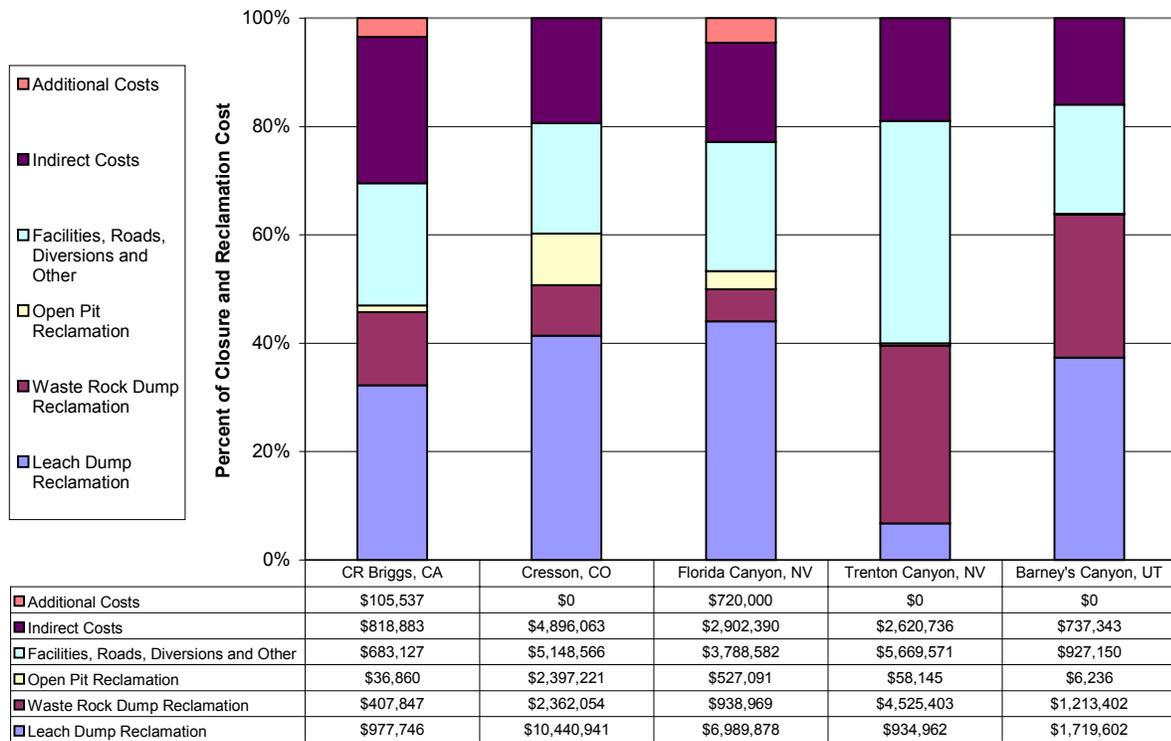
Hardrock Reclamation Bonding Practices
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significant cost factor, ranging from 20 percent to nearly 40 percent of total cost. Indirect costs range from 16 percent to 27 percent of total cost, and additional costs, where applicable, are five percent or less of the total cost.

The acreage disturbed as a percent of total project acreage for heap leach project reclamation is similarly variable in most respects, as shown in Chart 1.3.4. Leach dump reclamation acreages disturbed vary from less than 10 percent to more than 40 percent of total acreage, and in most cases are consistent with the cost of leach dump reclamation, except where substantial detoxification/neutralization costs are included, as is the case at Cresson, CO and Florida Canyon, NV.

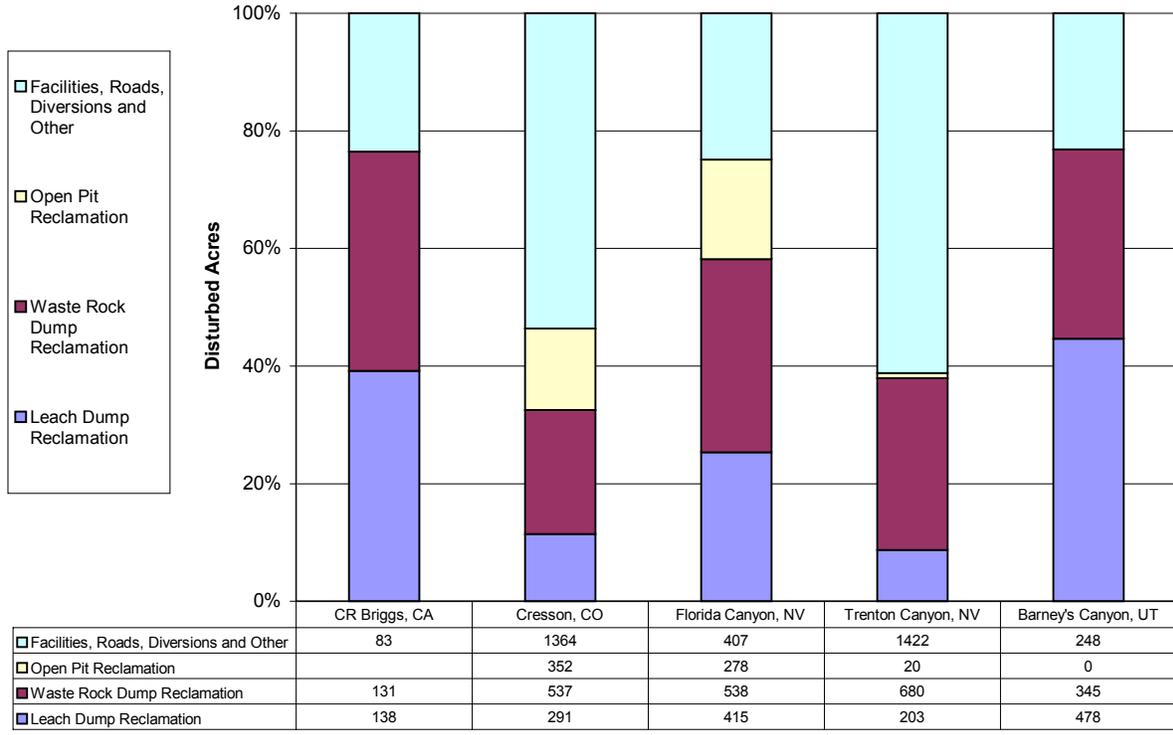
The acreage disturbed as a percent of total acreage by waste rock dump reclamation is highly consistent from project to project, ranging from 30 to 35 percent, and appears to be independent of the cost of waste rock dump reclamation. The acreage disturbed as a percent of total project acreage for facilities, roads, diversions and other areas ranges from about 25 percent to over 60 percent, with fairly consistent ratios of reclamation costs per acre disturbed between projects.

Chart 1.3.3 - Heap Leach Project Reclamation and Closure Costs
Percent of Total Cost by Area - Southern Region



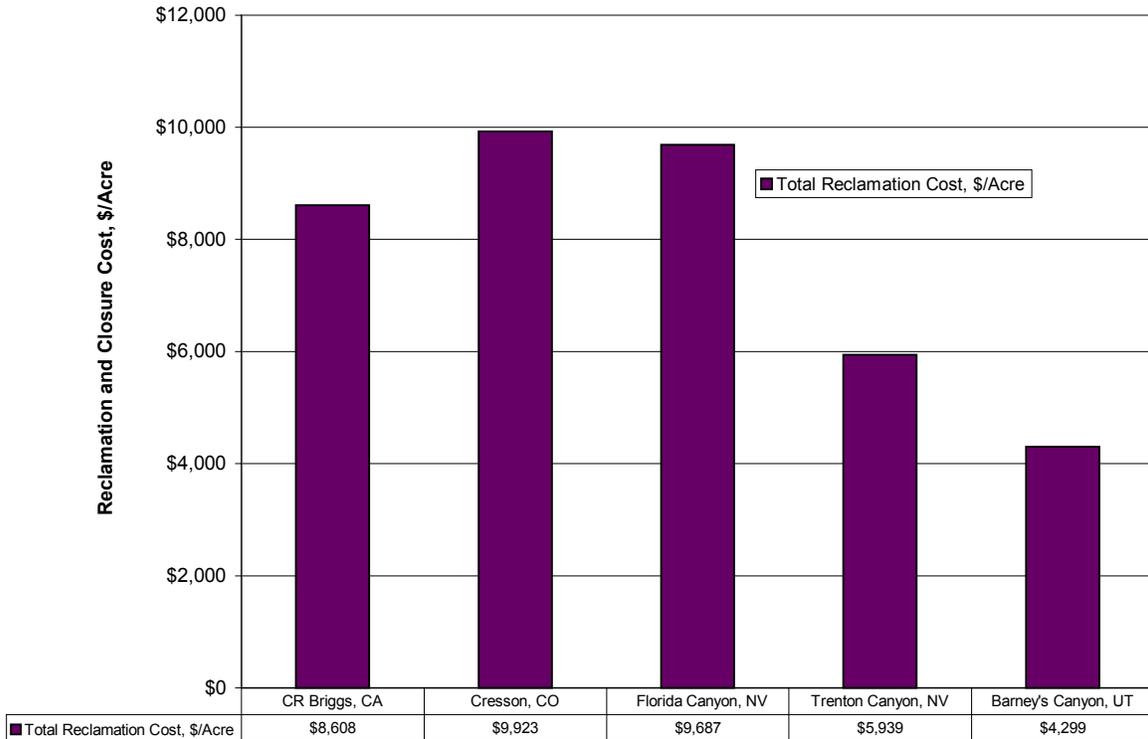
Mine

Chart 1.3.4 - Heap Leach Reclamation and Closure
Percent of Disturbed Acreage by Area - Southern Region



Mine

Chart 1.3.5 - Heap Leach Reclamation and Closure Costs
Cost/Acre Disturbed by Project - Southern Region



Mine

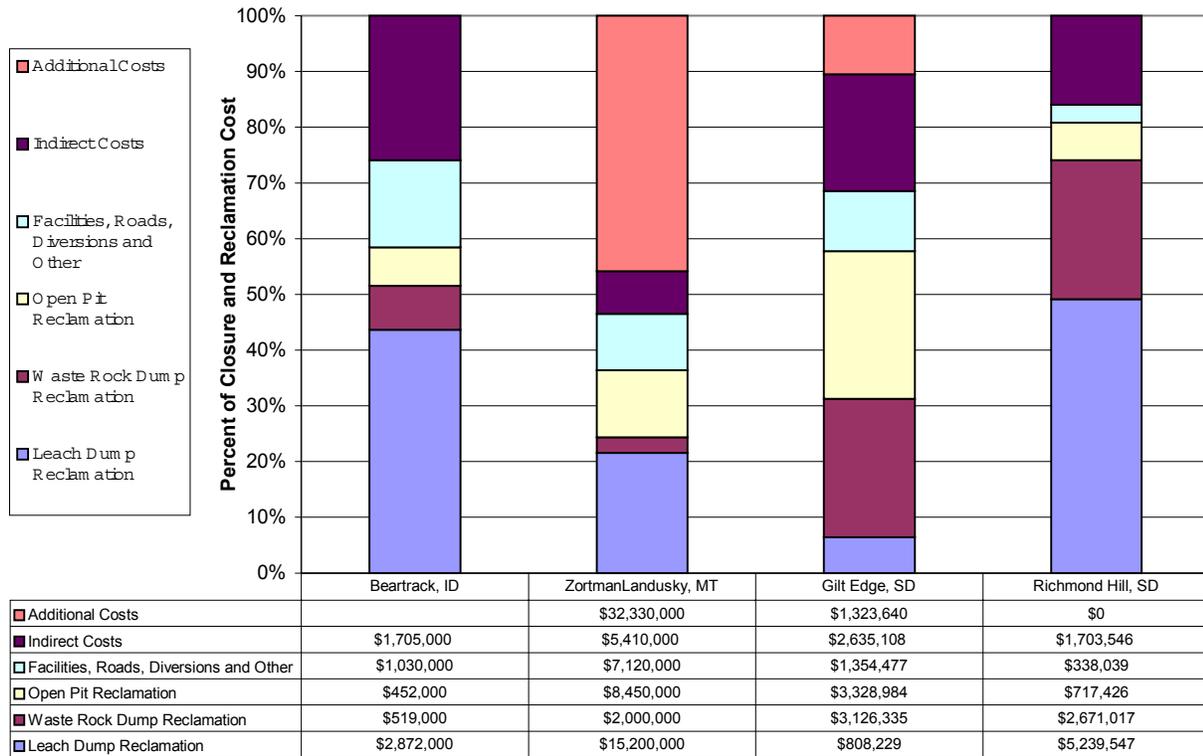
Chart 1.3.5, **Heap Leach Project Reclamation and Closure Costs, Cost/Acre Disturbed by Project**, shows the actual total reclamation and closure cost (direct + indirect + other) per acre for all reclamation and closure costs estimated, and acres disturbed, at each project. Chart 1.3.5 shows that the total heap leach project reclamation and closure costs on a total disturbed project area basis range from \$4,299 per acre to \$9,923 per acre. The cost of heap leach project reclamation at the Cresson, CO and Florida Canyon, NV mines is heavily influenced by heap leach neutralization costs. If neutralization/closure costs were similarly required at the Trenton Canyon, NV mine, its cost per acre for leach dump reclamation and total reclamation costs would be fairly similar to that of the Florida Canyon, NV mine.

1.3.2.2 Northern Region

Chart 1.3.6, **Heap Leach Project Reclamation and Closure Costs, Percent of Total Cost by Area** and Chart 1.3.7, **Heap Leach Reclamation and Closure, Percent of Disturbed Acreage by Area**, show the various costs and areas for the four northern region case studies that involved gold open pit mining and cyanide heap leaching operations.

As demonstrated in Chart 1.3.6, the percentage of total cost by area for heap leach project reclamation varies significantly from project to project. Leach dump reclamation and closure costs range from less than seven percent to nearly 50 percent of the total cost. Waste rock dump reclamation similarly varies from less than four percent to greater than 25 percent of the total cost. Open pit reclamation varies from seven percent to greater than 25 percent of the total cost. Facilities, roads, diversions and other costs are a significant cost factor, ranging from four percent to nearly 15 percent of total cost. Indirect costs range from nine percent to 26 percent of total cost. Additional costs, where applicable, are from 10 percent to nearly 50 percent of the total cost.

**Chart 1.3.6 - Heap Leach Project Reclamation and Closure Costs
 Percent of Total Cost by Area - Northern Region**



Mine

The acreage disturbed as a percent of total project acreage for heap leach project reclamation is similarly variable in most respects, as shown in Chart 1.3.7. Leach dump reclamation acreage disturbed varies from 18 percent to about 35 percent of total acreage, and in most cases is consistent with the cost of leach dump reclamation, except where substantial detoxification/neutralization costs are included. The acreage disturbed as a percent of total acreage by waste rock dump reclamation varies from five percent to nearly 40 percent of total acreage. The acreage disturbed as a percent of total project acreage for facilities, roads, diversions and other areas ranges from less than 20 percent to over 70 percent.

**Chart 1.3.7 - Heap Leach Reclamation and Closure
Percent of Disturbed Acreage by Area - Northern Region**

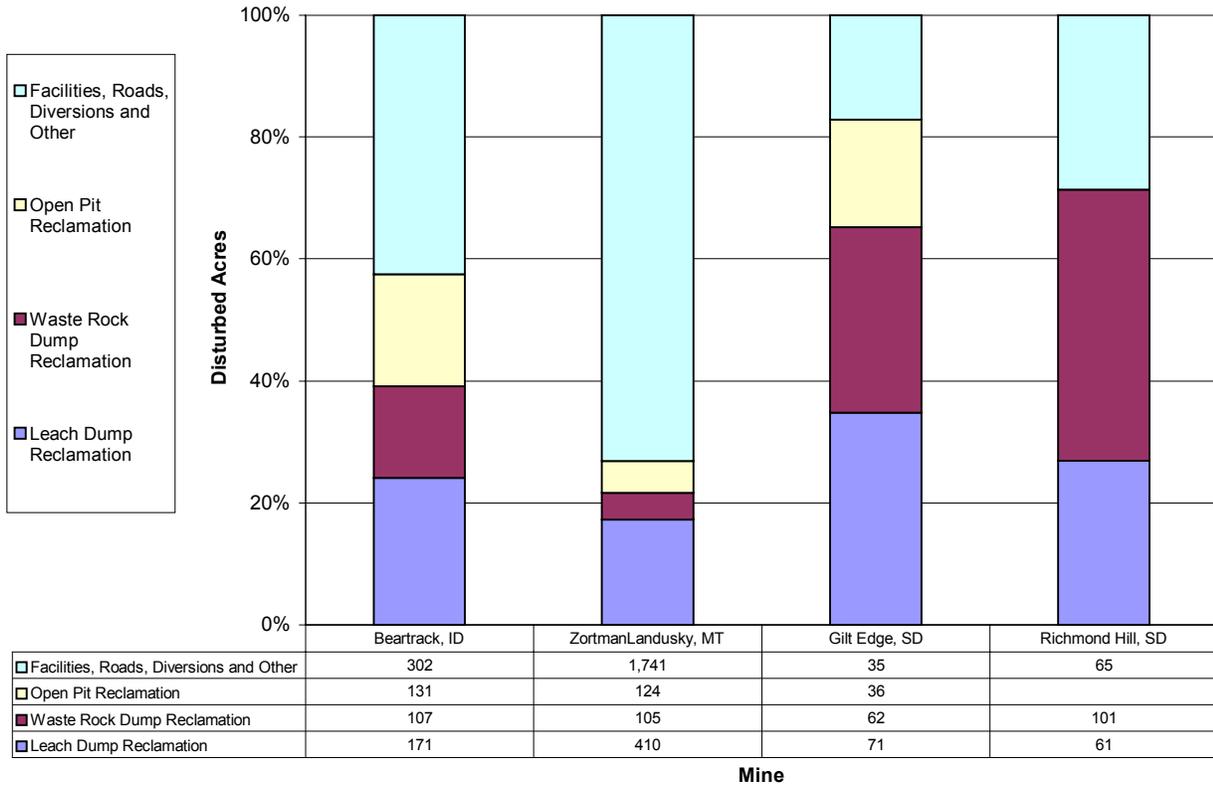
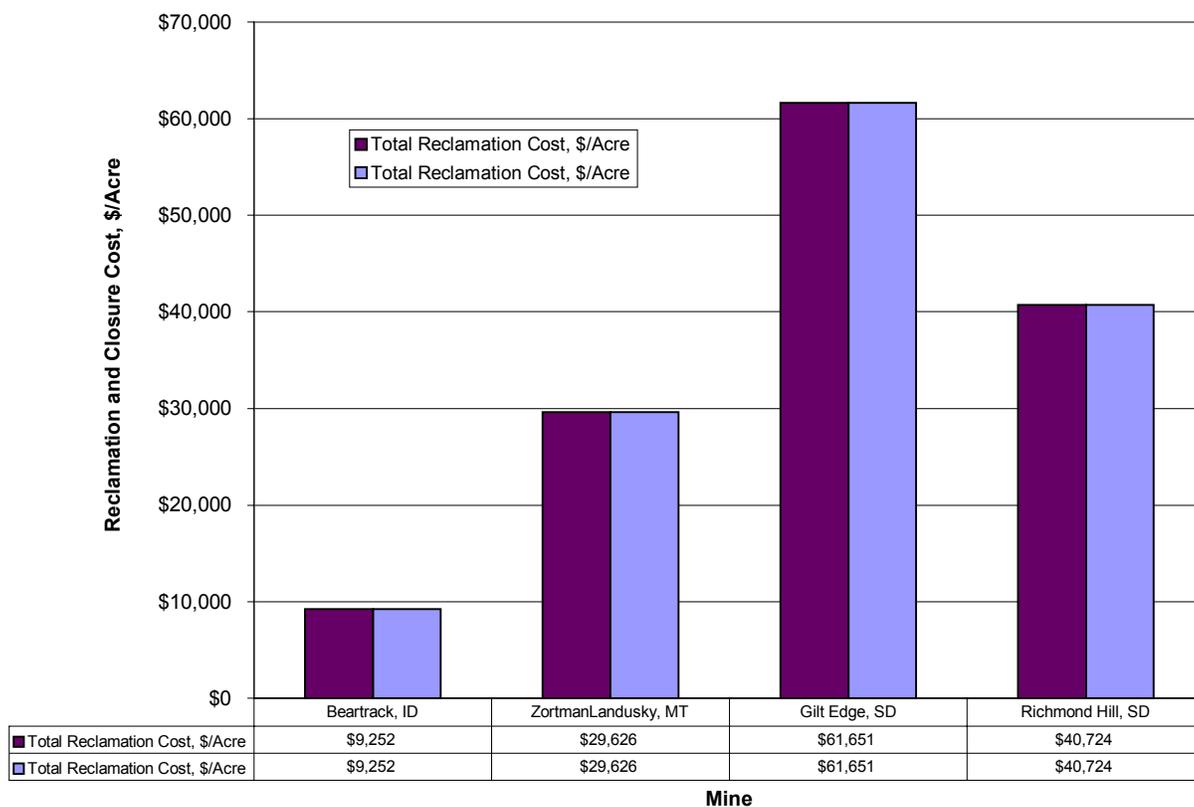


Chart 1.3.8, **Heap Leach Project Reclamation and Closure Costs, Cost/Acre Disturbed by Project**, shows the actual total reclamation and closure cost (direct + indirect + other) per acre for all estimated costs at each project.

Chart 1.3.8 shows that the total heap leach project reclamation and closure costs on a total disturbed project area basis range from \$9,252 per acre to \$61,651 per acre. The cost of heap leach project reclamation at the Richmond Hill mine is heavily influenced by heap leach neutralization costs.

**Chart 1.3.8 - Heap Leach Reclamation and Closure Costs
Cost/Acre Disturbed by Project - Northern Region**



1.3.3 Gold and Copper Mining – Leach and Milling Operations

1.3.3.1 Southern Region

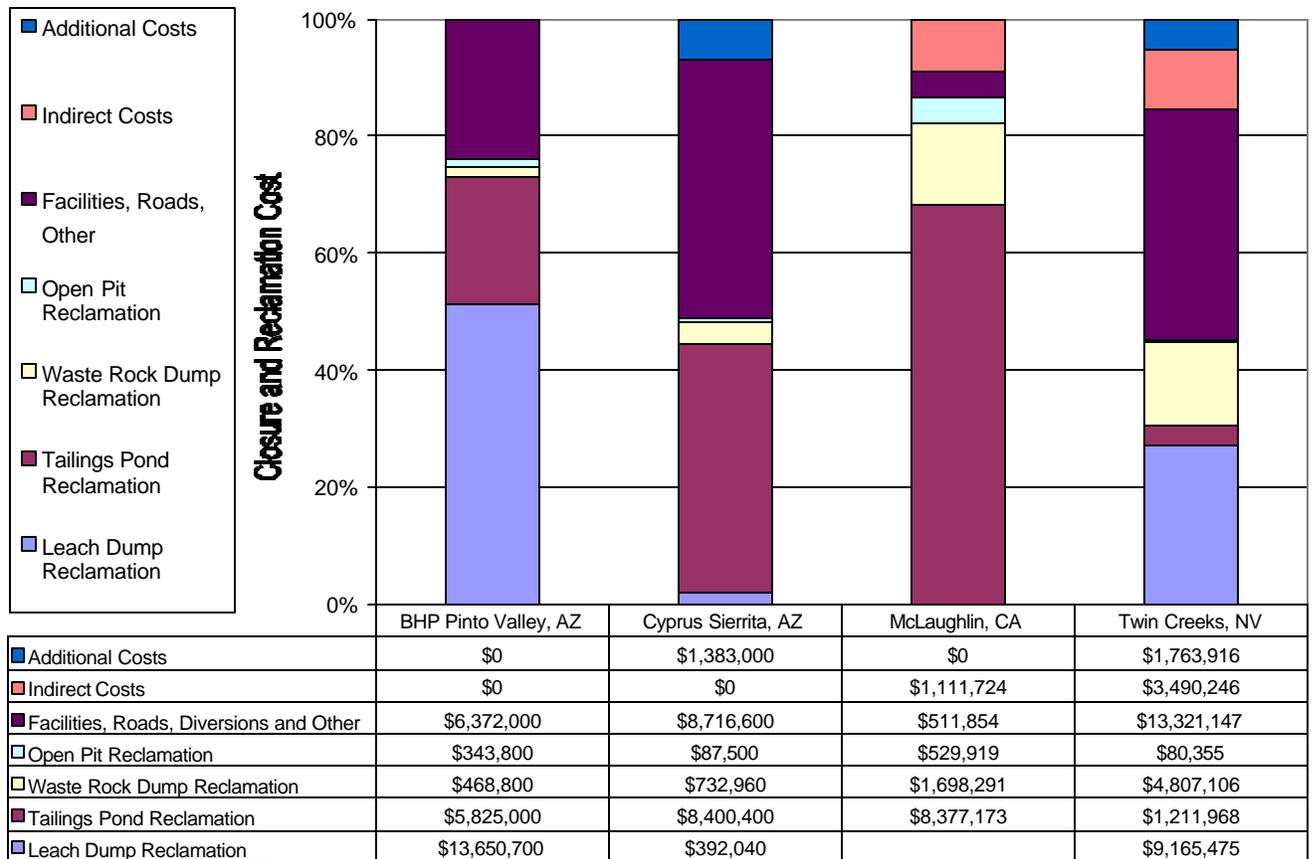
Chart 1.3.9, **Mill and Heap Leach Project Reclamation and Closure Costs, Percent of Total Cost by Area** and Chart 1.3.10, **Mill and Heap Leach Reclamation and Closure, Percent of Disturbed Acreage by Area**, show the various costs and areas for the four southern region case studies that involved gold open pit mining and cyanide heap leaching and milling operations, or open pit copper mining and acid leach and flotation milling operations.

Comparing Chart 1.3.9 and Chart 1.3.10 shows that although the disturbed acres as a percent of total reclamation and closure costs at the Cyprus Sierrita and BHP Pinto Valley mines varies from 10 percent to 25 percent respectively, the closure and reclamation cost as a percent of total cost varies more extremely between less than five percent to more than 50 percent respectively. This demonstrates the emphasis on leach dump reclamation costs at the BHP Pinto Valley operation versus those costs at the Cyprus Sierrita operation. The tailings pond disturbance area ranges from 35 percent to about 65 percent at the BHP Pinto Valley and Cyprus Sierrita mines respectively, while the cost for reclaiming those areas ranges from about 20 percent to 40 percent respectively. This in turn indicates that copper tailings dams on average are estimated to cost less per acre to reclaim and close than other operations. Waste rock dumps would occupy about 17 to 18 percent of the total disturbed acreage at

about 12 percent at the Cyprus Sierrita and BHP Pinto Valley operations respectively, with the estimated reclamation and closure cost for those areas ranging from about 25 percent to over 40 percent, respectively.

The McLaughlin, CA gold mine shows tailings pond disturbed acreage of about 38 percent of the total disturbed acreage, while tailings pond reclamation and closure costs are nearly 70 percent of the total reclamation cost because of the tailings pond cover costs. The tailings pond reclamation disturbed acreage is about 12 percent of the total disturbed acreage at the Twin Creeks, NV gold mine, and tailings dam reclamation is about four percent of the total reclamation cost. Waste rock dumps occupy about 34 percent and 52 percent of the total disturbed acres at the McLaughlin and Twin Creeks mines respectively, and the cost of waste rock dump reclamation is about 14 percent of the total reclamation cost in both cases. The facilities, roads, diversions and others areas of disturbed acres ranges from about 16 percent to 20 percent at the projects. The cost associated with reclamation ranges from about four percent at the McLaughlin mine, to about 25 percent at the Twin Creeks mine.

**Chart 1.3.9 - Mill and Heap Leach Project Reclamation and Closure Costs
Percent of Total Cost by Area - Southern Region**



Mine

**Chart 1.3.10 - Mill and Heap Leach Reclamation and Closure
Percent of Disturbed Acreage by Area - Southern Region**

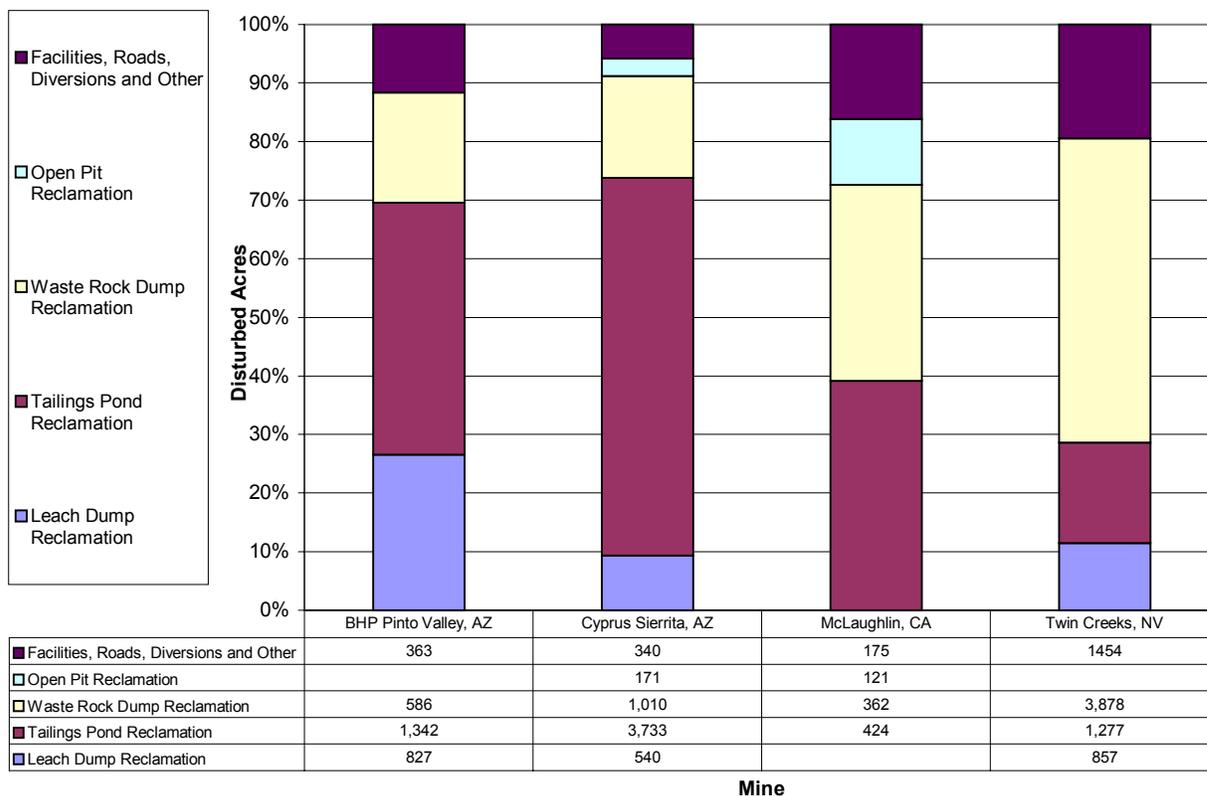
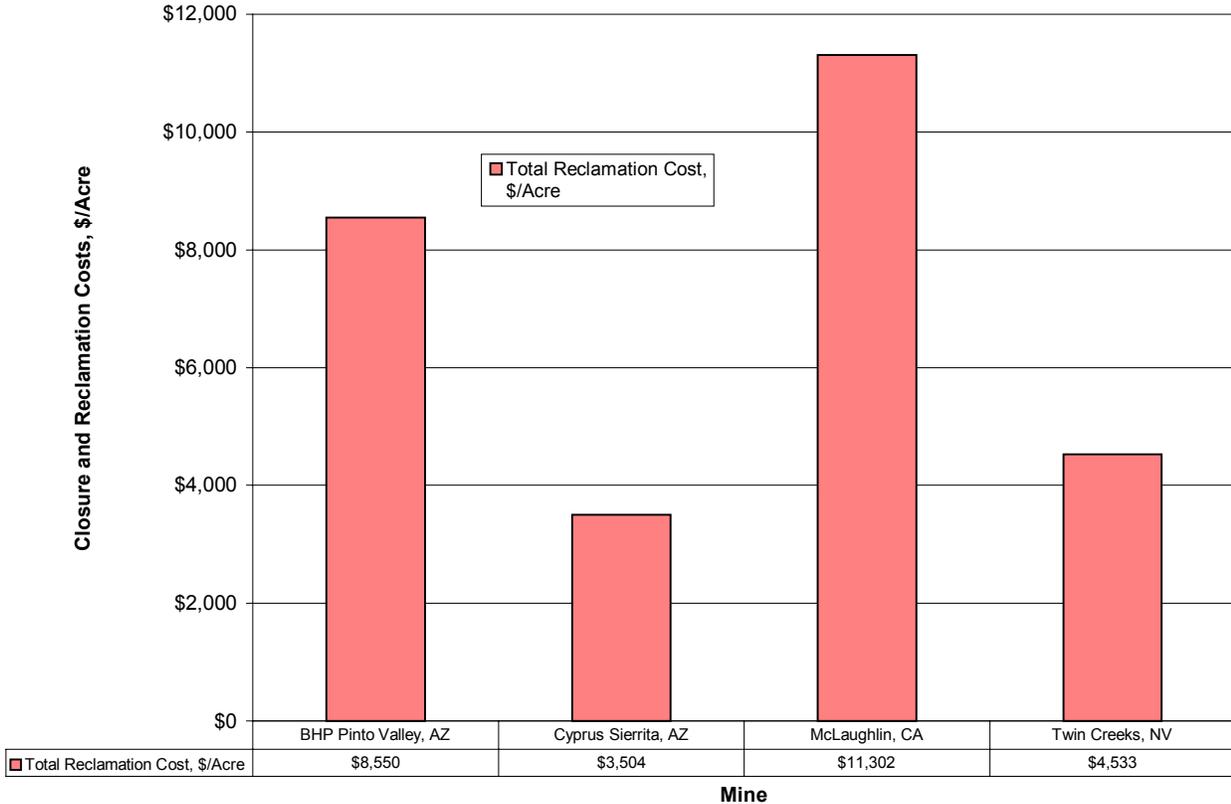


Chart 1.3.11, **Mill and Heap Leach Project Reclamation and Closure Costs, Cost/Acre Disturbed by Project**, shows the actual total reclamation and closure cost (direct + indirect + other) per acre for all the costs of each project.

Chart 1.3.11 shows the strong dissimilarity of total reclamation costs per total acre disturbed at the four different mines. The total cost of reclamation per disturbed acre is \$8,550 at the BHP Pinto Valley, AZ copper operation, compared to about \$3,500 at the Cyprus Sierrita, AZ operation. The difference is primarily due to different approaches and costs for leach pad reclamation and closure. The McLaughlin, CA and Twin Creeks, NV mines show similar dissimilarity between total reclamation costs per total acre, with average costs of \$11,300 per acre at the McLaughlin, CA mine, and approximately \$4,500 per acre at the Twin Creeks, NV mine. This difference is mainly due to different approaches and costs for tailings dam reclamation.

**Chart 1.3.11 - Mill and Heap Leach Reclamation and Closure Costs
Cost/Acre Disturbed by Area and Project - Southern Region**



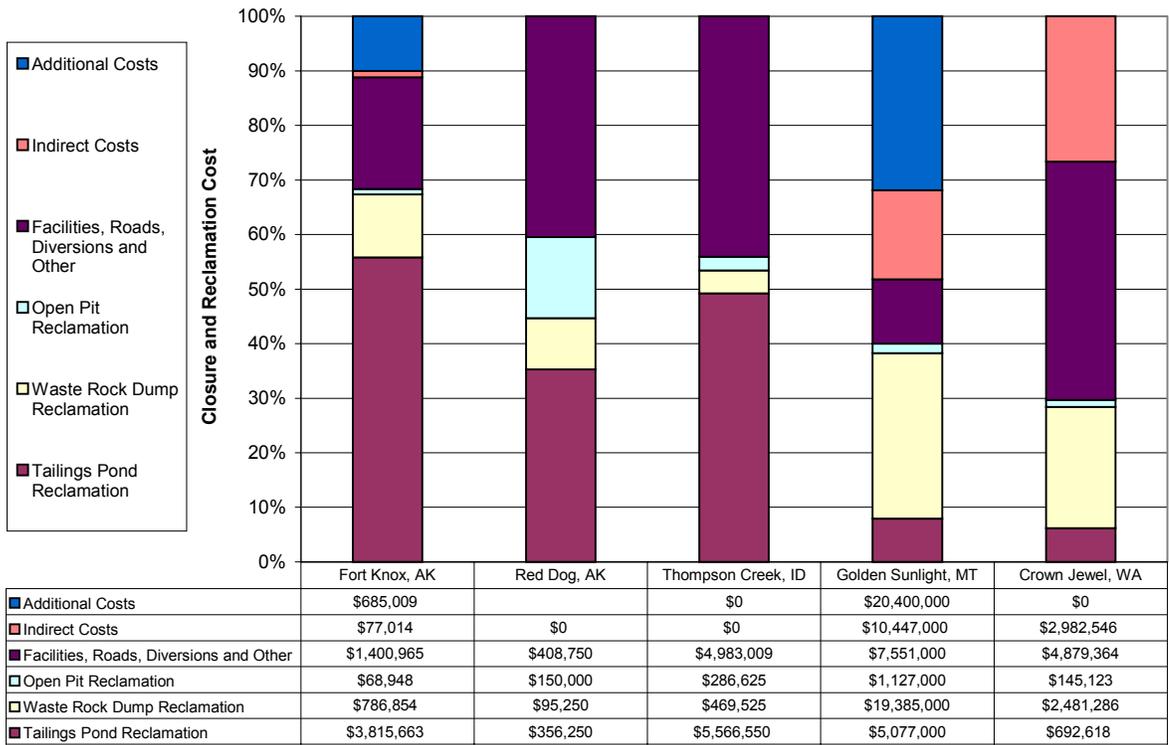
1.3.4 Gold and Base Metal Mining – Milling Operations

1.3.4.1 Northern Region

Chart 1.3.12, **Mill Project Reclamation and Closure Costs, Percent of Total Cost by Area** and Chart 1.3.13, **Mill Project Reclamation and Closure, Percent of Disturbed Acreage by Area**, show the various costs and areas for the five northern region case studies that involved gold open pit mining and either cyanide or flotation milling operations.

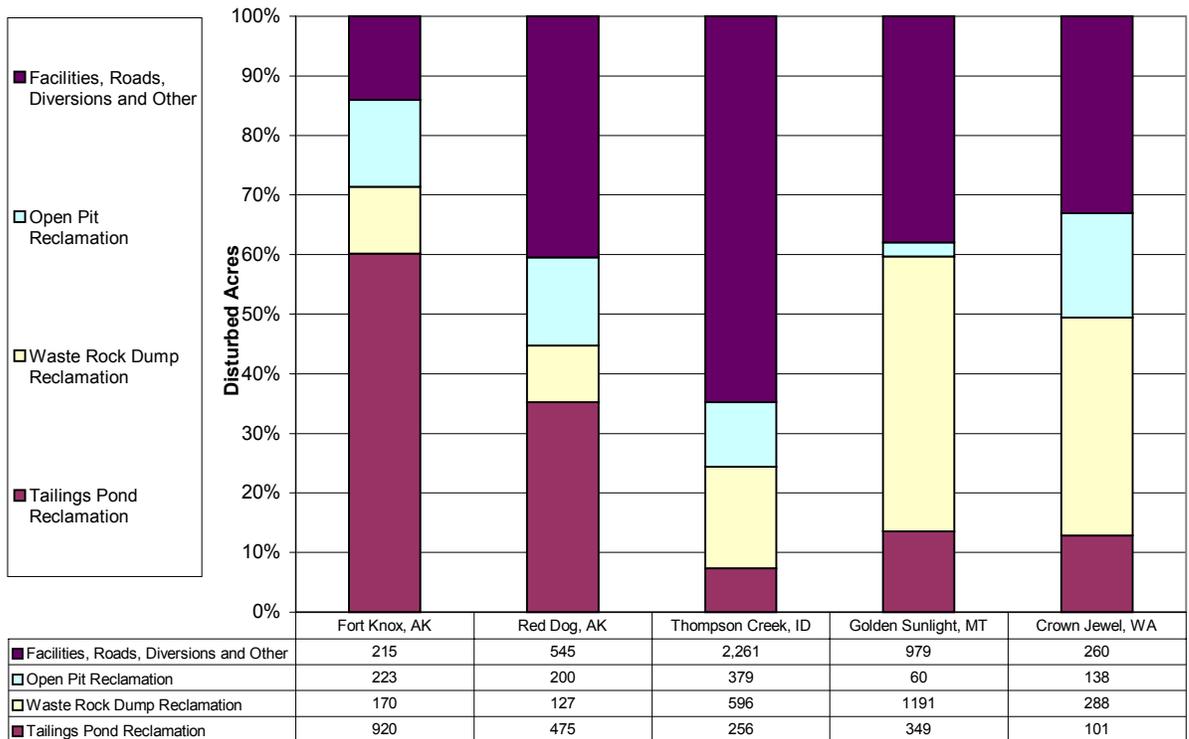
Comparing Chart 1.3.12 and Chart 1.3.13 shows that reclamation and closure costs are distributed proportionately to the acreage at the Fort Knox, AK and Red Dog, AK, Golden Sunlight, MT and Crown Jewel, WA projects. At the Thompson Creek, ID mine, the proportion spent on tailings is not in proportion to other cost areas. At Thompson Creek, less than 10 percent of the disturbed acreage, but nearly 50 percent of the costs, goes to tailings impoundment reclamation.

Chart 1.3.12 - Mill Project Reclamation and Closure Costs
Percent of Total Cost by Area - Northern Region



Mine

Chart 1.3.13 - Mill Project Reclamation and Closure
Percent of Disturbed Acreage by Area - Southern Region

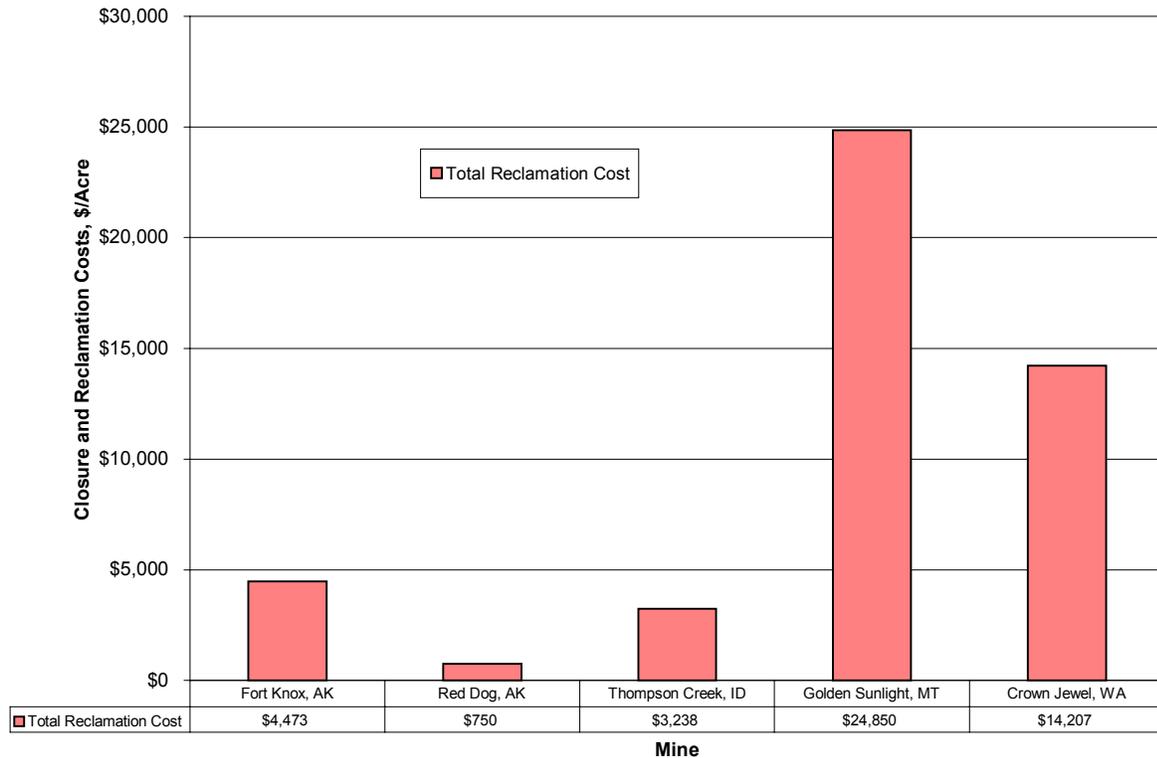


Mine

Chart 1.3.14, **Mill Project Reclamation and Closure Costs, Cost/Acre Disturbed by Project**, shows the actual total reclamation and closure cost (direct + indirect + other) per acre for all costs of each project.

Chart 1.3.14 shows the strong dissimilarity between the total reclamation costs per total acre disturbed at the five different mines. The lowest total cost of reclamation per disturbed acre is \$750 per acre at the Red Dog, AK, mine, the Alaska statutory per acre limit. The total cost of reclamation varies between approximately \$3,200 and \$4,500 at the Thompson Creek, ID and Fort Knox, AK mines, then jumps to \$14,000 per acre at the Crown Jewel, WA mine, and finally increases to nearly \$25,000 per acre at the Golden Sunlight mine. The difference is primarily due to statutory differences as well as mitigation at the Golden Sunlight, MT mine relative to AMD generation potential.

**Chart 1.3.14 - Mill Project Reclamation and Closure Costs
Cost/Acre Disturbed by Project - Northern Region**



Comparison of Reclamation Bonding Tasks

This section compares the costs exhibited by the various case studies for the most commonly definable reclamation bonding tasks of leach dump, waste dump, tailings dam, and mine pit closure and reclamation.

1.3.5 Leach Dump Reclamation and Closure

1.3.5.1 Southern Region

Chart 1.3.15, **Leach Dump Reclamation and Closure Costs, Total Cost by Task** shows the leach dump closure and reclamation costs for the various mines with leach dumps included as case studies in the southern region. The costs are broken down by the following tasks: detoxification/ neutralization, regrading and recontouring, installation of engineered covers, placement of topsoil or growth medium and revegetation. Additional information from the case studies is provided for comparison in Chart 1.3.16, **Leach Dump Reclamation and Closure, Disturbed Acreage by Mine**, and Chart 1.3.17, **Leach Dump Reclamation and Closure Costs, Cost/Acre by Task and Mine**.

**Chart 1.3.15 - Leach Dump Reclamation and Closure Costs
Total Cost by Task - Southern Region**

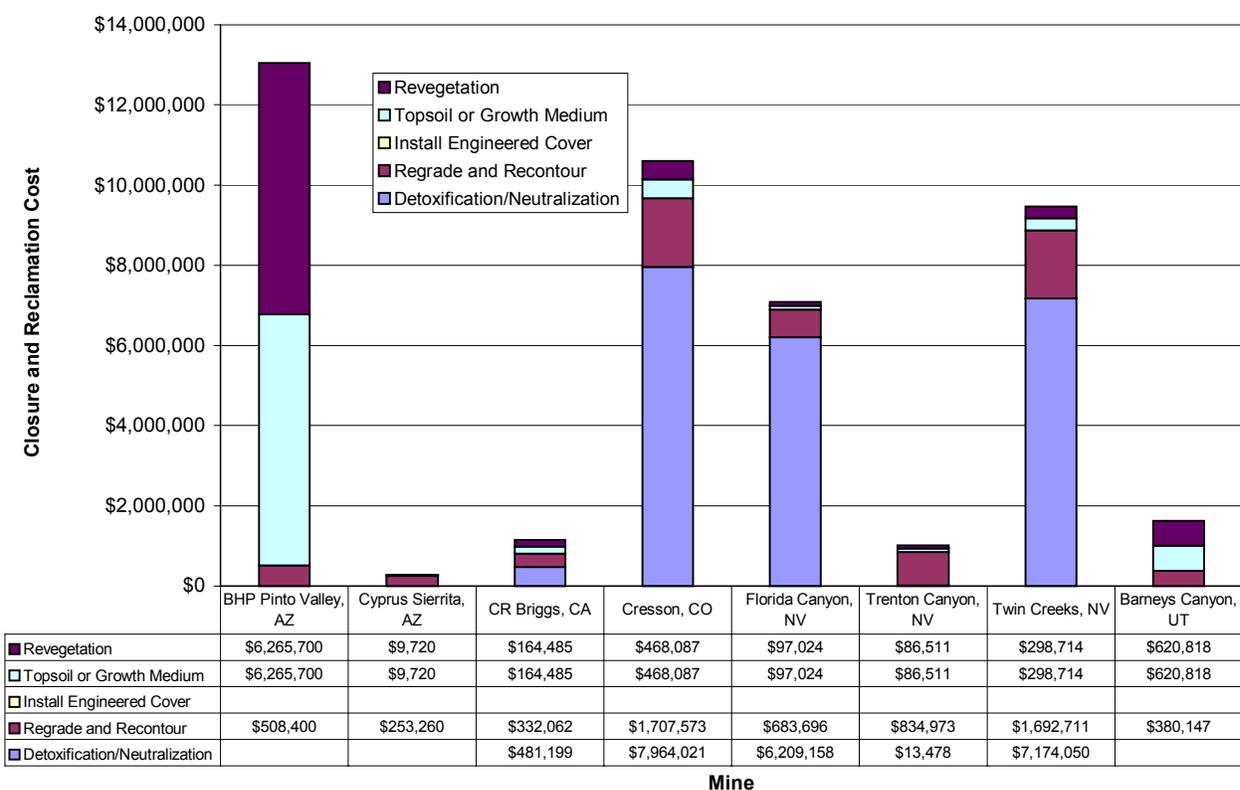
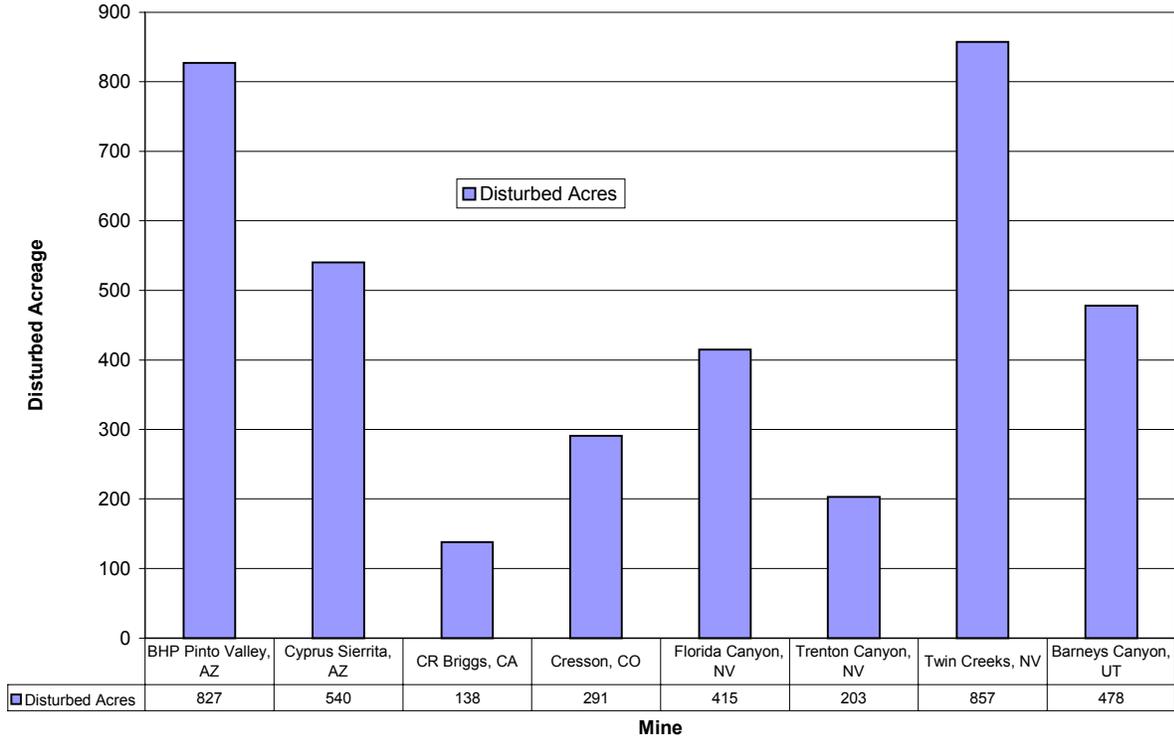


Chart 1.3.17 shows that the cost per acre for leach dump reclamation at the Cyprus Sierrita, AZ copper mine, at about \$700 per acre, and the cost at the Cresson, CO mine, at about \$36,000 per acre, represent the low and high spectrum of costs for all the leach dump facilities examined in the southern region.

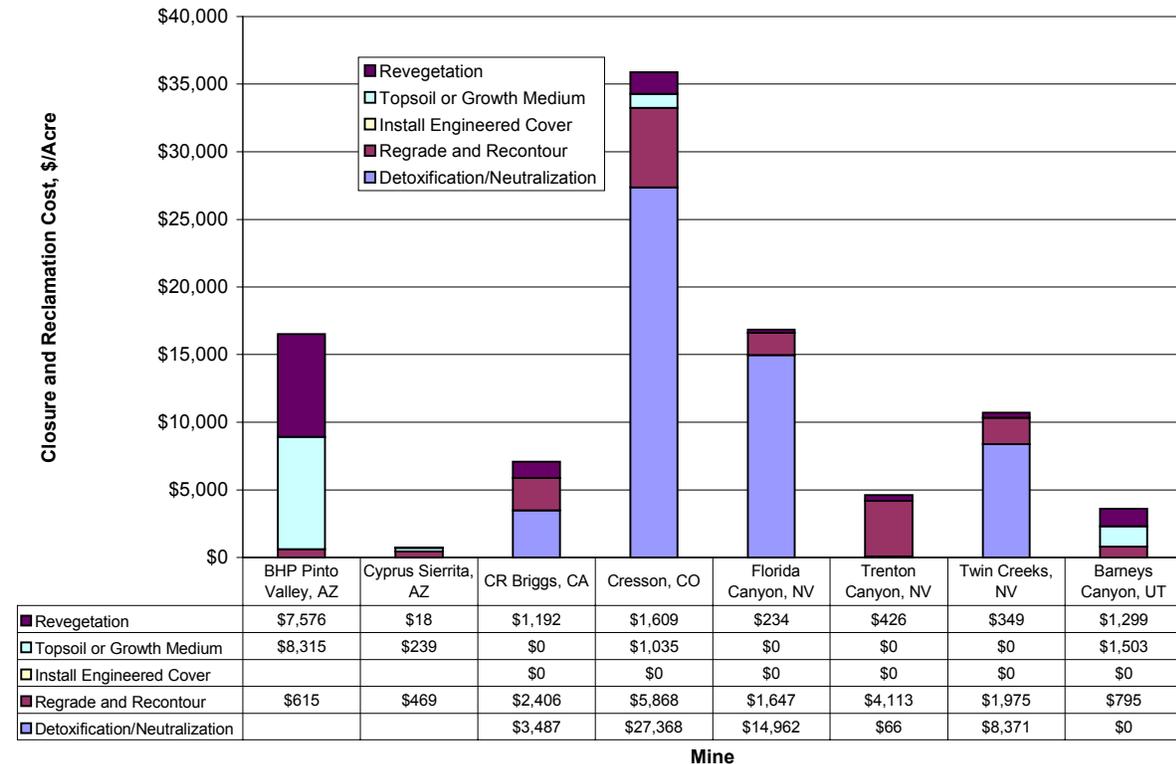
Reclamation and closure costs for gold heap leach dump detoxification/neutralization are highly significant when included in the reclamation and closure cost estimate. Cost in the category range from about \$7,000 per acre to \$27,400 per acre, and are most dependent upon the length of time and which parts of heap detoxification/neutralization operations are predicated in the cost estimate. The cost per acre is also highly dependent on whether the operation is a valley leach. At the Cresson, CO

heap leach operation, for example, the amount of material in the heap is relatively high with respect to the surface area of the heap leach facility. Leach dump detoxification/neutralization was not included in the Arizona copper mine case studies.

**Chart 1.3.16 - Heap Leach Reclamation and Closure
Disturbed Acreage by Mine - Southern Region**



**Chart 1.3.17 -Leach Dump Reclamation and Closure Costs
Cost/Acre Disturbed by Task and Mine - Southern Region**



Leach dump closure and reclamation costs for regrading and recontouring vary considerably both by state and by mine. The Arizona copper mines and the Barneys Canyon, UT gold mine cost for leach dump regrading and recontouring ranges from about \$470 to \$800 per acre, respectively. Leach dump regrading and recontouring costs at other gold mines range from about \$1,650 per acre to \$4,100 per acre at the Nevada mines, to about \$2,400 per acre at the Briggs, CA mine. At the Cresson, CO mine, these costs are \$5,870 per acre.

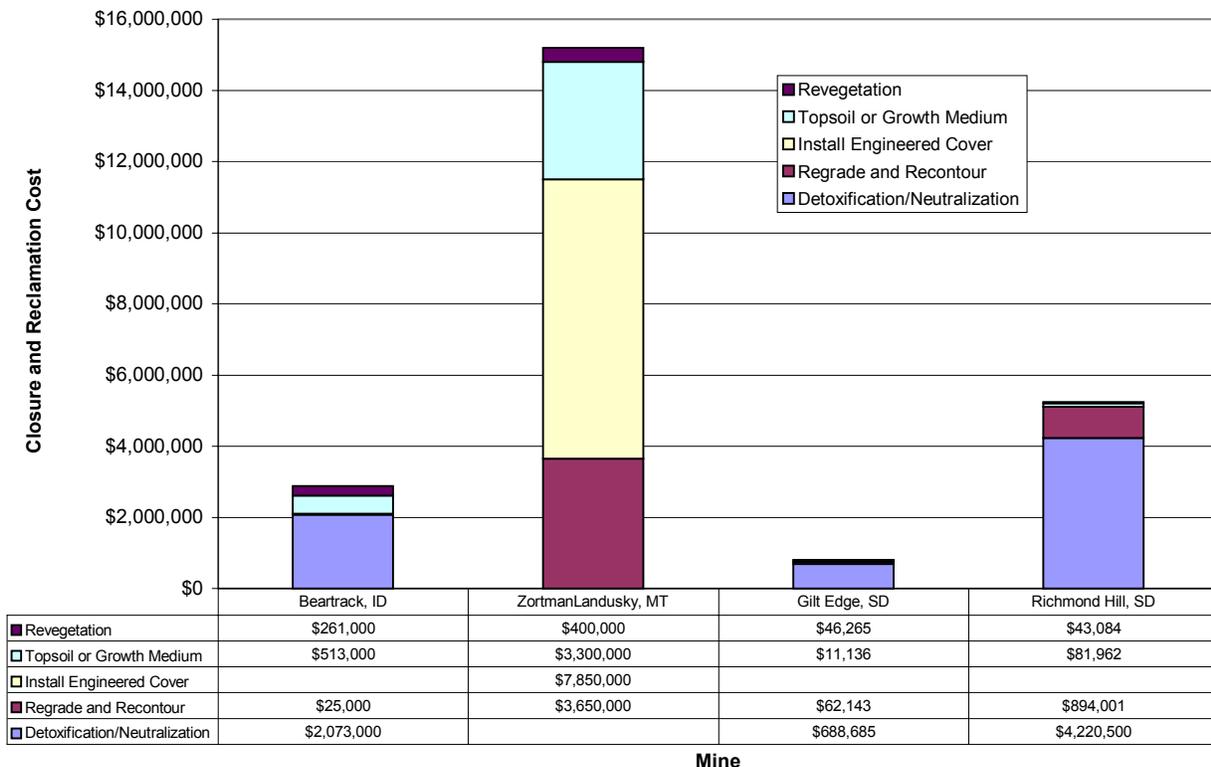
None of the mines studied in the southern region employ engineered covers in their reclamation and closure plan designs.

The application of topsoil or growth medium in leach dump reclamation was not included in the California and Nevada case studies. The Cresson, CO mine included topsoil or growth medium application at about \$1,050 per acre while the Barneys Canyon, UT gold mine included topsoil or growth medium application at about \$1,500 per acre. The two Arizona copper mines also included topsoil or growth medium application, but at a considerable difference in cost: \$8,315 per acre at the BHP Pinto Valley mine versus \$239 per acre at the Cyprus Sierrita mine. Revegetation costs for reclamation of leach dumps were also estimated at highly varying costs, ranging from \$18 per acre at the Cyprus Sierrita, AZ copper mine to between \$230 - \$430 per acre at the Nevada gold mines, \$1,200 - \$1,300 at the Briggs, CA and Barneys Canyon, UT gold mines, \$1,600 at the Cresson, CO gold mine, and over \$7,500 per acre at the BHP Pinto Valley, AZ copper mine.

1.3.5.2 Northern Region

Chart 1.3.18, **Leach Dump Reclamation and Closure Costs, Total Cost by Task** shows the leach dump closure and reclamation costs for the various mines with leach dumps included as case studies in the northern region. The costs are broken down by the task: detoxification/ neutralization, regrading and recontouring, installation of engineered covers, placement of topsoil or growth medium and

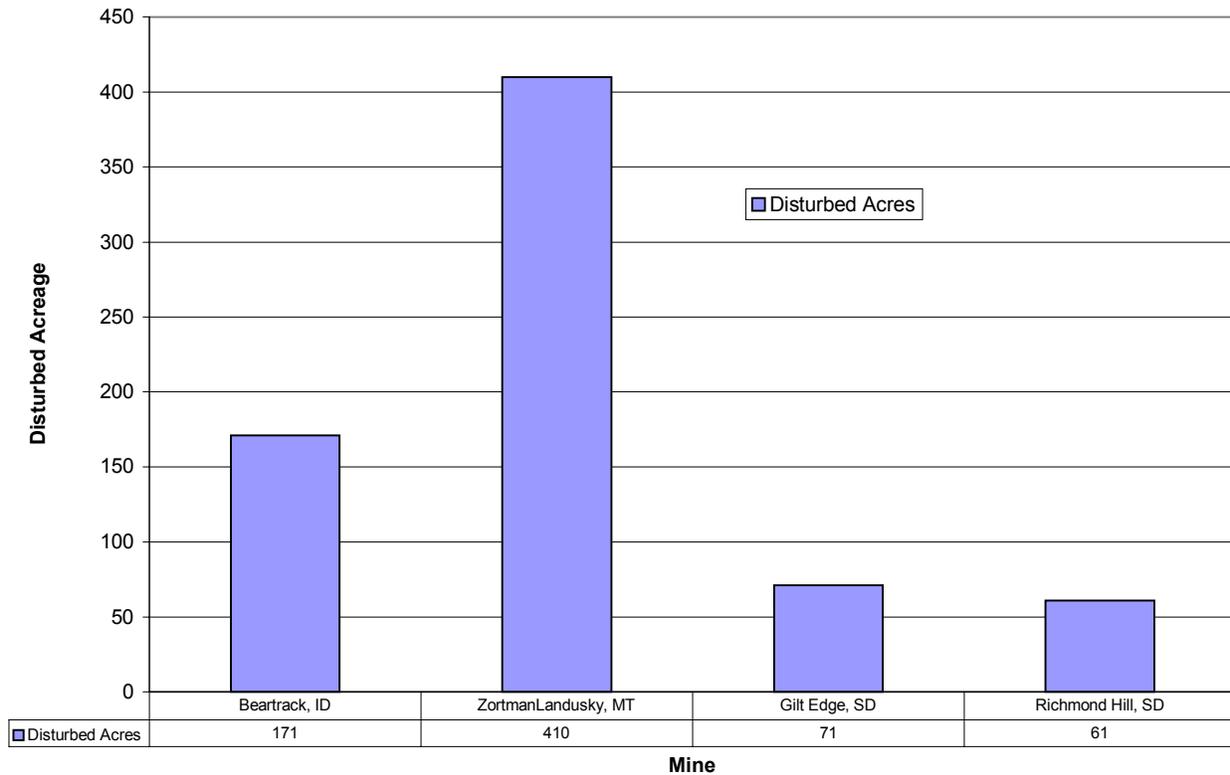
Chart 1.3.18 - Leach Dump Reclamation and Closure Costs
Total Cost by Task - Northern Region



revegetation. Additional information from the case studies is provided for comparison in Chart 1.3.19, **Leach Dump Reclamation and Closure, Disturbed Acreage by Mine**, and Chart 1.3.20, **Leach Dump Reclamation and Closure Costs, Cost/Acre by Task and Mine**.

Chart 1.3.20 shows that the lowest and highest cost per acre for leach dump reclamation are represented by the Gilt Edge, SD mine and the Richmond Hill, SD mine, at \$12,000 and \$85,000 per acre, respectively.

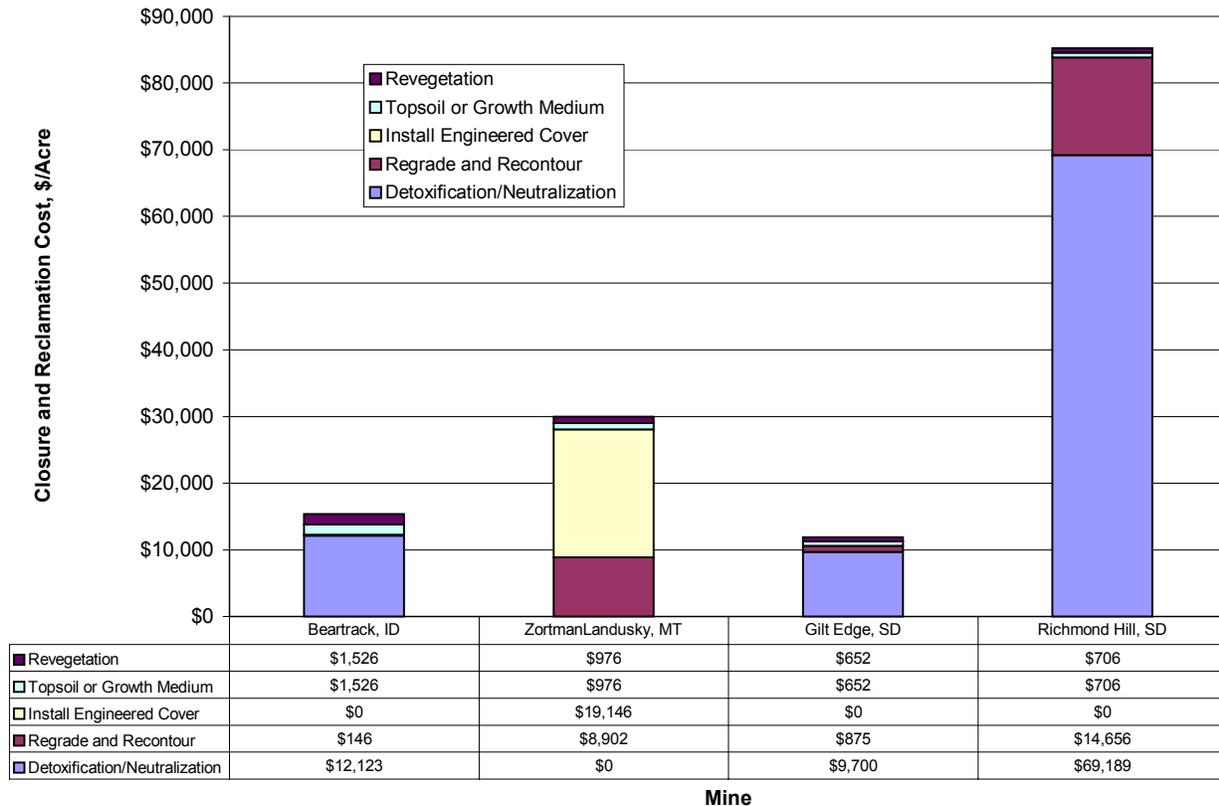
**Chart 1.3.19 - Leach Dump Reclamation and Closure
Disturbed Acreage by Mine - Northern Region**



Reclamation and closure costs for gold heap leach dump detoxification/neutralization were highly significant when included in the reclamation and closure cost estimate. Costs in the category range from around \$10,000 per acre to around \$69,000 per acre, and are mostly dependent upon the length of time and which parts of heap detoxification/neutralization operations are predicated in the cost estimate. The cost per acre is also highly dependent on whether the operation is a valley leach. For example, at the Richmond Hill heap leach operation, the amount of material in the heap is relatively high with respect to the surface area of the heap leach facility.

Leach dump closure and reclamation costs for regrading and recontouring also vary considerably by state and by mine. Regrading and recontouring at the Beartrack, ID mine is estimated at \$146 per acre, while the Richmond Hill, SD mine is one hundred percent higher at \$14,656 per acre.

**Chart 1.3.20 -Leach Dump Reclamation and Closure Costs
Cost/Acre Disturbed by Task and Mine - Northern Region**



Engineered covers were employed in the Zortman and Landusky mine reclamation plans to provide source control to acid mine drainage generating materials at a cost of approximately \$19,000 per acre.

Topsoil or growth medium in heap leach dump reclamation ranged from \$652 per acre to \$1,526 per acre. Revegetation costs ranged similarly from \$652 per acre to \$1,526 per acre.

1.3.6 Tailings Dam Reclamation and Closure

1.3.6.1 Southern Region

Chart 1.3.21, **Tailings Dam Reclamation and Closure Costs, Total Cost by Task** shows the tailings dam closure and reclamation costs for the various mines with tailings dams included as case studies in the southern region. The costs are broken down by task: detoxification/ neutralization, regrading and recontouring, installation of engineered covers, placement of topsoil or growth medium and revegetation. Additional information from the case studies is provided for comparison in Chart 1.3.22, **Tailings Dam Reclamation and Closure, Disturbed Acreage by Mine**, and Chart 1.3.23, **Tailings Dam Reclamation and Closure Costs, Cost/Acre by Task and Mine**.

Chart 1.3.23 shows the cost per acre for tailings dam reclamation and closure at the Cyprus Sierrita copper mine, at about \$2,200 per acre, and the cost at the BHP Pinto Valley copper mine at about \$4,341 per acre. The low and high end of the spectrum for tailings dam reclamation and closure occur respectively at the Twin Creeks, NV gold mine, with tailings dam reclamation costs of about \$950 per acre, and the McLaughlin gold mine, with costs of nearly \$20,000 per acre.

Chart 1.3.21 - Tailings Dam Reclamation and Closure Costs
Total Cost by Task - Southern Region

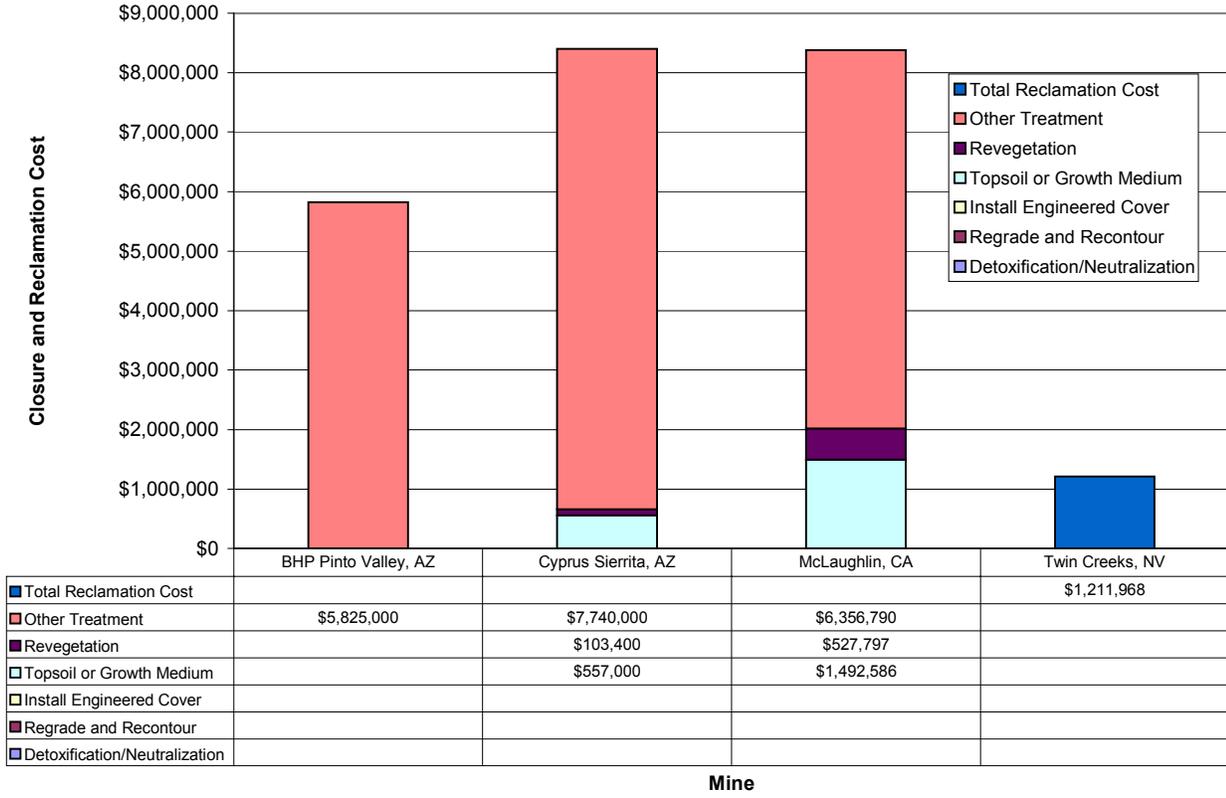
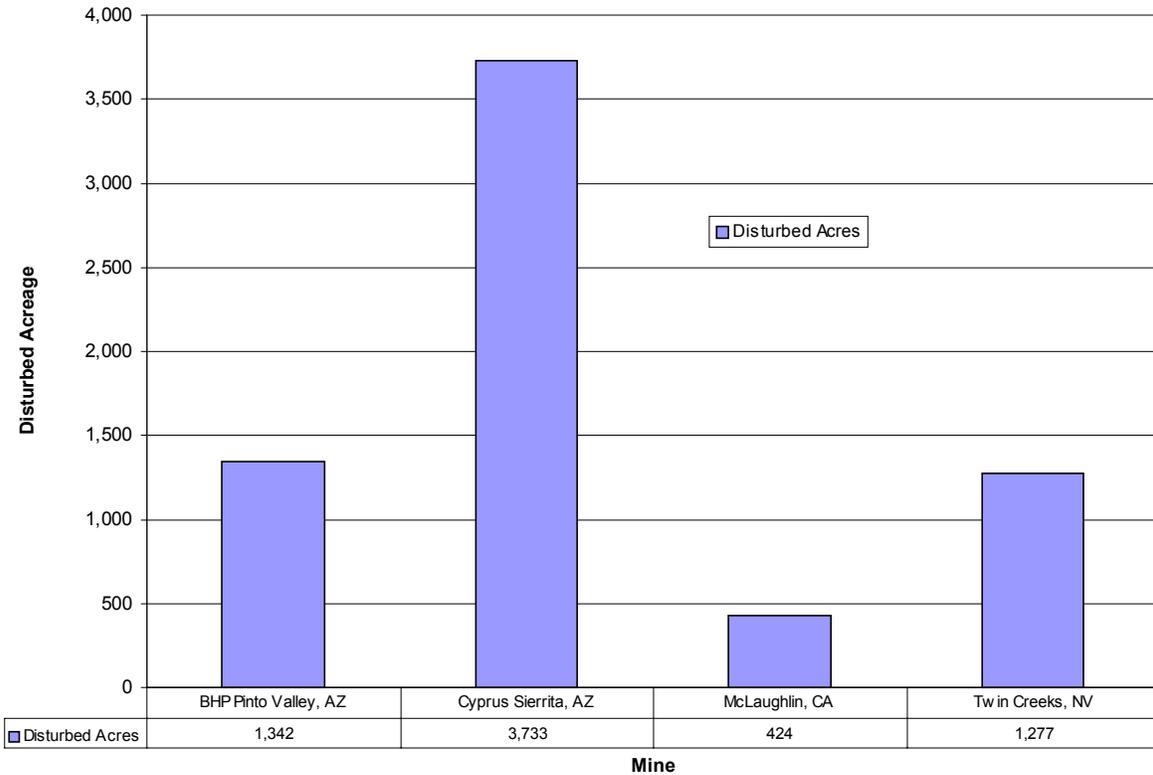


Chart 1.3.22 - Tailings Dam Reclamation and Closure
Disturbed Acreage by Mine - Southern Region

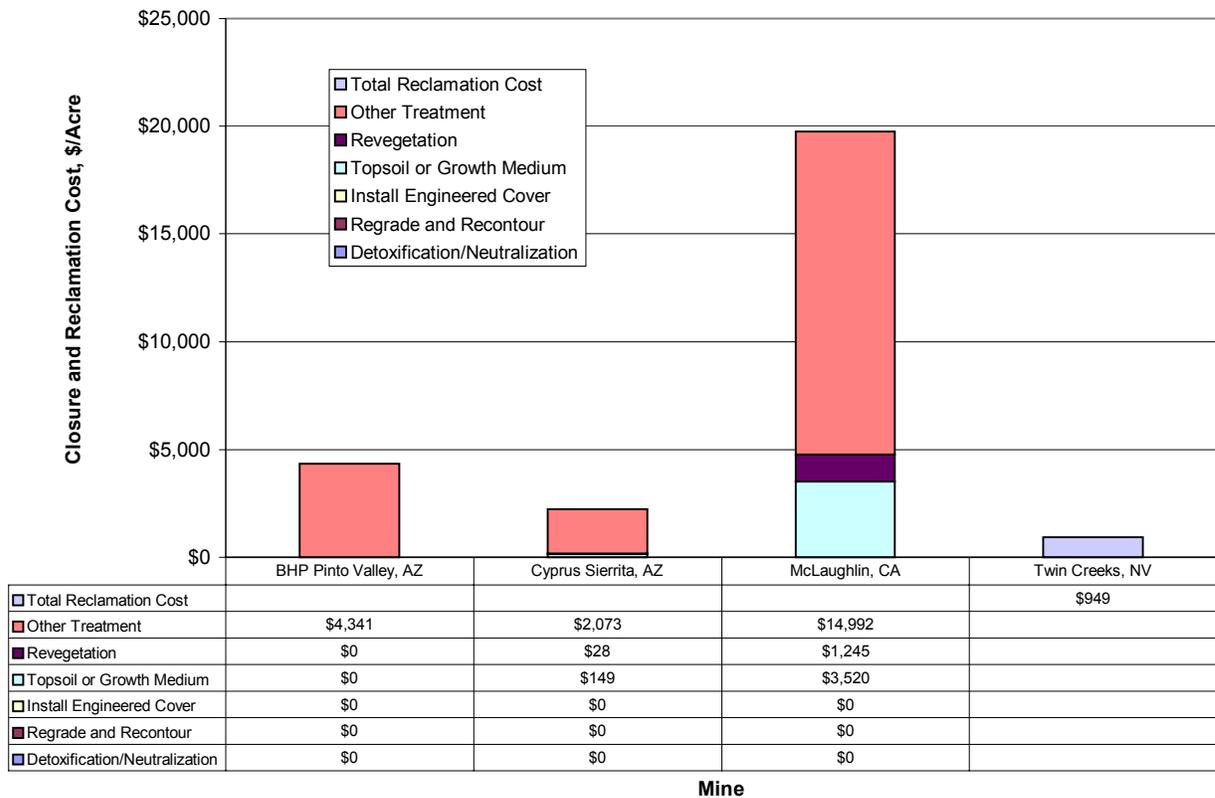


None of the southern region case studies with tailings dam reclamation includes detoxification/neutralization, regrading and recontouring or installation of engineered covers in their reclamation and closure plans and cost estimates.

The application of topsoil or growth medium (six inches on 20 percent of the tailings dam area) was included in the Cyprus Sierrita reclamation and closure plan at an estimated cost of \$149 per acre. The McLaughlin mine would include one foot of topsoil or growing medium over the entire tailings dam, at a cost of \$3,520 per acre. The same two mines also included revegetation in their reclamation plans, at a cost of \$28 (over 20 percent of the tailings dam area) per acre, and \$1,245 per acre, respectively.

Other treatment costs for tailings dam reclamation and closure at the various mines included the EMPACT and similar cattle grazing methods at the BHP Pinto Valley and Cyprus Sierrita copper mines at a cost of \$4,341 per acre and \$2,073 per acre, respectively. The McLaughlin, CA gold mine reclamation and closure plan calls for \$14,992 per acre in “closure” costs for the tailings dam, which is assumed to include a two-foot capillary break layer specified elsewhere in the plan. The two-foot capillary break layer might also be considered an engineered cover.

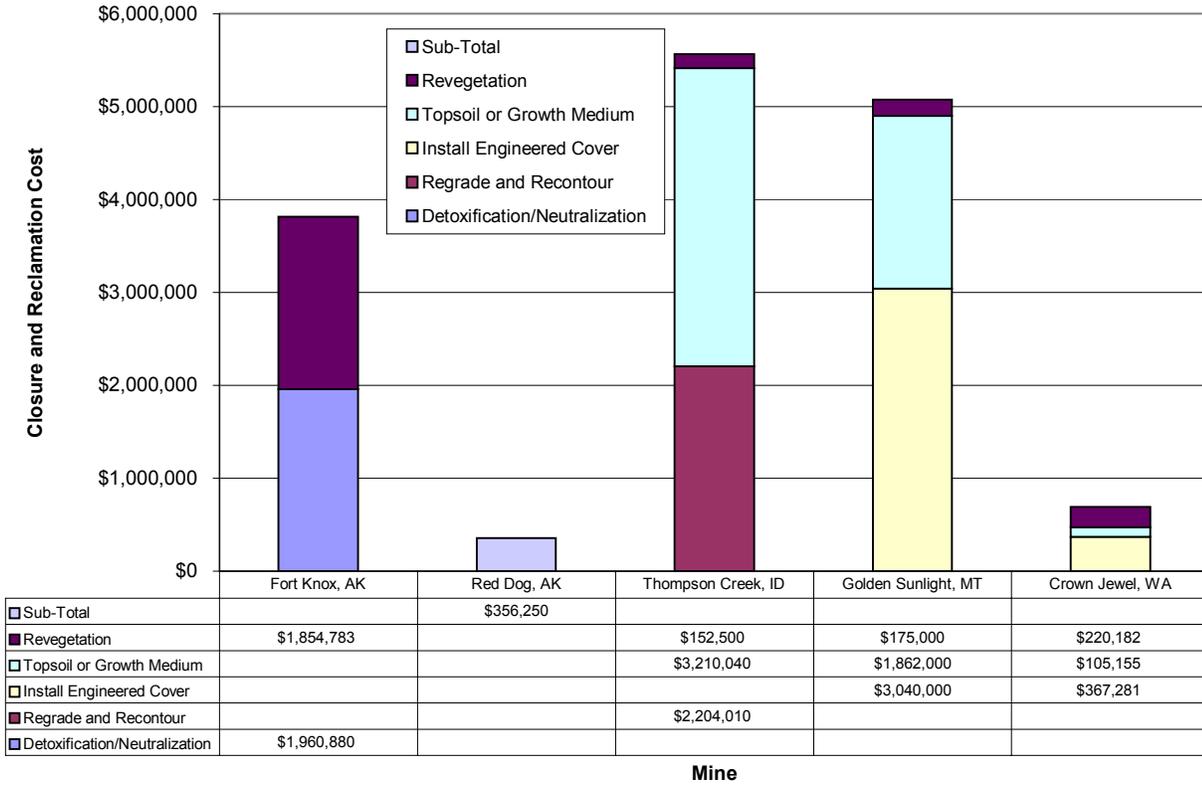
**Chart 1.3.23 - Tailings Dam Reclamation and Closure Costs
 Cost/Acre Disturbed by Task and Mine - Southern Region**



1.3.6.2 Northern Region

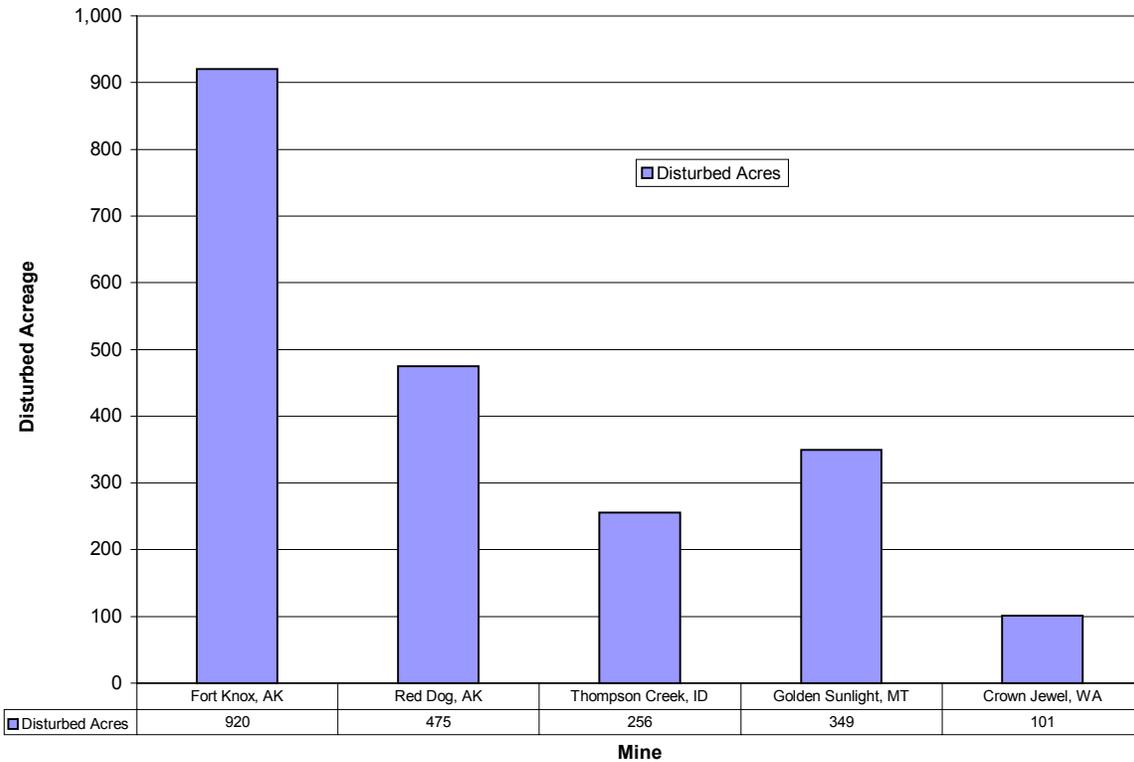
Chart 1.3.24, **Tailings Dam Reclamation and Closure Costs, Total Cost by Task**, shows the tailings dam closure and reclamation costs for the various mines with tailings dams included as case studies in the northern region. The costs are broken down by task: detoxification/neutralization, regrading and recontouring, installation of engineered covers, placement of topsoil or growth medium and

Chart 1.3.24 - Tailings Dam Reclamation and Closure Costs
Total Cost by Task - Northern Region



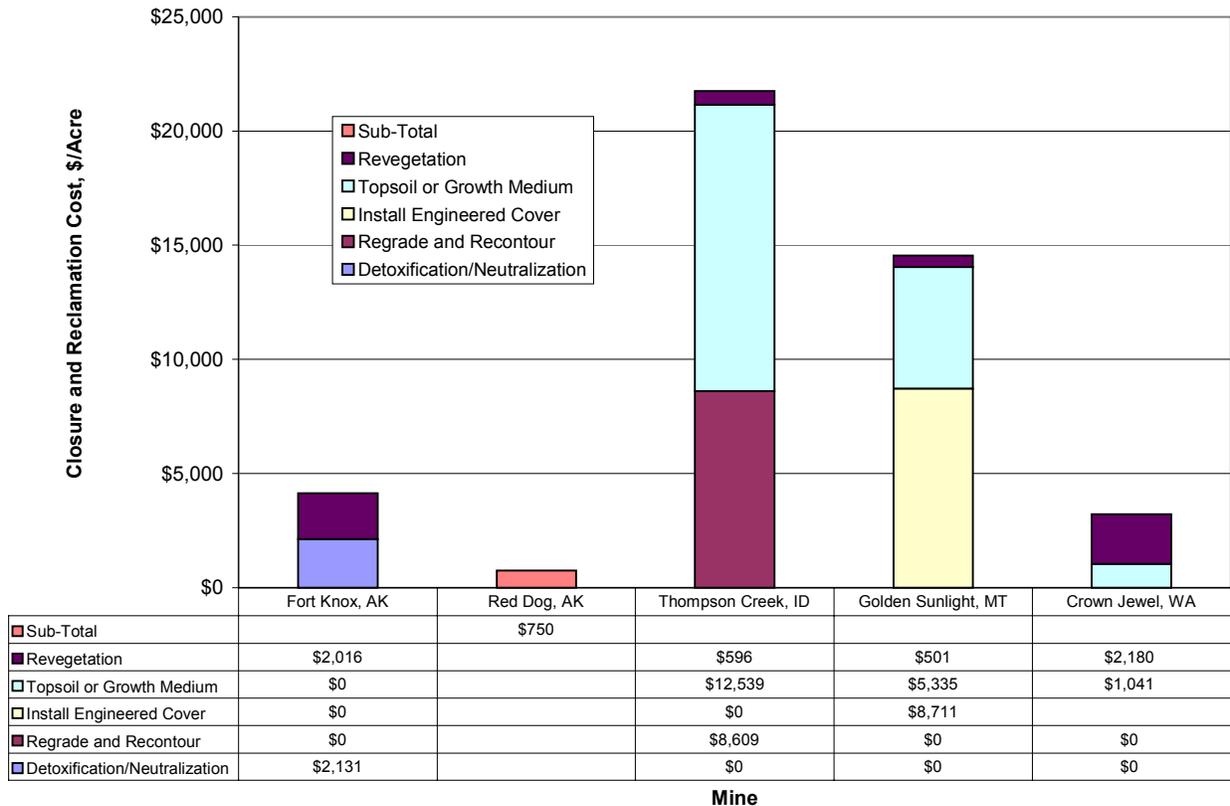
Mine

Chart 1.3.25 - Tailings Dam Reclamation and Closure
Disturbed Acreage by Mine - Northern Region



Mine

**Chart 1.3.26 - Tailings Dam Reclamation and Closure Costs
Cost/Acre Disturbed by Task and Mine - Northern Region**



revegetation. Additional information from the case studies is provided for comparison in Chart 1.3.25, **Tailings Dam Reclamation and Closure, Disturbed Acreage by Mine** and Chart 1.3.26, **Tailings Dam Reclamation and Closure Costs, Cost/Acre by Task and Mine**. Chart 1.3.26 shows that the cost per acre for tailings dam reclamation and closure ranges from the \$750 per acre state statutory limit at the Red Dog, AK mine to approximately \$21,500 at the Thompson Creek, ID mine. Costs at the Crown Jewel, WA and Fort Knox, AK impoundments are \$3,200 and \$4,100 respectively, while the cost per acre for tailings dam reclamation and closure is approximately \$14,500 at the Golden Sunlight, MT mine.

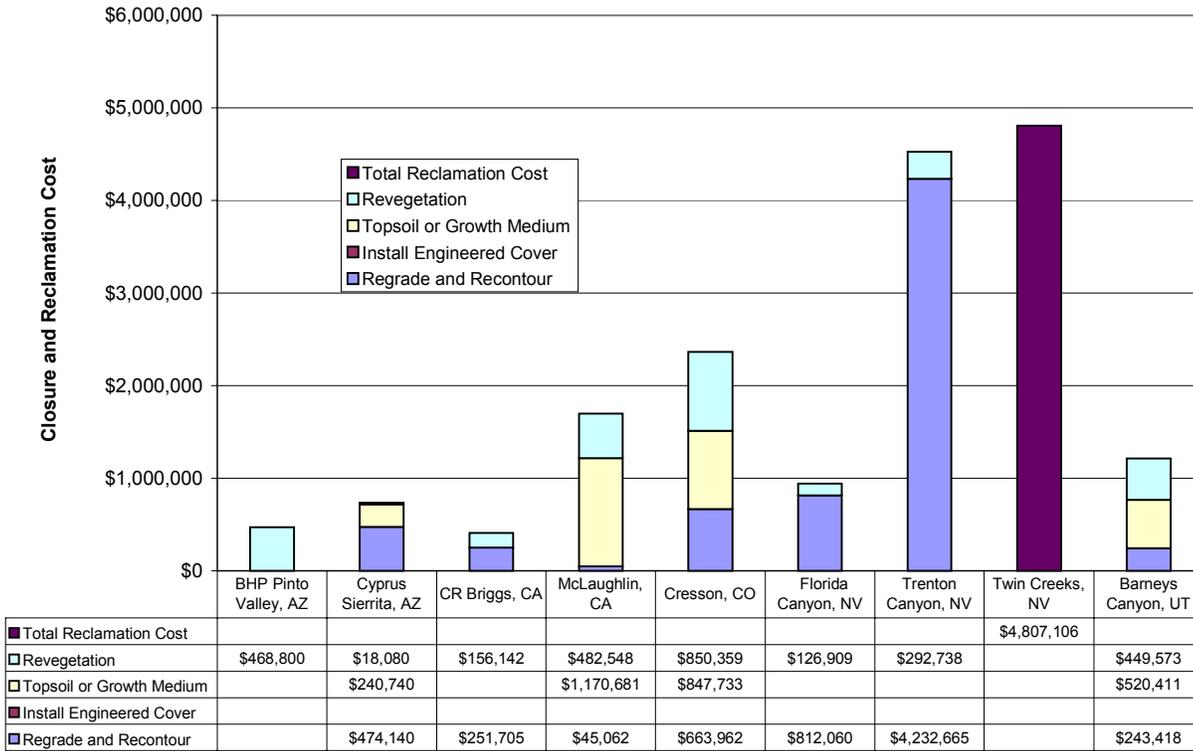
Only the Fort Knox, AK mine tailings dam reclamation and closure costs included detoxification/neutralization, while the Thompson Creek, ID mine was the only plan to include costs covered by an engineered cover.

1.3.7 Waste Rock Dump Reclamation and Closure

1.3.7.1 Southern Region

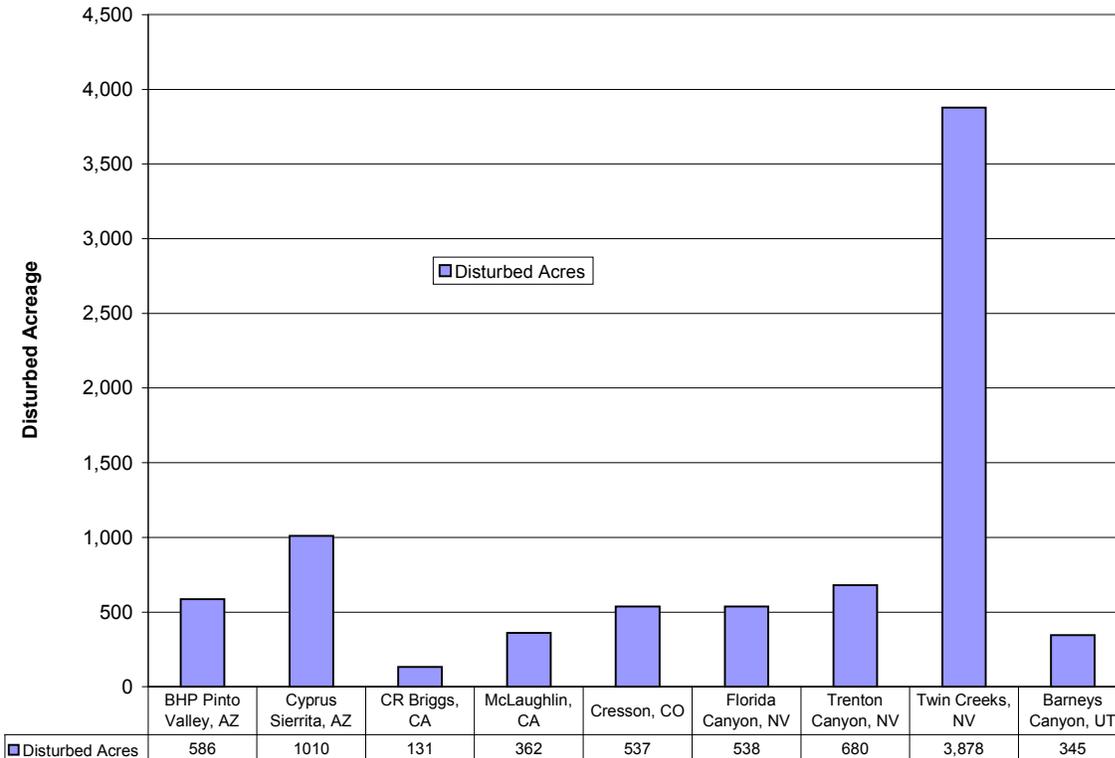
Chart 1.3.27, **Waste Rock Dump Reclamation and Closure Costs, Total Cost by Task**, shows the waste rock dump closure and reclamation costs for the various mines included as case studies in the southern region. The costs are broken down by task: regrading and recontouring, installation of engineered covers, placement of topsoil or growth medium and revegetation. Additional information from the case studies is provided for comparison in Chart 1.3.28, **Waste Rock Dump Reclamation**

Chart 1.3.27 - Waste Rock Dump Reclamation and Closure Costs
Total Cost by Task - Southern Region



Mine

Chart 1.3.28 - Waste Rock Dump Reclamation and Closure
Disturbed Acreage by Mine - Southern Region



Mine

and Closure, Disturbed Acreage by Mine and Chart 1.3.29, Waste Rock Dump Reclamation and Closure Costs, Cost/Acre by Task and Mine.

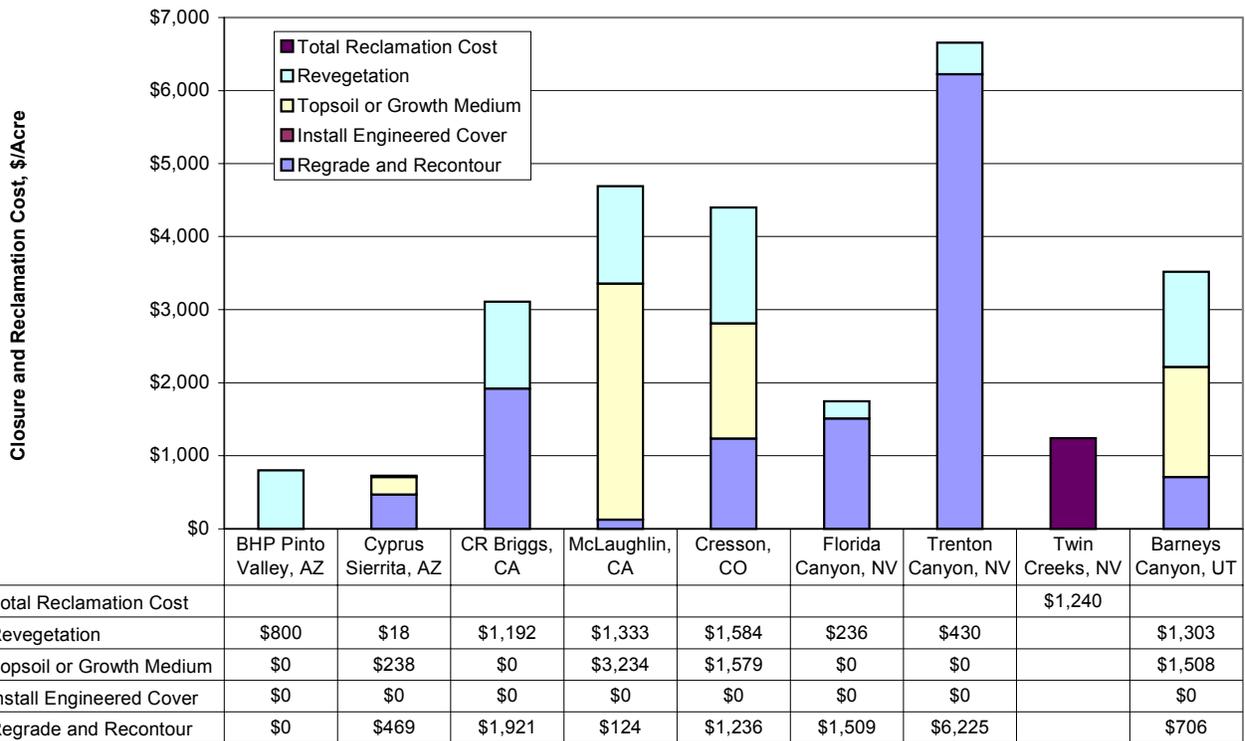
Chart 1.3.29 shows that the cost per acre for waste rock dump reclamation varies from about \$700-\$800 per acre at the two Arizona copper mines, from \$3,100 to \$4,700 per acre at the two California gold mines and from \$1,240 to over \$6,500 per acre at the Nevada mines. Waste rock dump reclamation and closure costs \$3,500 per acre at the Barneys Canyon, UT mine and \$4,400 at Cresson, CO.

Waste rock reclamation and closure plans and estimated costs for regrading and recontouring differ widely at the various sites examined, ranging from no requirement or cost for regrading waste rock dumps at the BHP Pinto Valley, AZ copper mine, to \$6,225 per acre for regrading waste rock dumps at the Trenton Canyon, NV gold mine.

None of the mines examined in the southern region included costs for engineered covers in their waste rock dump reclamation and closure plans.

Topsoil or growth medium was only specifically included in the Cyprus Sierrita, AZ, Barneys Canyon, UT and McLaughlin, CA waste rock dump reclamation and closure plans with cost estimates of \$238 per acre, \$1,508 per acre, and \$3,234 per acre, respectively. Revegetation was included in all the reclamation plans, but varied in cost considerably, ranging from \$18 per acre (revegetating 20 percent of the area) at the Cyprus Sierrita, AZ mine to \$1,580 per acre at the Cresson, CO mine.

Chart 1.3.29 - Waste Rock Dump Reclamation and Closure Cost Cost/Acre Disturbed by Task and Mine - Southern Region



Mine

1.3.7.2 Northern Region

Chart 1.3.30, **Waste Rock Dump Reclamation and Closure Costs, Total Cost by Task**, shows the waste rock dump closure and reclamation costs for the various mines included as case studies in the northern region. The costs are broken down by task: regrading and recontouring, installation of engineered covers, placement of topsoil or growth medium and revegetation. Additional information from the case studies is provided for comparison in Chart 1.3.31, **Waste Rock Dump Reclamation and Closure, Disturbed Acreage by Mine** and Chart 1.3.32, **Waste Rock Dump Reclamation and Closure Costs, Cost/Acre by Task and Mine**.

**Chart 1.3.30 - Waste Rock Dump Reclamation and Closure Costs
Total Cost by Task - Northern Region**

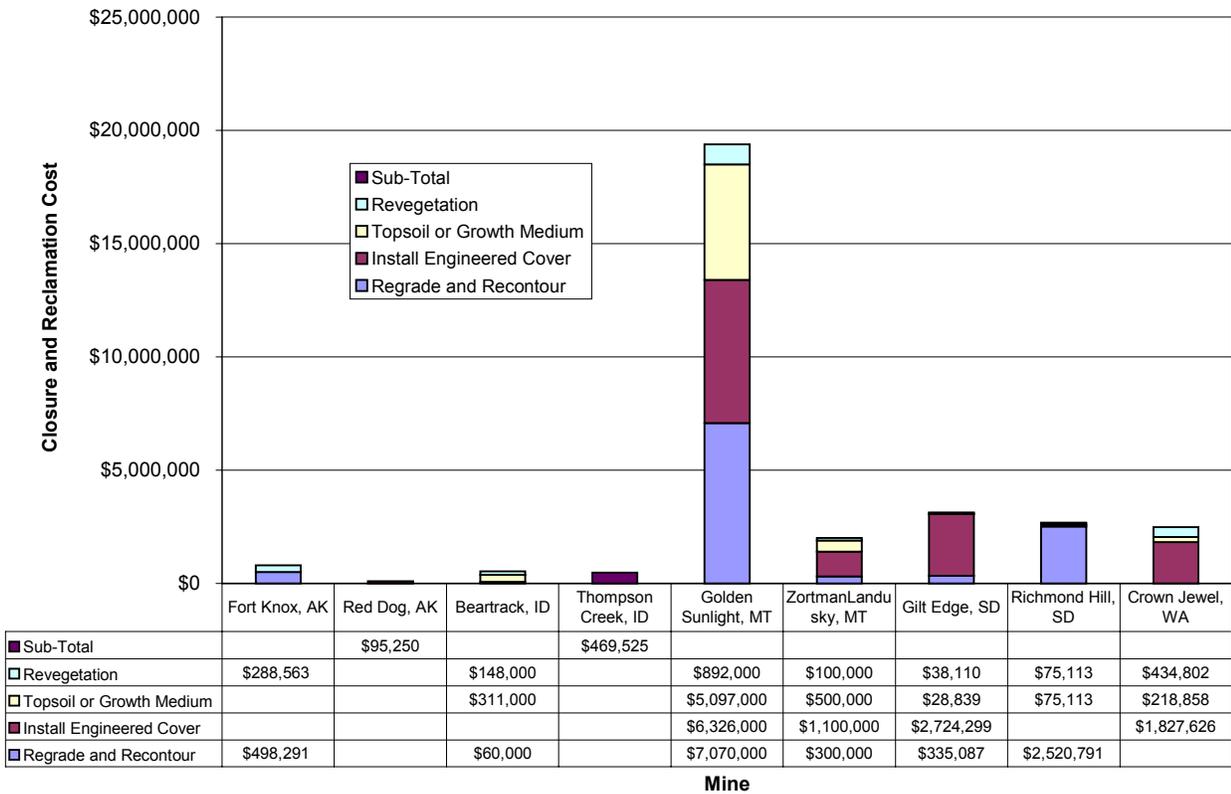


Chart 1.3.32 shows that the cost per acre for waste rock dump reclamation varies from the Alaska statutory limit of \$750 per acre at the Red Dog, AK mine and \$788 per acre at the Thompson Creek, ID mine to more than \$50,000 per acre at the Gilt Edge, SD mine. The Fort Knox, AK, Beartrack, ID and Crown Jewel, WA mines run in the lower mid-range of waste rock dump reclamation and closure costs at \$3,000 to \$8,000 per acre. The Golden Sunlight, MT, Zortman and Landusky, MT, and Richmond Hill, SD mines run in the upper mid-range of costs at \$20,000 to \$26,000 per acre.

Waste rock reclamation and closure plans and estimate costs for regrading and recontouring differed greatly at the various sites examined, ranging from no requirement or cost for regrading waste rock

Chart 1.3.31 - Waste Rock Dump Reclamation and Closure Disturbed Acreage by Mine - Northern Region

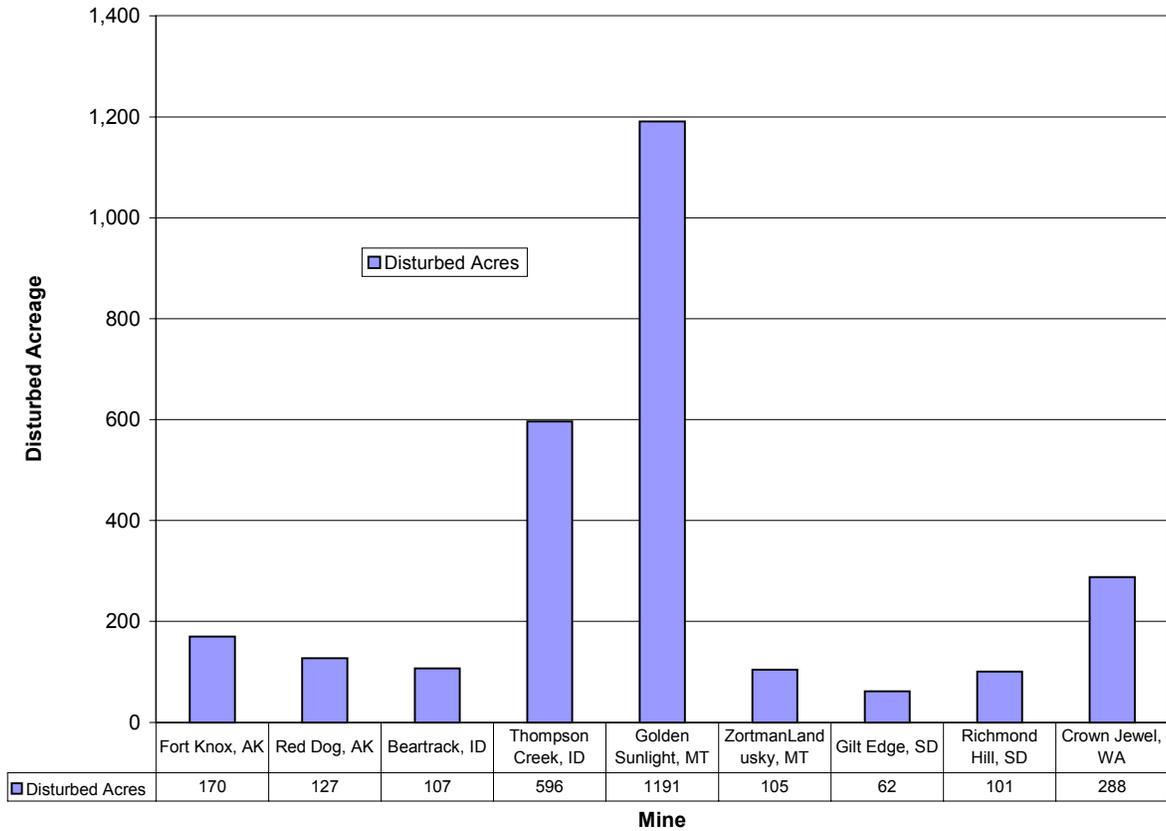


Chart 1.3.32 - Waste Rock Dump Reclamation and Closure Cost Cost/Acre Disturbed by Task and Mine - Northern Region

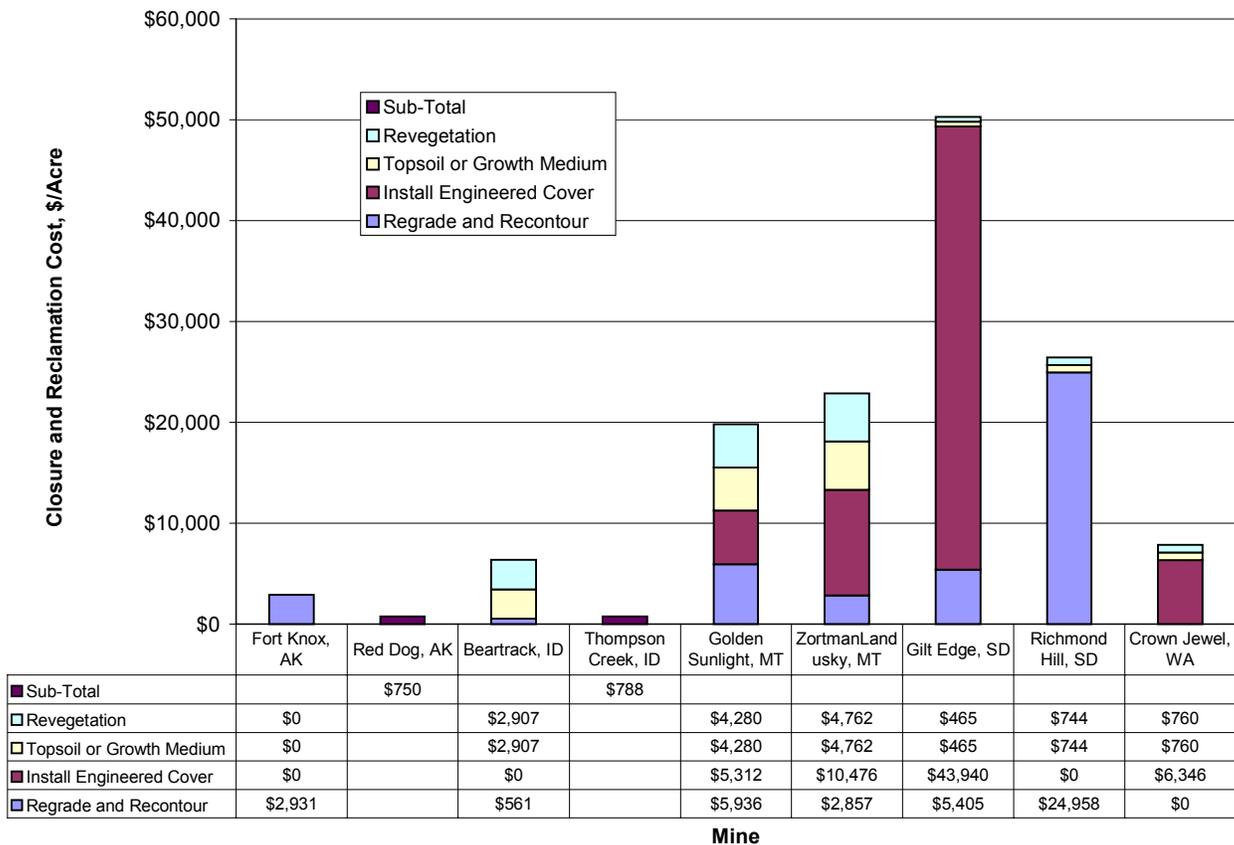


Chart 1.3.34 - Mine Pit Reclamation and Closure
Disturbed Acreage by Mine - Southern Region

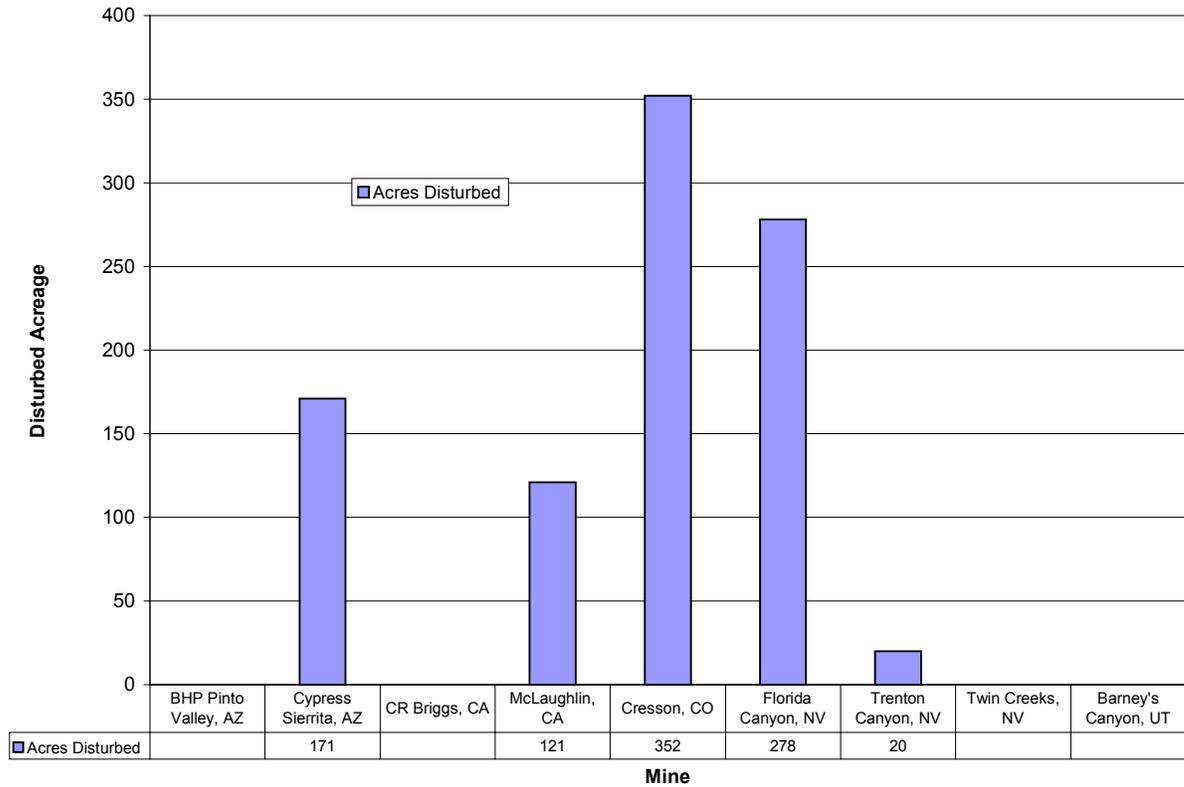
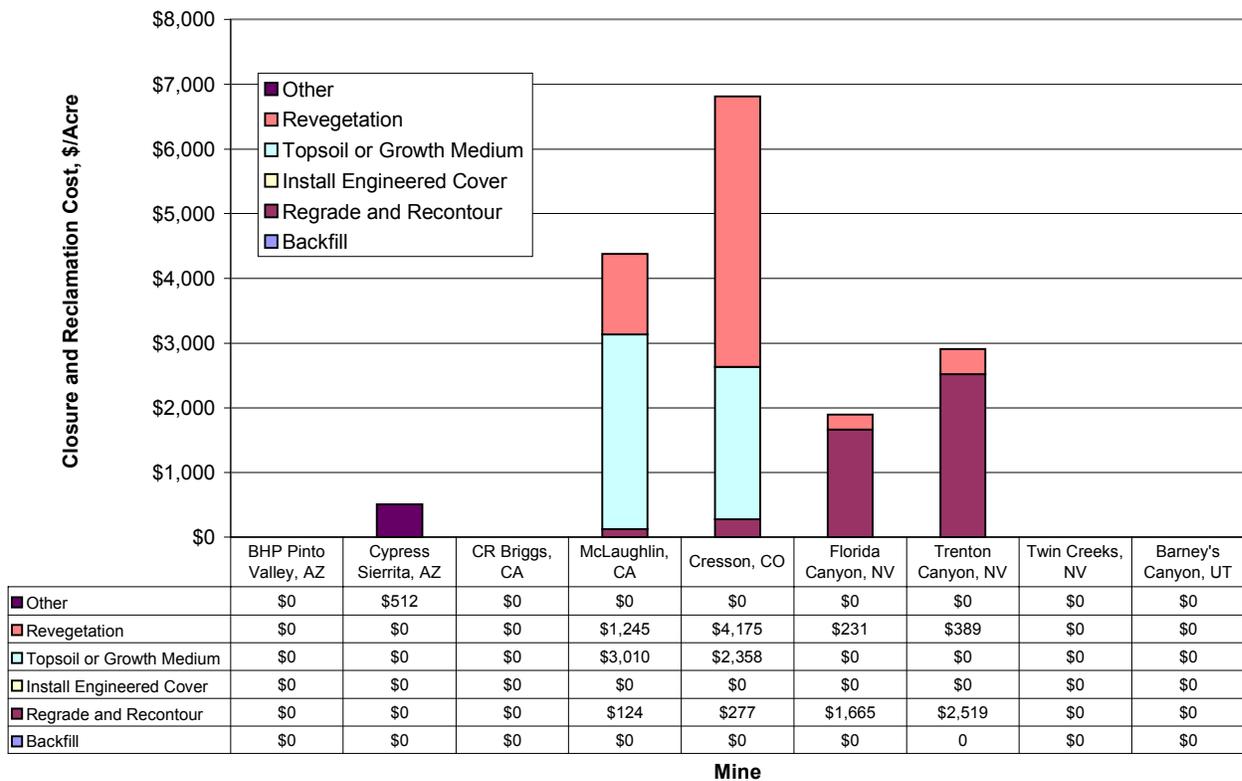


Chart 1.3.35 - Mine Pit Reclamation and Closure Costs
Cost/Acre Disturbed by Task and Mine - Southern Region



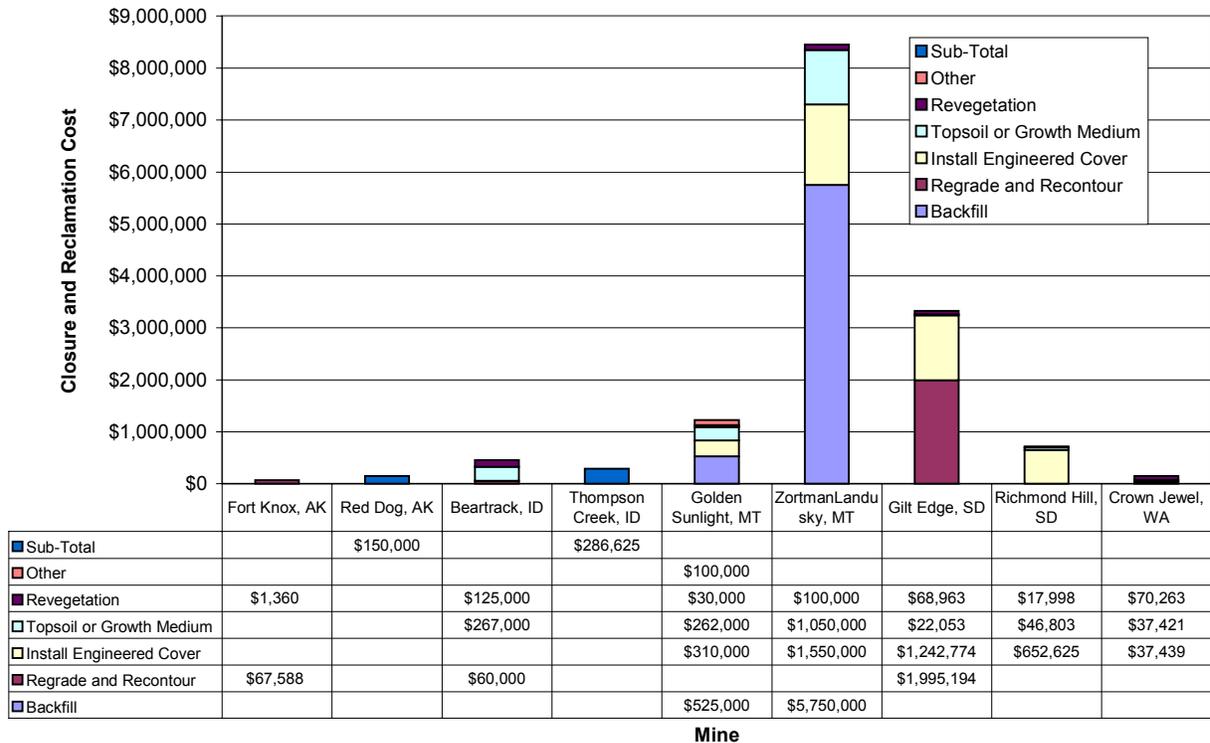
At the McLaughlin, CA and Cresson, CO mines, a relatively higher amount of disturbed acreage would be affected by reclamation and closure tasks. Both mines will reclaim relatively similar acreages in their open pits, but the Cresson, CO mine will spend about 1.5 times what the McLaughlin, CA mine will on the same area, primarily in revegetation.

1.3.8.2 Northern Region

Chart 1.3.36, **Mine Pit Reclamation and Closure Costs, Total Cost by Task** shows the mine pit closure and reclamation costs for the various mines included as case studies in the northern region. The costs are broken down by task: regrading and recontouring, installation of engineered covers, placement of topsoil or growth medium and revegetation. Additional information from the case studies is provided for comparison in Chart 1.3.37, **Mine Pit Reclamation and Closure, Disturbed Acreage by Mine** and Chart 1.3.38, **Mine Pit Reclamation and Closure Costs, Cost/Acre by Task and Mine**.

The charts show that the cost of mine pit reclamation, if part of the reclamation and closure plan and bonding costs at all, is highly variable and site specific.

**Chart 1.3.36 - Mine Pit Reclamation and Closure Costs
Total Cost by Task - Northern Region**



In the case of the Fort Knox, AK, Red Dog, AK, Beartrack, ID, Thompson Creek, ID and Crown Jewel, WA mines, only minimal costs are included, most likely for vegetation of the pit bottom and some benches. At the Golden Sunlight, MT, Zortman and Landusky, MT, Gilt Edge, SD and Richmond Hill, SD mines, costs for pit reclamation and closure are much more significant, ranging from \$20,000 to more than \$90,000 per acre, all relating to mitigation of acid mine drainage generation potential in the pit walls and in backfilled material.

Chart 1.3.37 - Mine Pit Reclamation and Closure
Disturbed Acreage by Mine - Northern Region

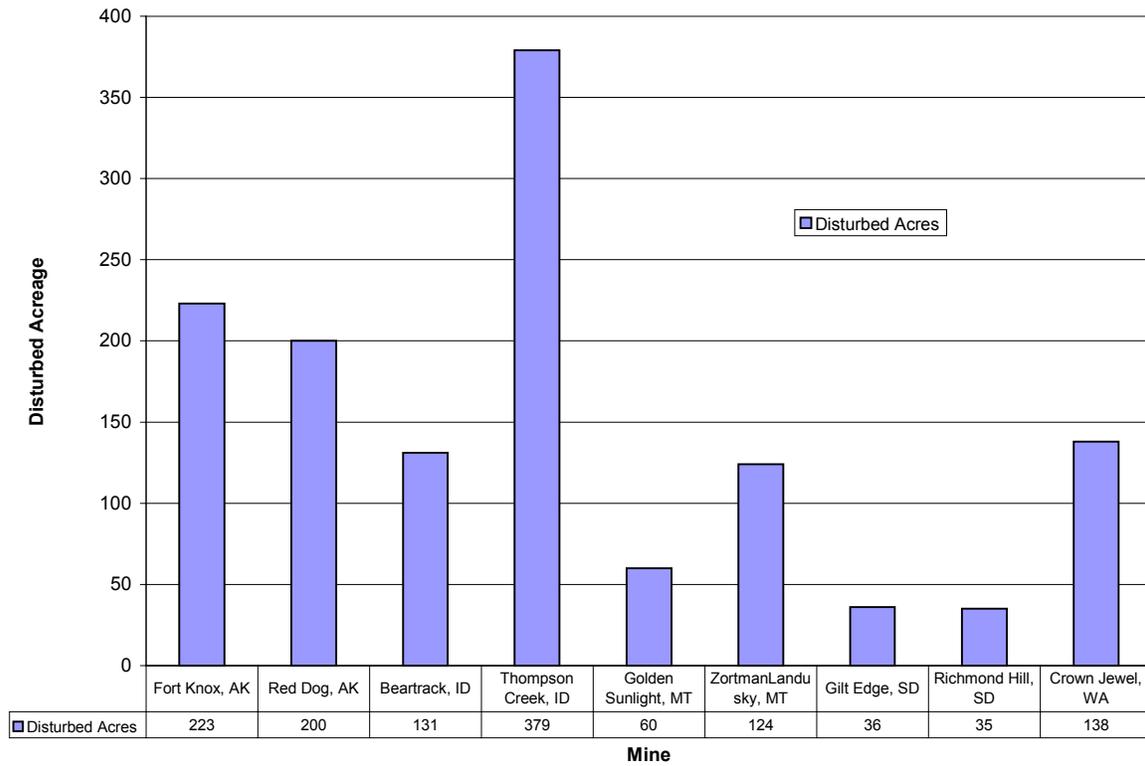
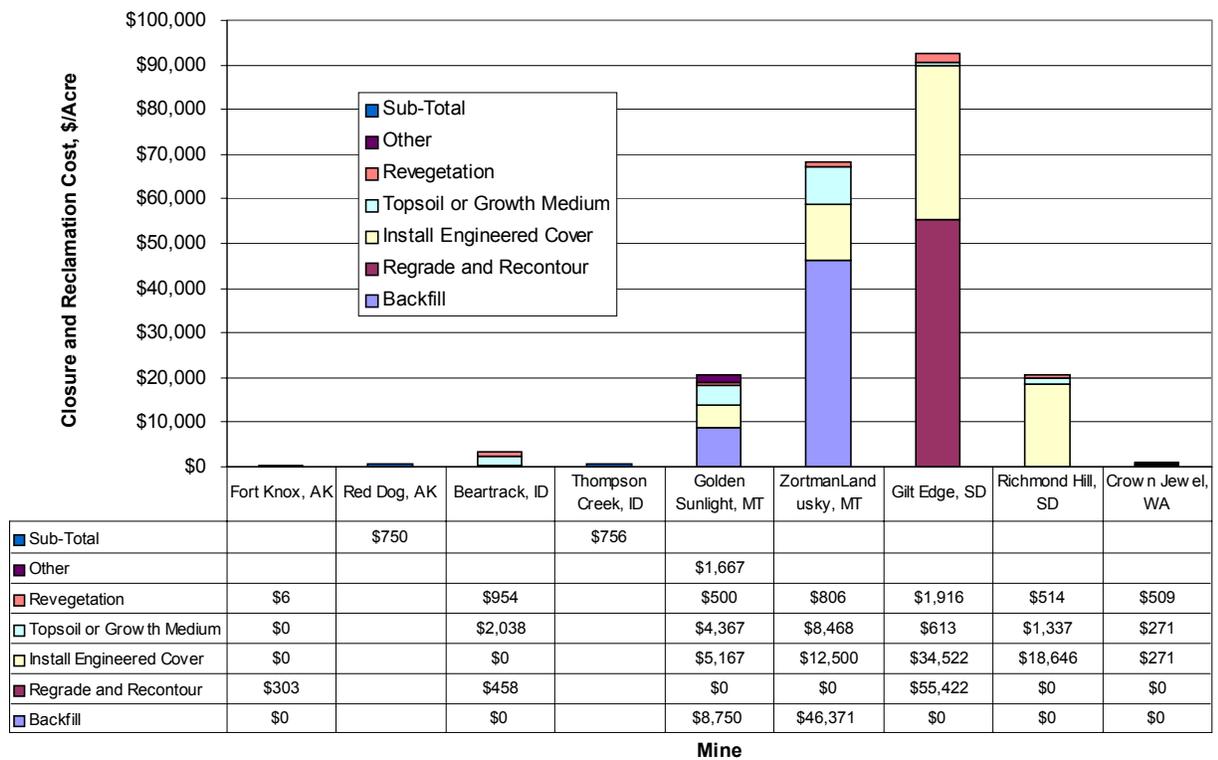


Chart 1.3.38 - Mine Pit Reclamation and Closure Costs
Cost/Acre Disturbed by Task and Mine - Northern Region



HARDROCK

Reclamation Bonding Practices In the Western United States

Part II – AN ANALYSIS OF PRESENT RECLAMATION BONDING MECHANISMS IN THE WESTERN UNITED STATES – SOUTHERN REGION

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HARDROCK

Reclamation Bonding Practices In the Western United States

Part II – AN ANALYSIS OF PRESENT RECLAMATION BONDING MECHANISMS IN THE WESTERN UNITED STATES – SOUTHERN REGION

Part II of the study of Hardrock Mining Reclamation Bonding Practices in the Western United States contains information on each individual state's reclamation and closure bonding mechanisms. A list of each state's major mines,¹ with existing permits and bonds, is included. This list indicates each mine's name, their respective operating company, the disturbed acreage covered by bonding, and the total reclamation and closure bond amount. Each state's statutes and regulations were reviewed and the relevant information extracted for its' various bonding features. (Please note that this information is presented verbatim, with typographical, grammar and structural errors intact.) In addition, mine sites were selected in each state and included as case studies, providing additional information as to the specific reclamation and closure plans and bonding cost estimates for those mines.

¹ As defined for the purposes of this study by a reclamation and closure bond amount of more than \$250,000.

2.1 ARIZONA

Hardrock mining for copper and byproduct molybdenum accounts for nearly all of Arizona's production of nonfuel minerals. Currently, 15 hardrock copper mines are permitted by the State Mine Inspector's Office, 13 of which are major mining and processing facilities with disturbance areas in excess of 1,000 acres. One new copper project has been permitted and bonded, although project startup has been delayed pending appeals by various environmental organizations (Carlota). A single medium-sized gold mine has also been proposed and is in the permitting process (Yarnell). Bond amounts have yet to be established by The State Mine Inspector's Office, the Bureau of Land Management (BLM) and the Arizona Department of Environmental Quality for these sites.

According to the Arizona Department of Environmental Quality's (ADEQ) Compliance and Enforcement Section database, there are 30 active mines within Arizona that have an Aquifer Protection Permit (APP) and 24 mines (including those both active and closed) that have a Groundwater Quality Protection Permit, which is the predecessor to an APP. There are also other mines currently in the process of obtaining an APP from ADEQ.

Arizona didn't promulgate its Mined Land Reclamation Act until 1994, followed by rulemaking in 1996. Hardrock reclamation bonding is still relatively new to the state, due to the relatively recent enactment of Arizona's Mined Land Reclamation Act. Most mining operations were required to submit a closure and reclamation plan (to both the State Mine Inspector and the Arizona Department of Environmental Quality) in 1996-1997. Many currently active copper mines have been involved in operations dating back to the 1950's, with some even dating back to the 1800's, complicating the reclamation and closure planning.

2.1.1 Major Mines with Existing Permits and Bonds

Arizona's 15 permitted copper mines are listed in Table 2.1.1, **Arizona Major Hardrock Mines, Mines with Existing Permits and Bonds**.

Arizona's total reclamation and closure cost of approximately \$146,500,000 equals \$1,858 per acre disturbed—the lowest value per acre of any western state. The disturbed area at most of Arizona's copper mines is relatively large in comparison to mines in other western states.

Arizona's copper mines are predominately massive, low-grade porphyry copper deposits. Oxide and sulfide ores are typically extracted using open pit mining methods (sometimes in conjunction with underground operations). The oxide ores are processed using sulfuric acid dump leach methods; solvent extraction/electrowinning (SX/EW) is utilized for the recovery of copper. The sulfide ores are processed in a flotation mill, where copper sulfide materials are enriched into a concentrate and then processed at a smelter. Some of the Arizona copper mines also have associated smelting facilities, but refining operations are specifically exempted from the Arizona Mined Land Reclamation Act.

All of Arizona's copper mines are currently in operation, although many are either on stand-by or a lowered-production basis. As the copper mines eventually close, (as some probably will within the next few years), Arizona's reclamation bonding statutes and regulations will become more thoroughly tested.

2.1.2 Reclamation and Closure Bonding Regulatory Features

The Arizona Department of Environmental Quality enforces Arizona's water quality protection statutes under the authority of the Aquifer Protection Permit Program (APP). The ADEQ essentially has the same authority to require surface reclamation as the State Mine Inspector's office. The ADEQ may also require additional bonding relative to closure and water quality considerations. The ADEQ typically accepts the bonding determined by the State Mine Inspector's office as sufficient to protect water quality from a surface reclamation standpoint. The additional bonding that exists for water quality under the APP program consists primarily of monitoring costs.

Additional information on Arizona's Mined Land Reclamation Act and its associated rules are contained in Table 2.1.2, **Arizona Reclamation and Closure Bonding Features**. Information on bonding under the ADEQ's APP program follows the table.

**Table 2.1.1 – Arizona Major Hardrock Mines
Mines with Existing Permits and Bonds**

Mine Name	Ownership	Commodity	Type	Status	Disturbed Acres²	Cost Estimate²
Ajo	Phelps Dodge Ajo, Inc.	Copper	Open Pit	Suspended	2,245	\$3,651,000
Bagdad	Cyprus Bagdad Copper Corp.	Copper, Molybdenum	Open Pit, SX/EW, Flotation	Operating	4,424	\$12,735,170
Carlotta	Carlotta Copper Co.	Copper	Open Pit, SX/EW	Proposed - Permits Pending	255	\$336,118
Hayden	ASARCO	Copper	Open Pit, SX/EW, Flotation, Smelter	Operating	3,754	\$2,528,476
Miami	Cyprus Miami Mining Corp.	Copper	Open Pit, SX/EW, Flotation	Operating	4,641	\$17,800,000
Miami	BHP Copper, Inc.	Copper	Open Pit, SX/EW	Operating	442	\$5,035,298
Mineral Park	Equatorial Mineral Park, Inc	Copper	SX/EW	Operating	1,403	\$1,323,650
Mission	ASARCO	Copper	Open Pit, SX/EW, Flotation	Operating	8,358	\$2,988,441
Morenci	Phelps Dodge Morenci, Inc.	Copper	Open Pit, SX/EW, Flotation	Operating	18,968	\$14,254,000
Pinto Valley	BHP Copper, Inc.	Copper	Open Pit, SX/EW, Flotation	Operating	3,985	\$26,660,300
Ray	Asarco	Copper	Open Pit, SX/EW, Flotation	Operating	9,157	\$784,826
San Manuel	BHP Copper, Inc.	Copper	Underground and Open Pit, SX/EW, Flotation, Smelter	Operating	7,532	\$33,500,000
Sierrita	Cyprus Sierrita Corp.	Copper	Open Pit, SX/EW, Flotation	Operating	8,446	\$18,323,800
Silver Bell	ASARCO	Copper	Open Pit, SX/EW	Operating	3,769	\$906,000
Twin Buttes	Cyprus Sierrita Corp.	Copper	Open Pit, SX/EW, Flotation	Operating	1,458	\$5,629,700
Total					78,837	\$146,456,779

² Data from list attached to letter dated July 1, 1998 from Arizona State Mine Inspector's Department to NWF. In most cases bond totals include ADEQ APP program closure bonding in addition to bonding under the Mined Land Reclamation Act. In some cases there may be additional bonding by the ADEQ, U.S. Forest Service or BLM.

Table 2.1.2 – Arizona Reclamation and Closure Bonding Features

<p>Statutes, Regulations and Guidelines</p>	<p>Arizona Mined Land Reclamation Act Title 27, Arizona Revised Statutes (ARS) [Enacted 1994]</p> <p>State Mine Inspector Mined Land Reclamation Title 11, Chapter 2, Arizona Rules (AR) [Enacted 1996]</p> <p>Mined Land Reclamation Rules and Statutes Division of Mined Land Reclamation, Arizona State Mine Inspector (January 1997)</p>
<p>Authority</p> <p>Governing State Body</p> <p>Lead State Agency</p> <p>Bonding Required By State</p> <p>And</p> <p>Relationship with Federal Agencies</p>	<p>The state mine inspector shall establish a division of mined land reclamation and employ staff who have the necessary and appropriate experience in mining and reclaiming mined lands.ⁱ</p> <p>The State Mine Inspector may enter into agreements pursuant to Title 11, Chapter 7, Article 3 with the State Land Department, United States bureau of Land Management, United States Forest Service and other agencies that manage public lands and take other appropriate measures to coordinated the review and approval of reclamation plans, including designating a lead agency for reclamation plan review and action. The Inspector shall avoid redundant, inconsistent or contradictory reclamation, inspection, administration, enforcement and financial assurance requirements.ⁱⁱ</p> <p>If an exploration operation is located on land administered by a federal agency, an approved federal reclamation plan and a financial assurance mechanism for the federal land that are consistent with the requirements of the Chapter supersede the requirements for a reclamation plan and financial assurance mechanism otherwise required by this Chapter.ⁱⁱⁱ</p>
<p>Exemptions to Reclamation Bonding</p> <p>Activities Prior to Regulation</p> <p>Size Limitations</p>	<p>An owner or operator of an existing exploration operation or existing mining unit with surface disturbances of more than five contiguous acres shall submit a reclamation plan to the State Mine Inspector by April 1, 1997.^{iv}</p> <p>The reclamation of surface disturbances created in whole or part before July 17, 1994, the effective date of this Chapter, and the initial rules adopted pursuant to this Chapter may present special technical and economic constraints that are not encountered for new surface disturbances. The Inspector shall consider the nature and extent of the existing surface disturbances, relevant site-specific circumstances, and the technical and economic practicability of reclaiming such disturbances. The Inspector shall not require the removal or relocation of existing mining units to satisfy the requirements of this Chapter.^v</p> <p>Nothing in this Chapter shall prevent an owner or operator of an exploration operation or mining unit from creating a surface disturbance of five acres or less. From and after December 31, 1996, the State Mine Inspector may require either or both of the following in case of a series of surface disturbances of five contiguous acres or less by the same owner or operator if the series of surface disturbances in aggregate constitute more than five acres: 1. A reclamation plan under Article 3 or 4 of this Chapter. 2. A financial assurance mechanisms under Article 5 of the Chapter.^{vi}</p>

<p>Reclamation Plan Requirements</p>	<p>Article 6 – Mining Unit Reclamation Standards</p> <p>Public Safety Standards.</p> <p>A. Reclamation activities at mining unit shall be designed to reduce hazards to public safety to the extent technically and economically practicable by measures, including: 1. Removal of scrap metal, wood, trash and other debris that pose a threat to public safety, or create a public nuisance, or are inconsistent with an approved reclamation plan; and 2. Regrading slopes as prescribed under R11-2-602.^{vii}</p> <p>Features Excluded from Reclamation Plan or Allowed to Remain Following Reclamation; Public Protection Measures.</p> <p>A. A reclamation plan may exclude any provision for reclaiming open pits, rock faces or subsidence areas through backfilling or returning material to the open pit, rock face or subsidence area from which it was extracted if it is impracticable and if public access to the open pit, rock face or subsidence area, including any surrounding unstable areas or walls, is restricted by fencing or other institutional controls.</p> <p>B. The following factors shall be considered in determining whether the reclamation of open pits, rock faces or subsidence areas is impracticable: 1. Cost to perform the reclamation. 2. Topography of the site. 3. Geology and stability of the site. 4. Time required to perform the reclamation. 5. Consumption of resources required to perform the reclamation. 6. Future access to mineral resources.</p> <p>C. Buildings and other structures may remain after reclamation if adequate measures are taken to protect public safety.^{viii}</p> <p>Erosion Control and Topographic Contouring.</p> <p>A. Mining units shall be reclaimed to a stable condition for erosion and seismic activity.</p> <p>B. Grading and other topographic contouring methods shall be conducted, as necessary, to establish final land forms which are 1. Suitable for the post-mining land use objective in the approved reclamation plan. 2. Stable under static and dynamic conditions as certified by a qualified engineer considering the following: a. Site-specific conditions; b. Safety consistent with good engineering practices; and c. The hazard to public safety, if failure occurs.</p> <p>C. Site-specific grading, revegetation, or other proposed erosion-control measures shall be conducted, as necessary, to address erosion so that permanent piles of mine development rock, overburden, and tailings shall not restrict surface drainages in a manner that contributes to excessive erosion or which compromises the stability of the reclaimed facility.^{ix}</p> <p>Roads. A. Reclamation of a road that is not included in the approved reclamation plan as part of the approved post-mining land use shall begin once the road is no longer needed for operations, reclamation, or monitoring. ^x</p> <p>Article 7 – Revegetation and Soils Standards</p> <p>Revegetation Provisions.</p> <p>A. If revegetation is part of the proposed reclamation plan, the plan shall describe the: 1. Season of revegetation; 2. Species and amounts per acre of seeds or flora; and 3. Planting methods.</p> <p>B. If the proposed reclamation plan includes mulching, irrigation, pest control, disease control, or growth management measures, the proposed reclamation plan shall specifically describe the techniques, methods, controls, or measures to be used.^{xi}</p>
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<p>Reclamation Plan Requirements (continued)</p>	<p>Revegetation Standards.</p> <p>A. Where surface disturbances result in compaction of the soil, ripping, disking, or other means shall be used in areas to be revegetated to reduce compaction and to establish a suitable root zone in preparation for planting.</p> <p>B. Revegetation shall be conducted to establish plant species that will support the approved post-mining land use. the establishment of vegetation species, density, or diversity which is different than pre-existing conditions or on adjacent lands shall constitute successful reclamation if any of the following apply: 1. The post-mining land use is different than the pre-mining land use or the use of adjacent lands; 2. Site-specific nature of the surface disturbance, including soil conditions and topography, is such tat the establishment of pre-existing or adjacent conditions is not technically or economically practicable, or 3. The establishment of different species is preferable for control of erosion.</p> <p>C. Planting shall be conducted during the most favorable period of the year for plant establishment.</p> <p>D. Soil stabilizing practices or irrigation measures, or both, may be used to establish vegetation.</p> <p>E. This Section only applies if vegetation or revegetation procedures are included in the approved reclamation plan.^{xiii}</p>
<p>Bonding Requirements</p> <p>Bond Amount And Calculation</p>	<p>The owner or operator of an existing exploration program or a new or existing mining unit shall transmit a financial assurance mechanism to the State Mine Inspector within sixty days after a reclamation plan is approved. The Inspector shall take final action on the financial assurance mechanism within thirty days after it is received.^{xiii}</p> <p>In determining the amount of financial assurance to be provided for an existing exploration operation or a new or existing mining unit, the Inspector shall consider the costs of approved reclamation measures stated in the reclamation plan. In computing reclamation costs, the Inspector shall assume that third parties will perform the reclamation measures. The Inspector shall reduce the amount of the required financial assurance to the costs of the owner or operator performing the reclamation measures if the owner or operator can demonstrate sufficient financial ability to perform the necessary reclamation. Financial ability shall be established by one or more of the financial mechanisms described in 40 Code of Federal Regulations Section 264.143(f). Each financial assurance mechanism for an existing exploration or new or existing mining unit approved by the Inspector shall provide the amount in current dollars equal to the cost to: 1. Perform the approved reclamation measures stated in the reclamation plan on the area of surface disturbance. 2. Provide continued care and monitoring of the areas stated in the reclamation plan for revegetation for no more than three growing seasons without additional supplemental irrigation or other man-induced inputs after performing the reclamation measures unless the supplemental inputs are part of the post-mining land use. Notwithstanding this paragraph, revegetation efforts that are necessary to achieve the post-mining land use objective are considered adequate and complete if the owner or operator has taken reasonable measures to achieve success. Technical and economic practicability as it relates to site-specific conditions and the proposed post-mining land use shall be taken into account in making that determination.^{xiv}</p> <p>Amount of Financial Assurance. A. In estimating the cost of executing the reclamation plan, all activities in the reclamation plan shall be addressed, including, if applicable: 1. Earth moving, regrading, and stabilization of surface disturbances included in the reclamation plan; 2. Revegetation, preparation of seedbed, and planting; 3. Demolition of buildings and other structures; 5. Any ongoing or long-term activities which are required to maintain the effectiveness of reclamation or are necessary in place of reclamation, including periodic clean-out of sediment basins or maintenance of berms and fences which are used to prevent access to</p>

<p>Bonding Requirements (continued)</p>	<p>areas which pose a threat to public safety; 6. Equipment mobilization and demobilization; Contractor profit; and 8. Administrative overhead. B. In addition to submitting the estimated costs to perform each of the proposed reclamation measures required under ARS §27-971(B)(11) or AR §11-2-301(B), the owner or operator of a mining unit or existing exploration operation shall submit to the State Mine Inspector: 1. Documentation for the calculation of the estimated costs, and 2. The source of the estimated costs.^{xv}</p>
<p>Phased Bonding</p>	<p>An owner or operator may provide financial assurance under this Article on an incremental basis for planned surface disturbances described in the reclamation plan.^{xvi}</p>
<p>Type of Bond Allowed</p>	<p>Allowable financial assurance mechanisms for purposes of this Article include any or a combination of the following: 1. Surety bond. 2. Certificate of Deposit. 3. Trust fund with pay-in period. 4. Letter of credit. 5. Insurance policy. 6. Certificate of self-insurance. 7. Cash deposited with the state treasurer. 8. Evidence of ability to meet a corporate financial test or corporate guarantees as provided by 40 Code of Federal Regulations section 264.143(f). 9. Annuities. 10. Additional financial assurance mechanisms that are acceptable to the Inspector.^{xvii}</p>
<p>Reclamation and Bonding Oversight</p>	<p>Reclamation Monitoring and Compliance</p> <p>Beginning April 1, 1996, the State Mine Inspector may enter and inspect, during normal business hours, any exploration operation or mining facility that is subject to this Chapter to determine compliance with this Chapter. The Inspector shall give the owner or operator the opportunity to have its representative accompany the Inspector. Within thirty days after the date of inspection, the Division of Mined Land Reclamation shall provide to the owner or operator a copy of any inspection report produced as a result of any inspection of the exploration operation or mining facility.^{xviii}</p>
<p>Bond Review</p>	<p>The Inspector shall adjust the amount of financial assurance every five years or more often as necessary to adjust for new areas of planned surface disturbances or inflation or to reflect changed costs resulting from substantial modifications of the reclamation plan.^{xix}</p>
<p>Bond Forfeiture</p>	<p>A financial assurance mechanism filed with the State Mine Inspector or state agency is subject to forfeiture if any of the following exist: 1. An exploration operation or mining unit has been completed, abandoned, or temporarily closed for a period greater than allowed by the Act or this Chapter without initiating reclamation. 2. An exploration operation or mining unit has been completed, abandoned or temporarily closed for a period greater than allowed by the Act or this Chapter and the owner or operator stops or suspends any ongoing reclamation as determined by the State Mine Inspector; 3. The operator stops conducting business in the State of Arizona and does not transfer the approved reclamation plan and financial assurance to a new operator under ARS § 27-928. 4. The operator stops conducting business due to insolvency, bankruptcy, receivership, or misconduct, under ARS § 27-905. 5. The operator fails to comply with the conditions of the financial assurance. 6. The owner or operator fails to reclaim the surface disturbances under the approved reclamation plan, the Act, or this Chapter.^{xx}</p>

Bond Release	Release of Financial Assurance. A. An owner or operator may apply to the State Mine Inspector to release all or part of the financial assurance provided under this Article. The application shall: 1. Describe the reclamation measures that have been performed. 2. Describe any surface disturbances included in the reclamation plan that have not been disturbed. 3. Contain an estimate of the costs of reclamation measures that have not been performed.. B. Within sixty days after receiving a complete application, the Inspector shall release all or part of the financial assurance except for any amount that is necessary to perform the reclamation measures identified in the reclamation plan. After the reclamation measures have been performed, the remaining financial assurance shall be released, except that ten percent shall be retained for the costs of care, monitoring and one reseeded, if necessary, for areas that have been revegetated. The Inspector shall release the retained monies after a period of not more than three growing seasons after the supplemental management or other man-induced inputs have been finally removed or as otherwise provided in Section 27-992, Subsection B. ^{xxi}
Public Participation in Bonding	No specific provisions for public participation are provided. If there is sufficient public interest by persons who may be adversely affected by the plan or substantial change, the Inspector may hold a public hearing in the county in which the exploration operation or mining permit is or will be located. ^{xxii}
Other Significant Features	Arizona Aquifer Protection Permitting Program - Water Quality Bonding Provisions

**2.1.2.1 Arizona Aquifer Protection Permitting Program –
Water Quality Bonding Provision**

The statutes and rules giving Arizona Department of Environmental Quality authority for bonding under the Aquifer Protection Permit (APP) program are contained in A.R.S. §49 and Arizona Administrative Code R18-9.

It should be noted that the APP Program statutes and rules pertaining to bonding focus on demonstrating financial capability rather than reclamation and closure. The predominant mining companies in Arizona—Phelps Dodge, ASARCO, Cyprus Minerals and BHP Minerals—are not typically required to bond for financial assurance. They instead rely on self-bonding to meet APP program requirements.

The following sections contain some of the relevant features of the APP program bond requirements.

R18-9-116. Individual permit conditions: Temporary cessation, closure, post-closure.

A. An individual Aquifer Protection Permit shall require that the permittee notify the Director before any temporary cessation of operations at the facility. An individual Aquifer Protection Permit shall specify any measures to be taken by the permittee if there is any temporary cessation of operations at a facility.

B. An individual Aquifer Protection Permit shall require that a permittee notify the Director of the permittee's intent to cease operations prior to ceasing, without intent to resume, an activity for which the facility was designed or operated.

C. An individual Aquifer Protection Permit shall require that a permittee who ceases, without intending to resume, an activity for which a facility was designed and operated, submit to the Director for approval a closure plan within 90 days following the notification. A closure plan shall describe all of the following: 1. The approximate quantities and the chemical, biological, and physical

characteristics of the materials to be removed from the facility. 2. The destination of the materials to be removed from the facility and an indication that placement of the materials at that destination is approved. 3. The approximate quantities and the chemical, biological, and physical characteristics of the materials that will remain at the facility. 4. The methods to be used to treat any materials remaining at the facility. 5. The methods to be used to control the discharge of pollutants from the facility. 6. Any limitations on future land or water uses created as a result of the facility's operations or closure activities. 7. The methods to be used to secure the facility. 8. An estimate of the cost of closure. 9. A schedule for implementation of the closure plan and the submission of a post-closure plan.

D. Within 60 days after receipt of a complete closure plan, the Director shall approve or reject the closure plan. The Director shall approve a closure plan that eliminates, to the greatest extent practicable, any reasonable probability of further discharge from the facility and of exceeding Aquifer Water Quality Standards at the applicable point of compliance.

E. An individual Aquifer Protection Permit may prescribe any part of a closure plan submitted pursuant to subsection (C).

F. An individual Aquifer Protection Permit shall require that a permittee submit to the Director for approval, and shall adhere to, a post-closure monitoring and maintenance plan for a facility, unless the Director determines that the closure of the facility will eliminate, to the greatest degree practicable, any reasonable probability of further discharge from the facility and of exceeding Aquifer Water Quality Standards at the applicable point of compliance. The post-closure plan shall describe all of the following:

1. The duration of post-closure care.
2. The monitoring procedures to be implemented by the permittee, including monitoring frequency, type, and location.
3. A description of the operating and maintenance procedures to be implemented for maintaining aquifer quality protection devices, such as liners, treatment systems, pump-back systems, and monitoring wells.
4. A schedule and description of physical inspections to be conducted at the facility following closure.
5. An estimate of the cost of post-closure maintenance and monitoring.
6. A description of limitations on future land or water uses, or both, at the facility site as a result of facility operations.

G. Within 60 days after receipt of complete post-closure plan, the Director shall approve or reject the post-closure plan. The Director shall approve a post-closure plan that eliminates, to the greatest extent practicable, any reasonable probability of further discharge from the facility and of exceeding Aquifer Water Quality Standards at the applicable point of compliance.

H. An individual Aquifer Protection Permit may prescribe any part of a post-closure plan submitted pursuant to subsection (F).

I. An individual Aquifer Protection Permit shall require that the permittee give the Department written notice that a closure plan or a post-closure plan has been implemented fully.

R18-9-117. Individual permit conditions: Technical and financial capability

A. An individual Aquifer Protection Permit shall require that a permittee have and maintain the technical and financial capability necessary to fully carry out the terms and conditions of the permit.

B. The Director may establish any of the permit conditions described in R18-9-109 through R18-9-116 on the basis of the Director's evaluation of the permittee's technical or financial capability necessary to carry out the terms and conditions of the individual Aquifer Protection Permit.

C. An individual Aquifer Protection Permit shall require that a permittee maintain any bond, insurance policy, or trust fund provided under R18-9-108(B)(8)(c)(iii) or R18-9-121(A). A bond, insurance policy, or trust fund required to be maintained under this subsection shall remain in effect for the duration of the permit.

2.1.3 Reclamation and Closure Bonding Case Studies

2.1.3.2 BHP Pinto Valley Mine

The Pinto Valley Unit of BHP Copper, Inc. is located in the historic Globe-Miami Mining District, west of the town of Miami, Arizona. Production on the property began in 1972 and continued until its closure was announced by BHP in 1999. The mine is located at an elevation of 4,000 feet in mountainous terrain. Vegetation consists of desert chaparral and dry-slope desert brush. The mine is located primarily on privately held and patented lode mining claims.

In 1997, BHP Copper delivered a reclamation plan to the Arizona State Mine Inspector's office for the Pinto Valley mining operations.^{xxiii} The plan was developed in response to the Arizona Mined Reclamation Act and Arizona Mined Land Reclamation Rules, which became effective on October 1, 1996. The plan describes a proposed reclamation plan to be implemented within two years of closure for all facilities active after January 1, 1986.

The BHP Pinto Valley mining operations consist of an open pit mine, waste rock dumps, concentrator, tailings impoundments, low-grade ore dump acid leaching operation, solvent-extraction-electrowinning (SX/EW) facilities and additional ancillary buildings and infrastructures. All facilities will eventually be closed. The buildings and infrastructure will be removed, and surface reclamation will take place. The open pit will be fenced and signed. According to the reclamation plan, hydrological studies indicate that the volume of seepage and storm water going into the pit is less than that expected to be lost by evaporation on an annual basis.

Reclamation Bonding

BHP provided a cost estimate of \$26,660,300 for reclamation of the Pinto Valley operations with its reclamation plan. BHP has provided financial assurance acceptable to the Arizona State Mine Inspector and Arizona Department of Environmental Quality by forming a reserve and adding to it on a basis of 1.3 cents per pound of copper produced. As of 1996, the reserve totaled \$32.4 million^{xxiv}, according to the company. Table 2.1.3, **Reclamation and Closure Bond Estimate, BHP Pinto Valley, AZ, Cost Summary**, provides a summary of costs as estimated by the company. Additional information describing the required reclamation and the basis for the estimated costs is provided in subsequent sections.

The reclamation bond estimate figures in Table 2.1.3 exclude the costs for reclamation of lands disturbed under U.S. Forest Service Use Fee Permits or Land Exchange Areas. Those areas are exempt from Arizona's Mine Land Reclamation Act. BHP estimated an additional cost of \$1,259,600 for reclamation of federal lands for a total cost of \$27,919,900.

The reclamation bond relies upon a closure plan developed for the Arizona Department of Environmental Quality's Aquifer Protection Permit program. The plan combines reclamation and closure estimates that should be considered separately by the State Mine Inspector and the Arizona Department of Environmental Quality. Rather than separate calculations, as is done in some cases (see Cyprus Sierrita case study), BHP combined costs into a single estimate.

Cost Estimate Sources

Closure and post-closure costs for the facilities are based on the methods described in the reclamation plan. The basis for the cost estimate is the post-closure activity which is slated to begin in 2008 and conclude in 2018. Unit costs for reclamation activities were either estimated by BHP Pinto Valley personnel or based on previous studies.

Tailings Facilities

The tailings dam facilities on private land will cover 1,342 acres at closure. The tailing impoundments will be reclaimed by contouring and treating the surface using Environmental Mining Practice and Cattle Treatment (EMPACT) methods, which consist of using cattle to promote revegetation.

The total construction and EMPACT cost (including follow up treatment) for all of the tailings impoundments is estimated at \$3,213,200; total post-closure maintenance is estimated at \$2,586,800. The total for post-closure includes the costs of high-level maintenance associated with EMPACT methods. The final total estimated cost per acre using the EMPACT reclamation method is \$4,341.

Acid Leach Dumps

The proposed reclamation and closure method for the acid leach dumps includes recontouring the slopes to a grade of suitable stability (2.5H:1V), covering the top and side slopes with the slimes and sand fraction of tailings (tailings are hydraulically excavated from a tailings impoundment and cycloned at the acid leach dump) and applying EMPACT treatment to the top and side slopes of the acid leach dumps. The total estimated cost of reclamation and post-closure maintenance on 827 acres of acid leach dumps is \$13,650,700, or \$16,506 per acre.

Waste Rock Dumps

The area of private land that will be disturbed by waste rock dumps is approximately 586 acres. The waste rock dumps will be contoured during the latter years of operation, and the associated costs will be charged to operations. The waste rock side slopes and top surfaces will be reclaimed by discing, hydromulching and seeding. The total estimated cost for waste rock dump reclamation is \$468,800, or \$800 per acre.

Open Pit

Closure methods for the mine's open pit consist of erecting a fence around the pit's perimeter. It is assumed that development of both stormwater drainage channels and an evaporation pond will be conducted during the last year of operation and charged to operating costs. The estimated costs for the fence is \$343,800. An allowance to the reclamation cost of \$5,836,000 has been estimated as a credit towards salvage of equipment and materials from the open pit.

Access and Haul Roads

The closure plan estimates the required reclamation of 92 miles of road with an average width of 14 feet. Closure is based on an assumed cost of \$800 per acre, for a total cost of \$124,900.

Facilities Closure

Facilities to be closed include the concentrator, solvent extraction-electrowinning (SX-EW) plant, related process and maintenance facilities and utility and process distribution infrastructure. Costs for decommissioning and closure of the concentrator are based on salvaging all equipment, dismantling the buildings and structures, razing foundations to grade and disposing of demolition rubble and debris. Following facility removal, the site will be ripped and revegetated by hydromulching and seeding. The estimated cost for facilities closure is \$14,578,900.

Labor

The cost of labor associated with reclamation activities for a manager, two environmental specialists, an engineer, a clerk, six utility staff members and security personnel have been included in the estimate. An additional allowance has been made for operating expenses.

Equipment Salvage

An allowance of \$18,436,000 has been made as a credit toward the salvage value of equipment, materials, buildings and scrap from facilities closure.

2.1.3.2 Cyprus Sierrita Mine

Introduction and Background

In 1996, Cyprus Sierrita Corporation delivered a reclamation plan to the Arizona State Mine Inspector's office for the copper mining operations at the Sierrita mine in Green Valley, Arizona.^{xxv} The mine is located in south-central Arizona at an elevation of about 4,000 feet within the Sierrita Mountains.

The plan was developed in response to the Arizona Mined Reclamation Act and Arizona Mined Land Reclamation Rules which became effective on October 1, 1996. The plan describes the reclamation to be implemented within two years of closure for all facilities active after January 1, 1986.

The Cyprus Sierrita complex is an open pit mining operation, producing copper and by-product molybdenum. Mining facilities at the site include three open pits, leach rock dumps, waste rock and tailings disposal areas, a mill and concentrator and a solvent extraction/electrowinning (SX/EW) plant.

Groundwater in the area is approximately 300 feet below the surface. Open pit operations have created a hydrologic sink and lowered the water table in the immediate vicinity of the mine. Groundwater at the site is about 900 feet below ground surface. The two main surface water outlets in the area—Esperanza and Demetrie Wash—drain the Sierrita Mountains and flow southeast into the Santa Cruz River. Water only flows through these washes immediately following storm events.

Cyprus Sierrita plans to continue its current open pit and leaching activities until 2019. At closure, the Sierrita and Esperanza pits will have been mined together to form a single pit consisting of approximately 1,500 acres. The Ocotillo pit will be backfilled with waste rock material to form the extension of an existing dump. The current footprint of the Sierrita tailings facility will remain the same (3,700 acres). At closure, it will have reached an elevation of 4,200 feet. Waste rock and heap leach areas will cover 2,600 acres.

**Table 2.1.3 - Reclamation and
Closure Bond Estimate
BHP Pinto Valley, AZ
Cost Summary**

Item	Task	Description	Volume Cu. Yd.	Thickness Ft.	Acres	Unit	Unit Cost	Estimated Cost
1	Tailings Facilities	Initial EMPACT			1342	Acre	\$2,394	\$3,213,200
		EMPACT Maintenance			1342	Acre	\$1,928	\$2,586,800
		Spillways			1,342	Acre	\$19	\$25,000
		Sub-total			1,342	Acre	\$4,341	\$5,825,000
2	Acid Leach Dumps	Regrade dumps to 2.5H:1V			827	Acre	\$615	\$508,400
		Pump and cyclone tailings onto dumps			827	Acre	\$7,781	\$6,435,000
		Distribute and grade tailings			827	Acre	\$534	\$441,600
		Initial EMPACT			827	Acre	\$4,374	\$3,616,900
		EMPACT Maintenance			827	Acre	\$3,203	\$2,648,800
		Sub-total			827	Acre	\$16,506	\$13,650,700
3	Waste Dumps	Disc, hydromulch and seed			586	Acre	\$800	\$468,800
4	Open Pit	Pit Perimeter Fencing						\$343,800
5	Access and Haul Roads	Disc, hydromulch and seed			156	Acre	\$800	\$124,900
6	Facilities Closure	Demolition						\$12,019,000
		Demolition debris removal						\$2,280,100
		Facilities Area Reclamation			207	Acre	\$1,352	\$279,800
		Power Line and Wells						\$1,222,200
		Sub-total						\$15,801,100
7	Labor						\$8,882,000	
8	Equipment Salvage						(\$18,436,000)	
	Total Final Reclamation Bond							\$26,660,300

Within its reclamation plan, Cyprus Sierrita has designed various objectives for Post-Mining Land Use (PMLU). Portions of the mine have designated PMLU as wildlife habitat and dispersed reclamation (2,981 acres), domestic grazing (1,550 acres), industrial (252 acres), Caterpillar proving grounds (165 acres) and stormwater management (32 acres).

Reclamation Bonding

In its reclamation plan, Cyprus Sierrita provided a cost estimate of \$18,324,000 for reclamation of the facility. In August of 1997, the State Mine Inspector approved both the plan and the estimate. Cyprus Sierrita Corporation provided financial assurance equal to its estimate with a surety bond payable to the State of Arizona. Table 2.1.4, **Reclamation and Closure Bond Estimate, Cyprus Sierrita, AZ, Cost Summary**, displays the costs as estimated by Cyprus Sierrita. Additional information describing the reclamation and basis for the estimated costs is provided in subsequent sections.

Cost Estimate Sources

The reclamation cost is based largely on information provided by the operator, while production and operating rates are primarily based on the cost data of historic mines. Production and operating rates for activities not historically performed were calculated using the 1995 Caterpillar Performance Handbook (Ed. 26) and 1994 Means Heavy Construction Cost Data. Hourly labor costs are based on the average pay scale for normal production operations of Cyprus Sierrita operators, including taxes, fringe benefits and unemployment benefits. Cost estimates assume that Cyprus Sierrita equipment will be utilized and that Cyprus Sierrita personnel will be available to manage the work at the time of reclamation.

Tailings Facilities

The Sierrita and Esperanza tailings facility will cover approximately 4,315 acres at closure. The final tailings facility will be approximately 1,137 feet in height.

Diversion ditches or retention basins will be maintained to divert stormwater from contacting the tailings. A lined retention basin will be constructed within the Esperanza tailings impoundment during the life of the mine. The basin will have sufficient capacity to store the 100-year, 24-hour storm event. Precipitation on reclaimed portions of the tailings will be directed to a pond with an estimated capacity of 300 acre-feet.

The surface of the Sierrita tailings will be regraded during final operations to minimize ponding and to redirect surface flows. The reclamation plan calls for approximately six inches of growth material to be placed on the surface of the tailings, scarified and revegetated in accordance with PMLU objectives. The slopes will be reclaimed utilizing the controlled grazing methods currently practiced at Cyprus Sierrita.

The tailings facilities are also covered by provisions of the Aquifer Protection Permit (APP). The existing water monitoring and collection system will continue in accordance with the APP. The reclamation plan estimates costs associated with the APP of \$1,085,000.

Waste Rock Disposal and Acid Leach Areas

At closure, acid leach dumps will occupy approximately 690 acres at the Sierrita mine. The reclamation plan calls for crown chaining operations using a D10N Bulldozer and anchor chain to round and stabilize the slope. The dump tops will be compacted after grading to reduce stormwater

Hardrock Reclamation Bonding Practices

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infiltration. Growth medium will be spread on 20 percent of the top surface. After growth medium is placed, the ground will be scarified and then seeded.

The surface of the acid leach areas will be regraded to provide a constant one percent slope to a central evaporation pond. The pond area will be compacted and lined with six to 12 inches of growth medium. Twenty percent of the top surface of the acid leach facilities will be capped and revegetated in a mosaic pattern to encourage natural revegetation on the top surface and slopes. The acid leach areas are also covered by provisions of the APP. In accordance with permit requirements, the acid leach dump will be neutralized during closure. The existing leachate monitoring and control system will also continue in accordance with the APP.

Pits

Pit reclamation consists of public safety measures including 31,600 linear feet of four-strand barbed wire fence as well as pit perimeter signs every 300 linear feet.

Access and Haul Roads

Except for haul roads required to provide access for industrial facilities, public access roads and maintenance activities, all roads will be reclaimed. The roads to be reclaimed will be regraded to minimize cut banks and to promote proper drainage. The disturbed areas will then be ripped, scarified and revegetated in accordance with PMLU objectives.

Pipes, Conveyor Belts and Soil Stockpiles

For estimating purposes it was assumed that 30 miles of pipe will be either buried in place or cut up and removed from the site at closure. The conveyor belt system will be dismantled and the disturbed area will be ripped, regraded and shaped and revegetated.

Building Demolition

Buildings that will not be retained for a specific PMLU will be demolished. The foundations will be left in place and buried approximately two feet. After the demolition of buildings is complete and material to cover foundations has been placed, reclamation will include revegetation in accordance with industrial PMLU objectives.

Ponds

Reclamation of process ponds, sumps and other elements of the leachate collection systems are required both under Cyprus Sierrita's closure plan and the Aquifer Protection Permit (APP). Reclamation will include the use of lined ponds, headwalls and interceptor trenches retained for post-mining land use of stormwater control. The reclamation plan estimates \$298,000 for reclamation costs relative to the APP.

Ongoing Maintenance

Costs for ongoing maintenance include expenses of periodic inspection, maintenance and repair of gates, fences, berms and signage. In addition, diversion channels will be inspected and cleared as necessary to allow passage of runoff consistent with design flow. Water quality will be monitored in accordance with APP requirements. Tailings impoundments, waste rock piles and leach dumps will be monitored for stability. Revegetated areas will be monitored for success rates. All monitoring and inspections will continue until final bond release, which is estimated at five years.

**Table 2.1.4 - Reclamation and
Closure Bond Estimate
Cyprus Sierrita, AZ
Cost Summary**

Item	Task	Description	Volume Cu. Yd.	Thickness Ft.	Acres	Unit	Unit Cost	Estimated Cost
1	Tailings Facilities	Haul and spread growth material cap on tailings			1153	Acre	\$452	\$521,000
		Scarification of growth medium			1,153	Acre	\$31	\$36,000
		Seeding and revegetation			1,153	Acre	\$90	\$103,400
		Tailing Slopes			2,580	Acre	\$3,000	\$7,740,000
		Sub-total			3,733	Acre	\$2,250	\$8,400,400
2	Waste Rock Dumps and Acid Leach Dumps	Crown chaining						\$52,200
		Regrade and compaction			1,550	Acre	\$436	\$675,200
		Haul and spread growth material cap			310	Acre	\$1,162	\$360,100
		Scarification of growth medium			310	Acre	\$31	\$9,700
		Seeding and revegetation			310	Acre	\$90	\$27,800
Sub-total			1,550	Acre	\$726	\$1,125,000		
3	Open Pit	Pit Perimeter Fencing						\$81,900
		Pit Perimeter Signage						\$5,600
		Sub-total						\$87,500
4	Access and Haul Roads	Ripping			171	Acre	\$122	\$20,900
		Regrading and shaping			171	Acre	\$304	\$51,900
		Seeding and revegetation			171	Acre	\$90	\$15,400
		Sub-total			171	Acre	516	\$88,200
5	Pipes, Conveyor Belts, Soil Stockpile						\$797,300	
6	Building Demolition						\$6,956,800	
7	Ponds						\$39,200	
8	Maintenance						\$835,100	
	Reclamation Sub-Total						\$18,329,500	
9	APP Reclamation Costs	Tailings Facilities						\$1,085,000
		Ponds						\$298,000
		Sub-total						\$1,383,000
	Total Final Reclamation Bond						\$19,712,500	

2.2 CALIFORNIA

Mining for gold and silver accounts for all of California's production of minerals from hardrock metal mines. Currently, 13 hardrock gold and silver mines are permitted in the state, with disturbance sizes ranging from two to 2,640 acres. One additional major gold and silver project—the Imperial mine—is currently pending final permitting and the appeals process.

Hardrock reclamation and closure bonding has been a standard process in the state in a substantive form since at least the early 1980's. All of the major hardrock mines in California have been permitted with reclamation and closure plans and financial assurance.

2.2.1 Major Mines with Existing Permits and Bonds

California's 13 permitted copper mines are listed in Table 2.2.1, **California Major Hardrock Mines, Mines with Existing Permits and Bonds**. Most of the state's gold and silver mines are medium-sized (ranging from 200 to 1,000 acres of disturbance), with the exception of the Mesquite mine, which contains about 2,000 disturbed acres.

California's total reclamation and closure bond amount of approximately \$34,000,000 equals approximately \$3,800 per acre disturbed, which falls within the mid-range of per acre bonding values in the western United States.

All of the present day, major mining operations in the state of California utilize open pit mining methods. Typically, oxide and other non-refractory ores are processed using cyanidation techniques including heap leaching and vat leaching. Some mines may also employ flotation processes or pre-oxidation (pressure leaching) processes to sulfide ores prior to vat leach cyanidation. Most of the mines use carbon adsorption, desorption, electrowinning and on-site refining to produce a relatively small, but valuable, quantity of precious metals.

Most of California's mines are currently in operation. Currently, three mines have closed and are in various stages of reclamation, although an additional three or four will probably close within the next two years. No California mine has ever successfully gone through the entire permitting, reclamation and closure process and achieved complete bond release, although several are in the final stages of reclamation (consisting primarily of monitoring activities).³

Most of the mining corporations in California are medium-sized companies with a heavy emphasis in precious and base metals mining. There are currently no mines in the state operated by companies in bankruptcy, although some are recognized as being at risk of financial failure,⁴ particularly if gold prices continue at 25-year lows of less than \$300 per ounce.

2.2.2 Reclamation and Closure Bonding Regulatory Features

California, in 1975, was one of the first states to establish a mined land reclamation Act. This Surface Mining and Reclamation Act (SMARA) has been subsequently amended with significant revisions and additions (including the requirement of financial assurance) in 1980, 1987 and 1990. Since its inception, the Act has essentially been administered in a mostly consistent manner. This consistency is reflected in the fact that many of California's mines have not undergone any change in their original reclamation plans or bonds, except for periodic cost escalation and inflation adjustments.

³ Royal Mountain King and Colosseum.

⁴ Canyon Resources Corp.

California is unique among the western states in that the principal responsibility for bonding is typically held by the county or cities at which the mine is located. The local governments have lead authority for reclamation plans and bonding on all lands—private, state and federal. The California Department of Conservation’s Office of Mine Reclamation serves primarily in an oversight role, advising the counties as to the adequacy of submitted reclamation plans and cost estimates under the state’s reclamation statutes.

The California Regional Water Quality Control Boards enforce California’s water quality protection statutes. The boards may require additional bonding relative to water quality considerations or for chemical spills and worst-case accidents. Most of the additional bonding currently being held has been allocated for water quality monitoring and for potential accidents involving process solution spills. The additional bonding is not typically held by the counties.

The California SMARA contains extensive performance standards for reclamation plan requirements and the issues of surface reclamation, water quality and hydrology. The county regulatory bodies are still left with substantial discretion as to the application of the standards. These bodies receive only minimal oversight about private and state land from the Department of Conservation’s Office of Mine Reclamation. Some oversight on federal land is given by the BLM and/or U.S. Forest Service.

Additional information on California’s SMARA and its associated rules are contained in Table 2.2.2, **California Reclamation and Closure Bonding Features.**

**Table 2.2.1– California Major Hardrock Mines
Mines with Existing Permits and Bonds**

Mine Name	Ownership	Commodity	Type	Status	Disturbed Acres ¹	Bond Amount ⁵
American Girl (Cargo Muchaco)	MK Gold Co. (50%), Hecla Mining Co. (50%)	Gold, Silver	Open Pit and Underground, Heap Leach, Vat Leach	Operating	155	\$278,750
Briggs Mine	Canyon Resources Corp.	Gold, Silver	Open Pit and Heap Leach	Operating	300	\$3,030,000
Cactus Gold Mine (Shumake)	Hecla Mining Co. (64%)	Gold, Silver	Open Pit and Heap Leach	Operating	200	\$279,400
Castle Mountain	Viceroy Gold Corp.	Gold, Silver	Open Pit, Heap Leach, Vat Leach	Operating	685	\$1,605,000
Colosseum Gold Mine	Lac Minerals Ltd.	Gold, Silver	Open Pit and Vat Leach	Closed - Reclamation	2	\$800,000
Hayden Hill Mine	Amax Gold Inc.	Gold, Silver	Open Pit, Heap Leach, Vat Leach	Operating	1,021	\$5,714,566
McLaughlin Mine	Homestake Mining Co.	Gold, Silver	Open Pit, Pressure and Vat Leach	Closed – Reclamation	803	\$12,228,964
Mesquite Mine	Santa Fe Pacific Gold Corp.	Gold, Silver	Open Pit and Heap Leach	Operating	1,995	\$3,048,081
Picacho Mine	Glamis Gold Inc.	Gold, Silver	Open Pit and Heap Leach	Operating	240	\$220,894
Royal Mountain King Mine	FMC Gold Co.	Gold, Silver	Open Pit, Flotation and Vat Leach	Closed - Reclamation	650	\$3,303,000
Soledad Canyon	P.W. Gillibrand Co.	Gold, Silver	Open Pit, Heap Leach	Operating	30	\$259,600
Vista Cherokee Rainbow		Gold, Silver			2,640	\$3,048,081
Yellow Aster	Glamis Gold Inc.	Gold, Silver	Open Pit, Heap Leach	Operating	205	\$215,515
Total					8,926	\$34,031,851

⁵ Data from database attached to letter from California Department of Conservation, Office of Mine Reclamation to NWF, July 20, 1998.

Table 2.2.2 – California Reclamation and Closure Bonding Features

<p>Statutes, Regulations and Guidelines</p>	<p>California Surface Mining and Reclamation Act of 1975 Division 2, Chapter 9, Section 2710 et seq. , Public Resources Code (SMARA) [Enacted 1975]</p> <p>State Mining and Geology Board Reclamation Regulations Title 14, Division 2, Chapter 8, Subchapter 1, California Code of Regulations</p> <p>Surface Mining and Reclamation Act Financial Assurance Guidelines State Mining and Geology Board, 1997</p>
<p>Authority</p> <p>Governing State Body</p> <p>Lead State Agency</p> <p>Bonding Required By State</p> <p>And</p> <p>Relationship with Federal Agencies</p>	<p>The (State Mining and Geology) board shall adopt regulations which establish state policy for the reclamation of mined lands in accordance with the general provisions set forth in Article 1 (commencing with Section 2710) of this chapter and pursuant to Chapter 4.5 (commencing with Section 11371) of Part 1 of Division 3 of Title 2 of the Government Code.^{xxvi}</p> <p>"Lead agency" means the city, county, San Francisco Bay Conservation and Development Commission, or the board which has the principal responsibility for approving a surface mining operation or reclamation plan pursuant to this chapter.^{xxvii}</p> <p>Bonding is performed by the county under the Act on private, state and federal lands.</p> <p>Some counties have entered into site-specific MOU's with federal agencies in conducting their responsibilities under the Act.</p>
<p>Exemptions to Reclamation Bonding</p> <p>Activities Prior to Regulation</p> <p>Size Limitations</p>	<p>Reclamation Plan. The applicant's (operator's) completed and approved plan for reclaiming the lands affected by his surface mining operations conducted after January 1, 1976, as called for in Section 2772 of the Act.^{xxviii}</p> <p>In addition to the provisions of Public Resources Code Section 2714(a), (c) and (d), any surface mining operation that does not involve either the removal of a total of more than 1000 cubic yards of minerals, ores, and overburden, or involve more than one acre in any one location, shall be exempt from the provisions of the Act.^{xxix}</p>

<p>Reclamation Plan Requirements</p>	<p>Reclamation of mined lands shall be implemented in conformance with the standards in this Article.^{xxx}</p> <p>§ 3703. Performance Standards for Wildlife Habitat.</p> <p>Wildlife and wildlife habitat shall be protected in accordance with the following standards: (a) Rare, threatened or endangered species as listed by the California Department of Fish and Game, (California Code of Regulations, Title 14, sections 670.2 - 670.5) or the U. S. Fish and Wildlife Service, (50 CFR 17.11 and 17.12) or species of special concern as listed by the California Department of Fish and Game in the Special Animals List, Natural Diversity Data Base, and their respective habitat, shall be conserved as prescribed by the federal Endangered Species Act of 1973, 16 U.S.C. section 1531 et. seq., and the California Endangered Species Act, Fish and Game Code section 2050 et seq. If avoidance cannot be achieved through the available alternatives, mitigation shall be proposed in accordance with the provisions of the California Endangered Species Act, Fish and Game Code section 2050 et seq., and the federal Endangered Species Act of 1973, 16 U.S.C. section 1531 et seq. (b) Wildlife habitat shall be established on disturbed land in a condition at least as good as that which existed before the lands were disturbed by surface mining operations, unless the proposed end use precludes its use as wildlife habitat or the approved reclamation plan establishes a different habitat type than that which existed prior to mining. (c) Wetland habitat shall be avoided. Any wetland habitat impacted as a consequence of surface mining operations shall be mitigated at a minimum of one to one ratio for wetland habitat acreage and wetland habitat value.</p> <p>§ 3704. Performance Standards for Backfilling, Regrading, Slope Stability, and Recontouring.</p> <p>Backfilling, regrading, slope stabilization, and recontouring shall conform with the following standards: (a) Where backfilling is proposed for urban uses (e.g., roads, building sites, or other improvements sensitive to settlement), the fill material shall be compacted in accordance with section 7010, Chapter 70 of the Uniform Building Code, published by the International Conference of Building Officials (1991), the local grading ordinance, or other methods approved by the lead agency as appropriate for the approved end use. (b) Where backfilling is required for resource conservation purposes (e.g., agriculture, fish and wildlife habitat, and wildland conservation), fill material shall be backfilled to the standards required for the resource conservation use involved. (c) Piles or dumps of mining waste shall be stockpiled in such a manner as to facilitate phased reclamation. They shall be segregated from topsoil and topsoil substitutes or growth media salvaged for use in reclamation. (d) Final reclaimed fill slopes, including permanent piles or dumps of mine waste rock and overburden, shall not exceed 2:1 (horizontal:vertical), except when site-specific geologic and engineering analysis demonstrate that the proposed final slope will have a minimum slope stability factor of safety that is suitable for the proposed end use, and when the proposed final slope can be successfully revegetated. (e) At closure, all fill slopes, including permanent piles or dumps of mine waste and overburden, shall conform with the surrounding topography and/or approved end use. (f) Cut slopes, including final highwalls and quarry faces, shall have a minimum slope stability factor of safety that is suitable for the proposed end use and conform with the surrounding topography and/or approved end use. (g) Permanent placement of piles or dumps of mining waste and overburden shall not occur within wetlands unless mitigation acceptable to the lead agency has been proposed to offset wetland impacts and/or losses.</p> <p>§ 3705. Performance Standards for Revegetation.</p> <p>Revegetation shall be part of the approved plan, unless it is not consistent with the approved end use. (a) A vegetative cover suitable for the proposed end use and capable of self-regeneration without continued dependence on irrigation, soil amendments or fertilizer shall be established on disturbed land unless an artificially maintained landscape is consistent with the approved reclamation plan. Vegetative cover or density, and species-richness shall be, where appropriate, sufficient to stabilize the surface against effects of long-term erosion and shall be similar to</p>
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<p>Reclamation Plan Requirements (continued)</p>	<p>naturally occurring habitats in the surrounding area. The vegetative density, cover and species richness of naturally occurring habitats shall be documented in baseline studies carried out prior to the initiation of mining activities. However, for areas that will not be reclaimed to prior conditions, the use of data from reference areas in lieu of baseline site data is permissible. (b) Test plots conducted simultaneously with mining shall be required to determine the most appropriate planting procedures to be followed to ensure successful implementation of the proposed revegetation plan. The lead agency may waive the requirement to conduct test plots when the success of the proposed revegetation plan can be documented from experience with similar species and conditions or by relying on competent professional advice based on experience with the species to be planted. (c) Where surface mining activities result in compaction of the soil, ripping, disking, or other means shall be used in areas to be revegetated to eliminate compaction and to establish a suitable root zone in preparation for planting. (d) Prior to closure, all access roads, haul roads, and other traffic routes to be reclaimed shall be stripped of any remaining roadbase materials, prepared in accordance with subsection 3705(g), covered with suitable growth media or topsoil, and revegetated. When it is not necessary to remove roadbase materials for revegetative purposes, lead agencies may set a different standard as specified in section 3700(b) of this Article. (e) Soil analysis shall be required to determine the presence or absence of elements essential for plant growth and to determine those soluble elements that may be toxic to plants, if the soil has been chemically altered or if the growth media consists of other than the native topsoil. If soil analysis suggests that fertility levels or soil constituents are inadequate to successfully implement the revegetative program, fertilizer or other soil amendments may be incorporated into the soil. When native plant materials are used, preference shall be given to slow-release fertilizers, including mineral and organic materials that mimic natural sources, and shall be added in amounts similar to those found in reference soils under natural vegetation of the type being reclaimed. (f) Temporary access for exploration or other short-term uses on arid lands shall not disrupt the soil surface except where necessary to gain safe access. Barriers shall be installed when necessary to gain safe access. Barriers shall be installed when necessary to prevent unauthorized vehicular traffic from interfering with the reclamation of temporary access routes. (g) Native plant species shall be used for revegetation, except when introduced species are necessary to meet the end uses specified in the approved reclamation plan. Areas to be developed for industrial, commercial, or residential use shall be revegetated for the interim period, as necessary, to control erosion. In this circumstance, non-native plant species may be used if they are not noxious weeds and if they are species known not to displace native species in the area. (h) Planting shall be conducted during the most favorable period of the year for plant establishment. (i) Soil stabilizing practices shall be used where necessary to control erosion and for successful plant establishment. Irrigation may be used when necessary to establish vegetation. (j) If irrigation is used, the operator must demonstrate that the vegetation has been self-sustaining without irrigation for a minimum of two years prior to release of the financial assurances by the lead agency, unless an artificially maintained landscape is consistent with the approved end use. (k) Noxious weeds shall be managed: (1) when they threaten the success of the proposed revegetation; (2) to prevent spreading to nearby areas; and (3) to eliminate fire hazard. (l) Protection measures, such as fencing of revegetated areas and/or the placement of cages over individual plants, shall be used in areas where grazing, trampling, herbivory, or other causes threaten the success of the proposed revegetation. Fencing shall be maintained until revegetation efforts are successfully completed and the lead agency authorizes removal. (m) Success of revegetation shall be judged based upon the effectiveness of the vegetation for the approved end use, and by comparing the quantified measures of vegetative cover, density, and species-richness of the reclaimed mined-lands to similar parameters of naturally occurring vegetation in the area. Either baseline data or data from nearby reference areas may be used as the standard for comparison. Quantitative standards for success and the location(s) of the reference area(s) shall be set forth in the approved reclamation plan. Comparisons shall be made until performance standards are met provided that, during the last two years, there has been no human intervention, including, for example, irrigation, fertilization, or weeding. Standards for success shall be based on expected local recovery rates. Valid sampling techniques for measuring success shall be specified in the approved reclamation plan. Sample sizes must be sufficient to produce at least an 80 percent confidence level. There are</p>
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<p>Reclamation Plan Requirements (continued)</p>	<p>standard statistical methods in commonly available literature for determining an 80 percent confidence level on a site-by-site basis. Examples of such literature include, but are not limited to, D. Mueller-Dombois and H. Ellenberg, 1974, "Aims and Methods of Vegetation Ecology", John Wiley and Sons, Inc., or C. D. Bonham, 1988, "Measurements for Terrestrial Vegetation", John Wiley and Sons, Inc., and are available at many university libraries. The texts are also available at some local libraries through the Inter-Library Loan Program.</p> <p>§ 3706. Performance Standards for Drainage, Diversion Structures, Waterways, and Erosion Control.</p> <p>(a) Surface mining and reclamation activities shall be conducted to protect on-site and downstream beneficial uses of water in accordance with the Porter-Cologne Water Quality Control Act, Water Code section 13000, et seq., and the Federal Clean Water Act, 33 U.S.C. section 1251, et seq. (b) The quality of water, recharge potential, and storage capacity of ground water aquifers which are the source of water for domestic, agricultural, or other uses dependent on the water, shall not be diminished, except as allowed in the approved reclamation plan. (c) Erosion and sedimentation shall be controlled during all phases of construction, operation, reclamation, and closure of a surface mining operation to minimize siltation of lakes and watercourses, as required by the Regional Water Quality Control Board or the State Water Resources Control Board. (d) Surface runoff and drainage from surface mining activities shall be controlled by berms, silt fences, sediment ponds, revegetation, hay bales, or other erosion control measures, to ensure that surrounding land and water resources are protected from erosion, gullyng, sedimentation and contamination. Erosion control methods shall be designed to handle runoff from not less than the 20 year/1 hour intensity storm event. (e) Where natural drainages are covered, restricted, rerouted, or otherwise impacted by surface mining activities, mitigating alternatives shall be proposed and specifically approved in the reclamation plan to assure that runoff shall not cause increased erosion or sedimentation. (f) When stream diversions are required, they shall be constructed in accordance with: (1) the stream and lake alteration agreement between the operator and the Department of Fish and Game; and (2) the requirements of the Federal Clean Water Act, Sections 301 (33 U.S.C. 1311) and Section 404 (33 U.S.C. 1344) and/or Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403). (g) When no longer needed to achieve the purpose for which they were authorized, all temporary stream channel diversions shall be removed and the affected land reclaimed.</p> <p>§ 3707. Performance Standards for Prime Agricultural Land Reclamation.</p> <p>In addition to the standards for topsoil salvage, maintenance, and redistribution, the following standards shall apply to mining operations on prime agricultural lands where the approved end use is agriculture: (a) Mining operations which will operate on prime agricultural lands, as defined by the U.S. Soil Conservation Service, shall return all disturbed areas to a fertility level as specified in the approved reclamation plan. (b) When distinct soil horizons are present, topsoil shall be salvaged and segregated by defined A, B, and C soil horizons. Upon reconstruction of the soil, the sequence of horizons shall have the A atop the B, the B atop the C, and the C atop graded overburden. (c) Reclamation shall be deemed complete when productive capability of the affected land is equivalent to or exceeds, for two consecutive crop years, that of the premining condition or similar crop production in the area. Productivity rates, based on reference areas described in the approved reclamation plan, shall be specified in the approved reclamation plan. (d) Use of fertilizers or other soil amendments shall not cause contamination of surface or ground water.</p> <p>§ 3708. Performance Standards for Other Agricultural Land.</p> <p>The following standards shall apply to agricultural lands, other than prime agricultural lands, when the approved end use is agriculture. In addition to the standards for topsoil salvage, maintenance, and redistribution, non-prime agricultural lands shall be reclaimed so as to be</p>
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<p>Reclamation Plan Requirements (continued)</p>	<p>capable of sustaining economically viable production of crops commonly grown in the surrounding areas.</p> <p>§ 3709. Performance Standards for Building, Structure, and Equipment Removal.</p> <p>(a) All equipment, supplies and other materials shall be stored in designated areas (as shown in the approved reclamation plan). All waste shall be disposed of in accordance with state and local health and safety ordinances. (b) All buildings, structures, and equipment shall be dismantled and removed prior to final mine closure except those buildings, structures, and equipment approved in the reclamation plan as necessary for the end use.</p> <p>§ 3710. Performance Standards for Stream Protection, Including Surface and Groundwater.</p> <p>(a) Surface and groundwater shall be protected from siltation and pollutants which may diminish water quality as required by the Federal Clean Water Act, sections 301 et seq. (33 U.S.C. section 1311), 404 et seq. (33 U.S.C. section 1344), the Porter-Cologne Act, section 13000 et seq., County anti-siltation ordinances, the Regional Water Quality Control Board or the State Water Resources Control Board. (b) In-stream surface mining operations shall be conducted in compliance with Section 1600 et seq. of the California Fish and Game Code, section 404 of the Clean Water Act, and Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403). (c) Extraction of sand and gravel from river channels shall be regulated to control channel degradation in order to prevent undermining of bridge supports, exposure of pipelines or other structures buried within the channel, loss of spawning habitat, lowering of ground water levels, destruction of riparian vegetation, and increased stream bank erosion (exceptions may be specified in the approved reclamation plan). Changes in channel elevations and bank erosion shall be evaluated annually using records of annual extraction quantities and benchmarked annual cross sections and/or sequential aerial photographs to determine appropriate extraction locations and rates. (d) In accordance with requirements of the California Fish and Game Code section 1600 et seq., in-stream mining activities shall not cause fish to become entrapped in pools or in off-channel pits, nor shall they restrict spawning or migratory activities.</p> <p>§ 3711. Performance Standards for Topsoil Salvage, Maintenance, and Redistribution.</p> <p>When the approved reclamation plan calls for revegetation or cultivation of disturbed lands, the following performance standards shall apply to topsoil salvage, maintenance, and redistribution activities: (a) All salvageable topsoil suitable for revegetation shall be removed as a separate layer from areas to be disturbed by mining operations. Topsoil and vegetation removal shall not precede surface mining activities by more than one year, unless a longer time period is approved by the lead agency. (b) Topsoil resources shall be mapped prior to stripping and the location of topsoil stockpiles shall be shown on a map in the reclamation plan. If the amount of topsoil needed to cover all surfaces to be revegetated is not available on site, other suitable material capable of sustaining vegetation (such as subsoil) shall be removed as a separate layer for use as a suitable growth media. Topsoil and suitable growth media shall be maintained in separate stockpiles. Test plots may be required to determine the suitability of growth media for revegetation purposes. (c) Soil salvage operations and phases of reclamation shall be carried out in accordance with a schedule that: (1) is set forth in the approved reclamation plan; (2) minimizes the area disturbed; and (3) is designed to achieve maximum revegetation success allowable under the mining plan. (d) Topsoil and suitable growth media shall be used to phase reclamation as soon as can be accommodated by the mining schedule presented in the approved reclamation plan following the mining of an area. Topsoil and suitable growth media that cannot be utilized immediately for reclamation shall be stockpiled in an area where it will not be disturbed until needed for reclamation. Topsoil and suitable growth media stockpiles shall be clearly identified to distinguish them from mine waste dumps. Topsoil and suitable growth media stockpiles shall be planted with a vegetative cover or shall be protected by other equally effective measures to prevent water and wind erosion and to discourage weeds. Relocation of topsoil or suitable growth media stockpiles for purposes other than reclamation shall require</p>
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Type of Bond Allowed (continued)	letters of credit; and (3) Trust funds; (b) For governmental entity operators: (1) Surety bonds; (2) Irrevocable letters of credit; (3) Trust funds; (4) Pledges of Revenue; or (5) Budget Set Aside. ^{xxxvii}
<p>Reclamation and Bonding Oversight</p> <p>Reclamation Monitoring and Compliance</p> <p>Bond Review</p> <p>Bond Forfeiture</p> <p>Bond Release</p>	<p>The director or a qualified assistant may at any time enter or examine any and all mines, quarries, wells, mills, reduction works, refining works, and other mineral properties or working plants in this state in order to gather data to comply with the provisions of this chapter.^{xxxviii}</p> <p>(c) In order for the lead agency or the Department of Conservation to determine what annual adjustments, if any, are appropriate to the Financial Assurance Amount, the operator shall annually submit to the lead agency a revision of the written calculation required under Section 3804(a).^{xxxix}</p> <p>If the lead agency or the board, following a public hearing, determines that the operator is financially incapable of performing reclamation in accordance with its approved reclamation plan, or has abandoned its surface mining operation without commencing reclamation, either the lead agency or the director shall do all of the following: (1) Notify the operator by personal service or certified mail that the lead agency or the director intends to take appropriate action to forfeit the financial assurances and specify the reasons for so doing. (2) Allow the operator 60 days to commence or cause the commencement of reclamation in accordance with its approved reclamation plan and require that reclamation be completed within the time limits specified in the approved reclamation plan or some other time period mutually agreed upon by the lead agency or the director and the operator. (3) Proceed to take appropriate action to require forfeiture of the financial assurances if the operator does not substantially comply with paragraph (2). (4) Use the proceeds from the forfeited financial assurances to conduct and complete reclamation in accordance with the approved reclamation plan. In no event shall the financial assurances be used for any other purpose. The operator is responsible for the costs of conducting and completing reclamation in accordance with the approved reclamation plan which are in excess of the proceeds from the forfeited financial assurances.^{xi}</p> <p>The financial assurances shall remain in effect for the duration of the surface mining operation and any additional period until reclamation is completed.^{xii}</p>
Public Participation in Bonding	No specific provisions for Public Participation in bonding are provided.
Other Significant Features	California Water Code – California Regional Water Quality Control Boards

2.2.3 Reclamation and Closure Bonding Case Studies

2.2.3.1 Briggs Mine

Introduction and Background

In 1996, Canyon Resources began production at the Briggs Project, located near Death Valley National Monument, in southern California’s Inyo County. The medium-sized project is an open pit crushed ore heap leach operation that produces gold and silver. The project will ultimately disturb approximately 352 acres over its projected lifetime.

Reclamation Bonding

Three different permits, each with financial assurance features, are required:

- (1) The Mining Reclamation Plan administered by Inyo County as the lead agency (with oversight by the California Department of Conservation) requires surety under the State Mining and Reclamation Act (SMARA).
- (2) The Waste Discharge Order issued by the California Regional Water Quality Control Board, Lahontan Region, requires surety held against both heap detoxification and “reasonable worst-case” clean-up costs.
- (3) The Plan of Operations administered by the Bureau of Land Management (BLM) requires surety against the reclamation provisions in the Plan of Operations.

CR Briggs proposed that one financial instrument be posted with Inyo County to satisfy the bonding requirements of all the agencies.

CR Briggs provided a cost estimate of \$3,030,000 for reclamation of the facility with its reclamation plan.^{xliii} Table 2.2.3, **Reclamation and Closure Bond Estimate, CR Briggs, CA, Cost Summary**, displays the costs as estimated by CR Briggs. Additional information describing the required reclamation and the basis for the estimated costs is provided in the subsequent sections.

Cost Estimate Sources and Assumptions

The reclamation cost is based on information provided by the operator. The estimates are based on the cost components of labor, equipment and supplies.

Hourly labor rates were estimated based on the rates of a similar mining operation. Salaried labor rates were estimated from information about similar positions in a 1994 survey of wages by the Mountain States Employers’ Council. A burden of 31.3 percent was included in all labor cost estimates. Some labor costs were taken from *Site Work and Landscape Cost Data* published by Means (1995).

Equipment costs were based primarily on information in the *Cost Reference Guide for Construction Equipment* (K-III Directory Corporation) and Means. Other information, such as revegetation costs, is based on other Canyon Resources operations, such as the Kendall Mine in Montana.

The cost of removing equipment from the site is assumed to be less than the salvage value, so no costs are assigned to the removal of equipment.

The calculations are based on a snapshot of the project at completion, without concurrent reclamation. The basis for estimating the work to be completed is formed by the project description found in the Application for Plan of Operations, the Mining Reclamation Plan and the Report of Waste Discharge.

Heap Leach Pads

Detoxification would consist of three steps:

- (1) Circulation of process solution through the heap to remove metals, cyanide and other contaminants.

- (2) When circulation is no longer effective, chemical agents would be added to the process solution and circulated through the heap (to destroy cyanide) until closure concentrations are reached.
- (3) The remaining process solution would be evaporated.

In estimating detoxification costs, Canyon Resources excluded the cost of the first step. The company reasoned that revenues would exceed costs, so it is unlikely that the project would be abandoned during that phase of detoxification.

The leach pad slopes will be regraded to 3H:1V and 18 inches of topsoil will be placed over the leach pad surface. Revegetation and reseeding will consist of broadcast seeding, mulching and crimping.

Waste Rock Dumps

The waste rock dumps will be regraded to 2.5H:1V with 12 inches of topsoil placed over the waste rock dump surface. Revegetation and reseeding will consist of broadcast seeding, mulching and crimping.

Open Pit

The exposed surfaces of the open pit will be stained to blend with surrounding undisturbed surface features.

Facilities, Roads, Diversions and Other

Following removal of equipment and infrastructure, all facilities, roads and other areas will be regraded with 10 to 12 inches of topsoil placed over the regraded surface. Revegetation and reseeding will consist of broadcast seeding, mulching and crimping.

Supervisory Labor

Supervisory labor costs include management, supervision and maintenance labor during reclamation.

Indirect Costs

As noted in Table 1.1, the estimated reclamation bond costs for the Briggs mine includes indirect costs for mobilization, contingency (10.0 percent), administration (15.0 percent), insurance (1.5 percent), bond (1.5 percent) and profit (10 percent).

The indirect costs total about \$819,000. This equates to 39 percent of the direct costs, or approximately 27 percent of the total costs of reclamation.

Additional Indirect Water Quality Costs

The California Regional Water Quality Control Board, Lahontan Region, wanted assurance that the administrative overhead and contingency multiplier line items associated with the direct cost of water quality work were included in the water quality line items. To accommodate this request, the amount was increased as indicated.

**Table 2.2.3 Reclamation and
Closure Bond Estimate
CR Briggs, CA
Cost Summary**

Item	Task	Description	Volume Cu. Yd.	Thickness Ft.	Acres	Unit	Unit Cost	Estimated Cost
1	Leach Pad Reclamation	Detoxification			138	Acre	\$3,487	\$481,199
		Regrade leach pads			138	Acre	\$2,406	\$332,062
		Reseeding and Revegetation			138	Acre	\$1,192	\$164,485
		Sub-total			138	Acre	\$7,085	\$977,746
2	Waste Rock Dump Reclamation	Regrade waste rock dumps			131	Cu. Yd.	\$1,921	\$251,705
		Reseeding and Revegetation			131	Acre	\$1,192	\$156,142
		Sub-total			131	Acre	\$3,113	\$407,847
3	Open Pit	Pit Staining					\$36,860	
4	Facilities, Roads, Diversions and Other	Facilities Demolition						\$151,352
		Regrade Facilities			83	Acre	\$1,440	\$119,556
		Reseeding and Revegetation			83	Acre	\$1,264	\$104,930
		Sub-total			83	Acre	\$4,528	\$375,838
5	Supervisory Labor						\$307,289	
	Sub-total Direct Costs						\$2,105,580	
6	Indirect Costs	Mobilization						\$13,595
		Contingency @10%						\$211,918
		Administration @15.0%						\$317,876
		Insurance @1.5%						\$31,788
		Bond @1.5%						\$31,788
		Profit @ 10%						\$211,918
	Sub-total						\$818,883	
	Sub-total Direct + Indirect Costs						\$2,924,463	
7	Additional Indirect Water Quality Costs						\$105,537	
	Total Reclamation Cost+C55+C13						\$3,030,000	

2.2.3.2 McLaughlin Mine

Introduction and Background

The McLaughlin Mine, owned by Homestake Mining Co., has been in operation since 1984. The mine is located in northern California, about 70 miles north of San Francisco. This gold and silver mining operation consists of several open pits, waste rock dumps, low-grade ore dumps, a pressure-oxidation cyanidation process facility, tailings impoundment and ancillary facilities and infrastructure. The total area of disturbance over the project life is about 1,500 acres, with 1,082 acres identified for reclamation in the most current plan (1995).

According to the most recent addendum to the reclamation plan^{xliii}, the majority of the north pit and a portion of the south pit will be backfilled to slope angles of approximately 2.5H:1V. Other mine pit areas will be left open to maintain access for possible future mining. Following completion of mining and pit dewatering, the unreclaimed pit will keep both ground and surface water sources at a static level, forming a lake between 360 and 500 feet deep. The final level and quality of the pit lake water will be determined by hydrological and geochemical conditions, as well as season and actual precipitation.

Reclamation Bonding

According to documents on file with the California Department of Conservation, Homestake currently has reclamation bonding with the lead agencies: Napa, Yolo and Lake Counties. According to the California Department of Conservation, the current reclamation bonds total \$12,228,964.

Homestake estimated the reclamation cost for the McLaughlin operations in its 1995 reclamation plan addendum. However, Homestake has requested that the Department of Conservation withhold any specific information on the estimated costs of performing reclamation activities from public review, on the basis of proprietary financial information.

According to the plan addendum, the cost estimate is based on mid-1982 dollars (adjusted for increases in construction costs) and includes a 10 percent contingency factor. Other documents open to public inspection at the Department of Conservation contain a November 1984 cost estimate based on the original projection of 1,042 acres to be reclaimed.^{xliiv}

Table 2.2.4, **Reclamation and Closure Bond Estimate, McLaughlin, CA, Cost Summary** shows a reclamation cost estimate for the McLaughlin Mine, which was developed from available information.^{xliv} Acreage figures are based on data from the reclamation plan addendum. Unit costs, based on the cited information, were used to obtain a preliminary estimate roughly equivalent to that of the 1982 estimate. Those costs were then inflated to obtain the current estimate of \$12,228,964. The resulting inflationary adjustment factor was approximately 24 percent from the original estimate in 1982 to the most recent estimate in 1995.

Cost Estimate Sources

The cited cost estimate contains no information as to the sources of the cost information used.

Tailings Site

Tailings site reclamation costs in the 1984 estimate indicate \$14,992 (1995 dollars) per acre for “closure” costs. The reclamation plan addendum makes reference to “constructing a 2.0-foot capillary

barrier (including transition zone) on the tailings site,” in addition to the redistribution of topsoil and revegetation.

Waste Rock

Since 1987, preparation of the main Waste Rock Facility for reclamation has included encapsulation of acid generating waste rock as well as regrading and redistribution of topsoil. Waste rock is layered in cells which, after resloping, is encapsulated with clay and capped with waste rock and topsoil.

Mine Pits

The majority of the north pit and a portion of the south pit will be backfilled with waste rock as it is concurrently mined from the active portion of the pit. Therefore, no backfilling costs were included in the reclamation plan. The resulting topography of the backfilled portions of the pit will be a series of benched terraces at an overall slope of 2.5H:1V.

**Table 2.2.4 - Reclamation and
Closure Bond Estimate
McLaughlin, CA
Cost Summary**

Item	Task	Description	Volume Cu. Yd.	Thickness Ft.	Acres	Unit	Unit Cost	Estimated Cost
1	Tailings Site	Closure	959,242		424	Acre	\$14,992	\$6,356,790
		Topsoiling			424	Cu. Yd.	\$1.56	\$1,492,586
		Revegetate (drill)			424	Acre	\$1,245	\$527,797
		Sub-total			424	Acre	\$19,757	\$8,377,174
2	Waste Rock Site	Surface preparation	535,878		277	Acre	\$124	\$34,481
		Topsoiling				Cu. Yd.	\$1.56	\$833,830
		Revegetate (drill)			277	Acre	\$1,245	\$344,811
		Sub-total			277	Acre	\$4,380	\$1,213,122
3	Mine Pit	Surface preparation	234,084		121	Acre	\$124	\$15,062
		Topsoiling				Cu. Yd.	\$1.56	\$364,236
		Revegetate (drill)			121	Acre	\$1,245	\$150,621
		Sub-total			121	Acre	\$4,380	\$529,920
4	Mine and Mill Facilities	Surface preparation	135,714		88	Acre	\$124	\$10,954
		Topsoiling				Cu. Yd.	\$1.56	\$211,172
		Revegetate (drill)			88	Acre	\$1,245	\$109,543
		Plant Shrubs			5	Acre	\$3,548	\$17,738
		Sub-total			88	Acre	\$3,971	\$349,408
5	Low-grade Ore Stockpiles	Surface preparation	216,484		85	Acre	\$124	\$10,581
		Topsoiling				Cu. Yd.	\$1.56	\$336,851
		Revegetate (drill)			85	Acre	\$1,245	\$105,808
		Plant Shrubs			9	Acre	\$3,548	\$31,929
		Sub-total			85	Acre	\$5,708	\$485,170
6	Misc.	Grading			87	Acre	\$497.92	\$43,319
		Surface Preparation			87	Acre	\$124.48	\$10,830
		Revegetate (drill)			87	Acre	\$1,245	\$108,298
		Sub-total			87	Acre	\$1,867	\$162,447
	Sub-total Direct Costs							\$11,117,240
7	Indirect Costs	Contingency @10%						\$1,111,724
	Total Reclamation Cost				1,082			\$12,228,964

2.3 COLORADO

Historically, Colorado's mining industry—with significant production of lead, zinc, copper, gold, silver and molybdenum—has been the nation's most diverse. Today, however, most of Colorado's significant mining operations are either closed and undergoing reclamation, or are suspended due to low metals prices. Currently, the only operating major hardrock metals mines in the state are the Cresson gold and silver mine, and the Henderson molybdenum mine.

Hardrock reclamation and closure bonding has been a standard, substantive process in Colorado since at least the early 1980's. However, many of the major hardrock mines in the state were operating prior to that time. Reclamation plans and estimated costs for modern mines do not take into account activities affecting the environment prior to the early 1980's.

2.3.1 Major Mines with Existing Permits and Bonds

Colorado's seven major permitted and bonded mines are listed in Table 2.3.1, **Colorado Major Hardrock Mines, Mines with Existing Permits and Bonds**.

2.3.2 Reclamation and Closure Bonding Regulatory Features

Colorado, in 1973, was one of the earlier states to establish a mined land reclamation Act. The Colorado Mined Land Reclamation Act (CMLRA) has been subsequently amended several times, including changes in 1993 in response to the Summitville mine foreclosure.

The Colorado Mined Land Reclamation Act contains broad—but fairly brief—reclamation plan requirements that address surface reclamation and hydrology. The Division of Minerals and Geology has substantial discretion as to the application of these requirements on a site-specific basis.

Until Montana's recent run-ins with financially inept operations, Colorado had more experience than any state with bankrupt mines and bonding issues (thanks largely to the infamous Summitville mine, which was permitted under the Act and rules as they existed in the mid-1980's). It wasn't until 1992, after evidence of repeated problems, that Summitville's reclamation bond was increased to \$5 million.

In 1993, after the mining company abandoned the site, leaving the state and EPA responsible for closure, it became obvious that even the increased bond was entirely insufficient to reclaim the catastrophe the Summitville mine had become. Cleanup at the mine site has been underway as a Superfund program since 1993. It is currently estimated that the cost of that cleanup will be between \$150 and \$180 million.

While many of the problems at Summitville were due to historic mining activities and a former lack of authority to bond for water treatment, similar situations with potential for public liability continue to exist at other mine sites in Colorado as well as in most other states.

Additional information on Colorado's Mined Land Reclamation Act and its associated rules are contained in Table 2.3.2, **Colorado Reclamation and Closure Bonding Features**.

**Table 2.3.1 – Colorado Major Hardrock Mines
Mines with Existing Permits and Bonds**

Mine Name	Ownership	Commodity	Type	Status	Disturbed Acres	Bond Amount
Bulldog	Homestake Mining Co.	Silver	Underground, Flotation Mill	Closed – Reclamation	60	\$268,500
Climax	Cyprus Climax Metals Co.	Molybdenum	Open Pit, Underground, Flotation Mill	Operations Suspended	3,372	\$52,365,000
Cripple Creek – Cresson	Cripple Creek and Victor Gold Mining Co.	Gold, Silver	Open Pit, Cyanide Heap Leach	Operating	2,544	\$25,244,845
Henderson	Cyprus Climax Metals Co.	Molybdenum	Underground, Flotation Mill	Operating	4,138	\$10,133,000
Leadville Unit	ASARCO Inc.	Lead, Zinc, Gold, Silver	Underground, Flotation and Gravity Mill	Operations Suspended	54	2,233,400
San Luis Project	Battle Mountain Gold Co.	Gold, Silver	Open Pit, Cyanide Mill	Closed – Reclamation	560	\$6,100,000
Sunnyside	Echo Bay Mines Ltd.	Gold, Silver, Copper, Lead, Zinc	Underground, Flotation and Gravity Mill	Closed – Reclamation	243	\$1,250,000
Total					10,986	\$97,846,815.00

Table 2.3.2 – Colorado Reclamation and Closure Bonding Features

<p>Statutes, Regulations and Guidelines</p>	<p>Colorado Mined Land Reclamation Act Title 34, Chapter 32, Part 101, <i>et seq.</i>, Colorado Revised Statutes (CRS) [Enacted in 1973 and subsequently amended]</p> <p>Hardrock / Metal Mining Rules and Regulations Colorado Mined Land Reclamation Board [Promulgated 1977 and subsequently amended]</p>
<p>Authority</p> <p>Governing State Body</p> <p>Lead State Agency</p> <p>Bonding Required By State</p> <p>Relationship with Federal Agencies</p>	<p>The governing state body responsible for the promulgation of rules under the Colorado Mined Land Reclamation Act is the Colorado Mined Land Reclamation Board.^{xlvi}</p> <p>The lead state agency responsible for administering the Colorado Mined Land Reclamation Act is the Office of Mined Land Reclamation, Division of Minerals and Geology, Department of Natural Resources.^{xlvii}</p> <p>Any person who intends to extract minerals on private, state or federal lands shall apply for a Mined Land Reclamation Board permit unless specifically exempted by the Board according to the provisions of the Subsection 1.2.^{xlviii}</p> <p>No specific provisions addressing formal relationship with federal agencies.</p>
<p>Reclamation Plan Requirements</p>	<p>Every operator to whom a permit is issued pursuant to the provisions of this article shall perform such reclamation as is prescribed by the reclamation plan adopted pursuant to this section.^{xlix}</p> <p>(7) Reclamation plans and the implementation thereof shall conform to the following general requirements:</p> <p>(a) Grading shall be carried on so as to create a final topography appropriate to the final land use selected in accordance with paragraph (j) of this subsection (7).</p> <p>(b) Earth dams shall be constructed, if necessary to impound water, if the formation of such impoundments will not interfere with mining operations, damage adjoining property, or conflict with water pollution laws, rules or regulations of the federal government or the state of Colorado, or any local government pollution ordinances.</p> <p>(c) Acid-forming or toxic-producing material that has been mined shall be handled in a manner that will protect the drainage system from pollution.</p> <p>(e) In those areas where revegetation is part of the reclamation plan, land shall be revegetated in such a way as to establish a diverse, effective, and long-lasting vegetative cover that is capable of self-regeneration and at least equal in extent of cover to the natural vegetation of the surrounding area. Native species should receive first consideration, but introduced species may be used in the revegetation process when found desirable by the board.</p> <p>(f) Where it is necessary to remove overburden in order to mine the mineral, topsoil shall be removed from the affected land and segregated from other spoil. If such topsoil is not replaced on a backfill area within a time short enough to avoid deterioration of the topsoil, vegetative cover or other means shall be employed so that the topsoil is preserved from wind and water</p>

<p>Reclamation Plan Requirements (continued)</p>	<p>erosion, remains free of any contamination by other acid or toxic material, and is in a useable condition for sustaining vegetation when restored during reclamation. If, in the discretion of the board, such topsoil is of insufficient quantity or of poor quality for sustaining vegetation or if other strata can be shown to be more suitable for vegetation requirements, the operator shall remove, segregate, and preserve in a like manner such other strata which are best able to support vegetation.</p> <p>(g) Disturbances to the prevailing hydrologic balance of the affected land and of the surrounding area and to the quality and quantity of water in surface and ground water systems both during and after the mining operation and during reclamation shall be minimized.</p> <p>(i) All surface areas of the affected land, including spoil piles, shall be stabilized and protected so as to effectively control erosion and attendant air and water pollution.</p> <p>(j) On all affected land, the operator in consultation with the landowner, where possible, subject to the approval of the board, shall determine which parts of the affected land shall be reclaimed for forest, range, crop, horticultural, homesite, recreational, industrial, or other uses, including food, shelter, and ground cover for wildlife. Reclamation shall be required on all the affected land.¹</p> <p>(q) All reclamation provided for in this section shall be carried to completion by the operator with all reasonable diligence and shall be conducted concurrently with mining operations to the extent practicable, taking into consideration the mine plan, mine safety, economics, the availability of equipment and material, and other site specific conditions relevant and unique to the affected land and to the postmining land use. Upon termination of the entire mining operation and in accordance with the reclamation plan, each phase of final reclamation shall be completed prior to the expiration of five years after the date on which the operator advises the board that such phase has commenced, unless such period is extended by the board pursuant to section 34-32-112 (7).ⁱⁱ</p>
<p>Bonding Requirements</p> <p>Bond Amount And Calculation</p> <p>Phased Bonding</p> <p>Type of Bond Allowed</p>	<p>No permit may be issued under this article until the board receives performance and financial warranties as described in subsections (2), (3), and (4) of this section. (2) A “performance warranty” shall consist of a written promise to the board, by the operator, to comply with all requirements of this article. (3) A “financial warranty” shall consist of a written promise, to the board, to be responsible for reclamation costs up to the amount specified by the board.ⁱⁱⁱ</p> <p>The board shall prescribe the amount and duration of financial warranties, taking into account the nature, extent, and duration of the proposed mining operation and the magnitude, type, and estimated cost of planned reclamation.ⁱⁱⁱⁱ In any single year during the life of a permit, the amount of required financial warranties shall not exceed the estimated cost of fully reclaiming all lands to be affected in said year, plus all lands affected in previous permit years and not yet fully reclaimed. For the purpose of this paragraph (b), reclamation costs shall be computed with reference to current reclamation costs. The amount of the financial warranty shall be sufficient to assure the completion or reclamation of affected lands if the office has to complete such reclamation due to forfeiture. Such financial warranty shall include an additional amount equal to five percent of the amount of the financial warranty to defray the administrative costs incurred by the office in conducting the reclamation.^{liv}</p> <p><i>No specific statute or regulation, but implied in type of bond amount and bond calculation.</i></p> <p>Proof of financial responsibility may consist of any one or more of the following subject to approval by the board: (I) A surety bond issued by a corporate surety authorized to do business in this state; (II) A letter of credit issued by a bank authorized to do business in the United States; (III) A certificate of deposit; (IV) A deed of trust or security agreement encumbering real or personal property and creating a first lien in favor of the state; (V) Assurance, in such form as the board may require, that: (A) Upon commencement of production, the operator will establish</p>

<p>Type of Bond Allowed (continued)</p>	<p>an individual reclamation fund, to be held by an independent trustee for the board, upon such terms and conditions as the board may prescribe, which trust fund shall be funded by periodic cash payments representing such fraction of receipts as will, in the opinion of the board, provide assurance that funds will be available for reclamation; (B) Prior to issuance of permit, the operator will provide another form of financial warranty as described in this paragraph (f). As the reclamation fund increases in value, the other form of financial warranty may be decreased in value so long as the sum of financial warranties is that amount specified by subsection (4) of this section; (C) Project-related fixtures and equipment (excluding rolling stock) owned or to be owned by the financial warrantor within the permit area will have a salvage value at least equal to the amount of the financial warranty, or the appropriate portion thereof; (D) Existing liens and encumbrances applicable to said fixtures and equipment, other than liens in favor of the United States or this state, or any other state, and any political subdivisions, will be subordinated to the lien described in section 34-32-118 (4) (b); and (E) Said fixtures and equipment will be maintained in good operating conditions and will not be removed from the permit area without the prior consent of the board; (VI) A certified financial statement for the financial warrantor's most recent fiscal year and a certification by an independent auditor that: (A) The financial warrantor is the issuer of one or more currently outstanding senior credit obligations that have been rated by a nationally recognized rating organization; (B) Said obligations enjoy a rating of "A" or better; and (C) At the close of the financial warrantor's most recent fiscal year, his or her net worth was equal to or greater than two times the amount of all financial warranties; (VII) A certified financial statement for the financial warrantor's most recent fiscal year and a certification by an independent auditor that as of the close of said year: (A) The financial warrantor's net worth was at least ten million dollars and was equal to or greater than two times the amount of all financial warranties; (B) The financial warrantor's tangible fixed assets in the United States were worth at least twenty-million dollars; (C) The financial warrantor's total liabilities-to-net-worth ratio was not more than two to one; and (D) The financial warrantor's net income, excluding nonrecurring items, was positive.^{lv}</p>
<p>Reclamation and Bonding Oversight</p> <p>Reclamation Monitoring and Compliance</p> <p>Bond Review</p> <p>Bond Forfeiture</p> <p>Bond Release</p>	<p>Mining operations shall be inspected a sufficient number of times each year to ensure compliance with the permit, law, and these Rules. The frequency of inspection shall be determined by the extent of the operation, rate of mining, degree of actual or potential environmental impact, and the Operator's past record of compliance.^{lvi}</p> <p>The office and the board shall take reasonable measures to assure the continued adequacy of any financial warranty. (c) (I) The board may: (A) From time to time for good cause shown, increase or decrease the amount and duration of required financial warranties; (B) By rule or permit condition require proof of value on a periodic basis of all or any group of warranties held by the board; and (C) By rule or permit condition limit certain types of warranties to specific purposes only or require a designated percentage of the total bond be held in easily valued and convertible instruments.^{lvii}</p> <p>A financial warranty shall be subject to forfeiture whenever the board shall determine that any one or more of the following circumstances exist: (a) The operator has violated a cease and desist order entered pursuant to section 34-12-124 and, if corrective action was proposed in such order, has failed to complete such corrective action although ample time to have done so has elapsed, or (b) The operator is in default under his performance warranty and has failed to cure such default although he has been given written notice thereof and has had ample time to cure such default; or (c) The financial warrantor has failed to maintain his financial warranty in good standing as required by section 34-32-117; or (d) The financial warrantor no longer has the financial ability to carry out his obligations under this article.^{lviii}</p> <p>An operator may file a written notice of completion with the office whenever such operator believes such operator has completed any or all requirements of this article with respect to any or all such operator's affected lands except for any such lands in designated mining operations. The office shall, within sixty days after receiving said notice, or as soon thereafter as weather conditions permit, inspect lands and reclamation described in the notice to determine if the operator has complied with all applicable requirements. (b) If the board or office finds that the</p>

Bond Release (continued)	operator has successfully complied with any or all requirements of this article, it shall release all performance and financial warranties applicable to said requirements. Releases shall be in writing and shall be delivered to the owner or operator promptly after the date of such finding. (c) If the board or office finds that the operator has not complied with applicable requirements of this article, it shall so advise the operator not more than sixty days after the date of the inspection. (d) If the office fails to conduct an inspection within the time specified in paragraph (a) of this subsection (5) or fails to advise the operator of deficiencies within the time specified in paragraph (c) of this subsection (5), then all financial warranties applicable to reclamation described in the notice shall be deemed released as a matter of law. ^{lix}
Public Participation in Bonding	Limited provisions for public participation are provided including: Any interested person may submit written comments on the request for reclamation responsibility release so long as such comments are submitted to the Office within ten (10) days of the Office's inspection of the affected area. ^{lx}
Other Significant Features	Environmental Protection Plan ^{lxi} Emergency Response Cash Fund ^{lxii}

2.3.3 Reclamation and Closure Bonding Case Studies

2.3.3.1 Cresson Mine

Introduction and Background

The Cresson mine, operated by the Cripple Creek and Victor Gold Mining Company, began production in 1995. The project is located in the historic Cripple Creek Mining District of central Colorado. The project is an open pit crushed ore heap leach operation which produces gold and silver. The site is situated at an average elevation of about 10,000 feet.

Reclamation Bonding

The reclamation bond for the Cresson mine actually consists of several different mines and leach facilities. In addition to the Cresson project operations, the bond also includes the Globe Hill and Ironclad Mines, and the #3 and #4 Leach Facilities, which preceded the present Cresson operation. Another mine owned by the company—the Portland mine—is also included in the bond, as are several small mine dumps and other disturbance areas located on company-owned land.

The Division of Mines and Geology calculated a surety cost estimate of \$25,244,845 for reclamation of the Cresson mine and the other areas.^{lxiii} Table 2.3.3, **Reclamation and Closure Bond Estimate, Cresson, CO, Cost Summary**, displays the estimated reclamation surety costs. The costs for the Cresson Project, Globe Hill, Ironclad and #3 & #4 Heap Leach Facilities have been combined into the various task classifications shown in Table 3.2. The costs for reclamation of the Portland mine and other disturbed areas are included in the facilities reclamation cost estimate.

Cost Estimate Sources and Assumptions

The cost estimate is based on R.S. Means, *Building Construction Cost Data*, 1997, 1998; *Dataquest Cost Reference Guide*, 1996, 1997; R.S. Means, *Site Work and Landscape Cost Data*, 1994, as well as material and contractor quotes.

Labor rates were based on a 1997 Salary Survey by the Colorado Contractors Association, Inc.

The calculations are based on a snapshot of the project at completion, without concurrent reclamation.

Heap Leach Pads

The detoxification costs shown are for the Cresson Valley leach facility, the Globe Hill/Ironclad Area I-V leach facility and the #4 leach facility.

Detoxification at the Cresson Valley leach facility will require installation of an upgraded (higher capacity) pumping system. Detoxification will consist of two cycles of one pore volume fresh water rinses, followed by a final rinse that includes peroxide treatment for removal of any remaining cyanide. The total number of rinse days is estimated at 1,785 days.

Detoxification of the Area I-V leach facility will consist of one cycle of one pore volume fresh water rinse that includes peroxide treatment for removal of any remaining cyanide. The total number of rinse days is estimated at 140 days

Detoxification of the #3 leach facility is not included in the estimate.

Detoxification of the #4 leach facility will consist of one cycle of one pore volume fresh water rinse that includes peroxide treatment for removal of any remaining cyanide. The total number of rinse days is estimated at 105 days.

The cost estimate for detoxification includes labor, equipment and material (i.e. cost of make-up water, sprinkler system and chemicals).

It should be noted that the number of acres occupied by the Cresson Valley leach facility is relatively small, although the facility's capacity is large. As a result, the unit cost per acre is comparatively higher for the Cresson project than it is at other heap leach projects.

Heap leach area reclamation costs usually include recontouring, ripping, spreading six inches of topsoil and area revegetation (which includes soil analysis, fertilization, seeding and dragging, hydromulching, planting trees and shrubs and sometimes fencing to exclude for livestock).

Waste Rock Dumps

In most cases, estimated costs for waste rock dump reclamation include recontouring, ripping, hauling and spreading six inches of topsoil and area revegetation (which includes soil analysis, fertilization, seeding and dragging, hydromulching, planting trees and shrubs, and sometimes fencing to exclude livestock).

Waste rock dump reclamation areas included in this estimate are the Arequa Gulch, Upper Squaw, Lower Squaw and overburden storage areas.

Open Pit

Estimated costs for open pit mine reclamation include hauling and spreading six inches of topsoil, ripping and area revegetation (which includes soil analysis, fertilization, seeding and dragging, hydromulching, planting trees and shrubs and fencing to exclude livestock).

The areas included in this estimate are the Main Cresson, East Cresson (Wildhorse and Goldstar), South, Globe Hill and Ironclad.

Facilities, Roads, Diversions and Other

Facilities demolition costs include disposal of equipment, buildings and materials for the Cresson project and Victor plant sites.

Reclamation of ancillary areas includes ripping and area revegetation (fertilization, seeding and dragging, hydromulching, and planting trees and shrubs). Reclamation of haul roads includes recontouring, ripping, hauling and spreading six inches of topsoil and revegetation (soil analysis, fertilization, seeding and dragging, hydromulching and planting trees and shrubs). Reclamation of plant site areas includes the hauling of fill to recontour, ripping and revegetation (fertilization, seeding and dragging, hydromulching and planting trees and shrubs).

The liner for pond areas will be folded in, followed by the hauling of fill to recontour, ripping, and revegetating the area (fertilization, seeding and dragging, hydromulching and planting trees and shrubs).

The costs for reclamation of the Portland mine, soil stockpiles and small dumps are also included in the costs for facilities, roads, diversions and other.

Other costs included in this category include supervisory labor (\$732,000) and post-reclamation monitoring costs (\$605,000).

Indirect Costs

As noted in Table 2.3.3, the estimated reclamation bond for the Cresson mine includes indirect costs for mobilization/demobilization, public liability (1.55 percent), contractors performance bond (0.975 percent), contract overhead and profit (five percent), mined lands reclamation department management fee (five percent) and contingency (10 percent)

The indirect costs total about \$4,900,000. This equates to 24 percent of the direct costs or approximately 19 percent of the total cost of reclamation.

**Table 2.3.3 - Reclamation and
Closure Bond Estimate
Cresson, CO
Cost Summary**

Item	Task	Description	Volume Cu. Yd.	Thickness Ft.	Acres	Unit	Unit Cost	Estimated Cost
1	Leach Pad Reclamation	Detoxification			291	Acre	\$27,368	\$7,964,021
		Regrading/Contouring			291	Acre	\$5,868	\$1,707,573
		Topsoil or Growth Medium			291	Acre	\$1,035	\$301,260
		Revegetation/Stabilization			291	Acre	\$1,609	\$468,087
		Sub-total			291	Acre	\$35,880	\$10,440,941
2	Waste Rock Dump Reclamation	Regrading/Contouring			537	Acre	\$1,236	\$663,962
		Topsoil or Growth Medium			537	Acre	\$1,579	\$847,733
		Revegetation			537	Acre	\$1,584	\$850,359
		Sub-total			537	Acre	\$4,399	\$2,362,054
3	Open Pit	Regrading/Contouring			352	Acre	\$277	\$97,440
		Topsoil or Growth Medium			352	Acre	\$2,358	\$830,082
		Revegetation/Stabilization			352	Acre	\$4,175	\$1,469,699
		Sub-total			352	Acre	\$6,810	\$2,397,221
4	Facilities, Roads, Diversions and Other	Facilities Demolition						\$901,955
		Regrading/Contouring			1364	Acre	\$261	\$356,401
		Topsoil or Growth Medium			1364	Acre	\$306	\$417,360
		Revegetation/Stabilization			1364	Acre	\$1,566	\$2,136,463
		Other						\$1,336,387
Sub-total							\$5,148,566	
	Sub-total Direct Costs							\$20,348,782
9	Indirect Costs	Mobilization/Demobilization						\$255,050
		Public Liability @1.55%						\$319,359
		Contractor's Performance Bond @ 0.975%						\$200,887
		Contract Overhead and Profit @ 5%						\$1,030,192
		MLRD Management Fee @ 5%						\$1,030,192
		Contingency @ 10%						\$2,060,383
		Sub-total						\$4,896,063
	Total Final Reclamation Bond				2,544			\$25,244,845

2.4 NEVADA

Mining for gold and silver accounts for nearly all of Nevada's production of minerals from metalliferous hardrock mines. Currently, 70 major hardrock gold and silver mines are permitted in the state, with disturbance sizes ranging from less than 10 to 13,447 acres. There also are three major hardrock copper mines permitted in the state. Several additional gold and silver mines may be permitted in the next year, and numerous mines are undergoing permitting for various expansions.

Nevada currently ranks as the third-largest gold producing region in the world, a fact that helps make the United States the second-largest gold producing country. Gold and silver mining began their current boom in the 1970's and saw significant growth during both the 1980's and the 1990's. Nevada continues to be extensively explored for additional reserves. It is anticipated that many of the existing mines will continue to operate as deeper, more refractory deposits are discovered.

Hardrock reclamation and closure bonding was not a standard process in the state until the Nevada Mined Land Reclamation Act was passed in 1989. Up until that time, bonding, to the extent it was required, was primarily done under the authority of the federal agencies for disturbed lands in their jurisdiction. Since 1991, all existing and new hardrock mines have submitted either original or revised reclamation and closure plans and bond cost estimates to the state and federal agencies.

2.4.1 Major Mines with Existing Permits and Bonds

Nevada's 73 permitted major hardrock mines are listed in Table 2.4.1, **Nevada Major Hardrock Mines, Mines with Existing Permits and Bonds**. Forty-three of these mines are medium-sized (less than 1,000 acres disturbed), 15 mines are large operations (ranging from 1,000 to 2,000 acres disturbed) and 14 of the mines are very large operations, with disturbance areas of greater than 2,000 acres.

Nevada's total hardrock mine reclamation and closure bond amount of approximately \$479,846,714 far surpasses that of any other western state. At approximately \$5,412 per acre disturbed, the state's ratio of bond to acre disturbed is within the mid-range of bonding values in the West.

Most of the present day major mining operations in Nevada utilize open pit mining methods. Underground mining production, however, has recently increased, and is expected to continue to do so as deeper, richer ore deposits are discovered and exploited.

Near-surface oxide and other non-refractory ores are typically processed using cyanidation techniques that include heap leaching and vat leaching. Some mines may also employ either flotation or pre-oxidation (pressure leaching, roasting, chlorination, and bioleaching) processes to refractory sulfide ores before vat leach cyanidation. Most mines use carbon adsorption, desorption, electrowinning and on-site refining to produce a small but valuable quantity of precious metals.

Most of Nevada's gold and silver mines are currently active, although 24 mines have closed, and are in various stages of reclamation, since being permitted under the current statutes and regulations. An additional 10-20 mines will probably close within the next few years. No mine in Nevada has entirely gone through the current permitting, mining, reclamation and closure process and achieved complete bond release, although several are primarily monitoring their sites in the final stages of reclamation.

Historically, most of the mining corporations in Nevada were small or medium-sized companies whose activities were based on the discoveries of precious metals deposits in the 1970's and 1980's.

In the 1990's, there has been a definite trend towards consolidation of the various gold companies and their associated properties. Today, approximately 75 percent of gold production comes from two companies: Newmont Gold Co. and American Barrick Gold Co. However, numerous other large and medium-sized companies with Nevada holdings also continue to actively participate.

According to the Nevada Division of Environmental Protection (NDEP), 13 mines in the state are owned by companies in bankruptcy or foreclosure.⁶ The difficulty in dealing with bankrupt mines prompted a recent allocation of \$600,000 from the NDEP's operating budget for the establishment of an emergency response fund. This fund will provide for operation of any mines whose operators decide to abandon the site. Nevada is also concerned about the cost of interim operations prior to reclamation of the mines under bankruptcy. In cases where bankruptcy appears imminent, the state has made requests for additional bonding to provide for up to six months of interim operations.

NDEP has also expressed concerns about self-bonding in the state. Approximately 50 percent of the \$480,000,000 in total bonding liability by state and federal agencies are covered under self-bonding provisions. In the event that depressed gold prices continue, the probability of additional companies closing their mines and filing for bankruptcy protection will increase. In addition, the fact that some of the larger companies rely entirely on gold production creates the potential for more financial difficulties.

2.4.2 Reclamation and Closure Bonding Regulatory Features

Nevada was relatively late in establishing a Mined Land Reclamation Act. However, since the Act's 1989 inception, it has been administered in an essentially consistent manner. While the NDEP is responsible for administration and enforcement of closure requirements under Nevada's water quality laws, state statutes do not allow for the bonding of water quality-related mine closure costs (i.e. detoxification/rinsing, water treatment, etc.) on private land.

The Nevada Mined Land Reclamation Act contains perhaps the least comprehensive and detailed reclamation requirements of any western state. The reclamation standards briefly address soil erosion, slope stability and, in some cases, revegetation. As a result, the NDEP is left with broad discretion as to the application of these standards. This facet of Nevada's regulations allows for site specificity and encourages innovation. However, the lack of specific performance standards—or any statutes for important parameters such as geochemical acid mine drainage or water quality—in the Act, compromises Nevada's ability to legally and adequately address these items.

Additional information on Nevada's Mined Land Reclamation Act and associated rules are contained in Table 2.4.2, **Nevada Reclamation and Closure Bonding Features**.

⁶ The list of mines currently potentially affected by bankruptcy or foreclosure includes the County Line, Paradise Peak/Ketchup Flat, and Yerington mines owned by Arimetco International Inc (the County Line and Paradise Peak/Ketchup Flat mines were formerly owned by FMC Gold Corp, which sold the closed mines and reclamation liability to Arimetco); the Florida Canyon mine owned by Pegasus Gold Corp. (now Apollo Gold); the Mt. Hamilton mine owned by Mt. Hamilton Mining Co.; the Easy Junior, Elder Creek, Golden Butte, Griffon, and Kinsley Mtn owned by Alta Gold; and the Gold Bar and Gold Canyon mines owned by Atlas Gold Mining Inc.

**Table 2.4.1 – Nevada Major Hardrock Mines
Mines with Existing Permits and Bonds**

Mine Name	Ownership	Commodity	Type	Status	Disturbed Acres ⁷	Bond Amount
Alligator Ridge	Placer Dome U.S.	Gold, Silver	Open Pit, Heap Leach	Operating	593	\$2,948,987
Aurora	Nevada Goldfields inc.	Gold, Silver	Open Pit, Underground, Mill	Operating	368	\$279,478
Aurora	Aurora Partnership	Gold, Silver	Open Pit, Underground, Mill	Closed – Reclamation	61	\$815,000
Bald Mountain	Placer Dome U.S.	Gold, Silver	Open Pit, Heap Leach	Operating	1,596	\$8,396,385
Battle Mountain Complex	Battle Mountain Gold Co.	Gold, Silver	Open Pit, Heap Leach, Mill	Operating	3,966	\$6,756,127
Big Springs	Independence Mining Co.	Gold, Silver	Open Pit, Heap Leach, Mill	Operating	714	\$2,499,505
Blue Star	Newmont Gold Co.	Gold, Silver	Open Pit, Underground, Heap Leach, Mill	Operating	3,178	\$10,224,000
Bootstrap/ Capstone/ Tara	Newmont Gold Co.	Gold, Silver	Open Pit, Underground, Heap Leach, Mill	Operating	1,271	\$9,196,000
Borealis	Echo Bay Minerals Co.	Gold, Silver	Open Pit, Heap Leach	Closed – Reclamation		
Buckhorn	Cominco American Resources Inc.	Gold, Silver	Open Pit, Heap Leach	Closed – Reclamation	820	\$400,000
Bullfrog	Barrick Bullfrog	Gold, Silver	Open Pit, Underground, Mill	Operating	1,430	\$3,195,895
Candelaria	Kinross Candelaria Mining Co.	Gold, Silver	Open Pit, Heap Leach	Operating	1,326	\$4,160,356
Carlin Mine/ Mill #1	Newmont Gold Co.	Gold, Silver	Open Pit, Heap Leach, Mill	Operating	1,526	\$10,050,000
Casino/ Winrock	Placer Dome U.S.	Gold, Silver	Open Pit, Heap Leach	Closed – Reclamation	216	\$853,000

⁷ Data from Mine Plans, Existing/Permitted, Bureau of Land Management, Nevada State Office ([www.nv.blm.gov/minerals/Permitting/Permitted Mine Plans.htm](http://www.nv.blm.gov/minerals/Permitting/Permitted_Mine_Plans.htm)); and Table attached to letter from Nevada Division of Environmental Protection to NWF, August 4, 1998, and updated information from NDEP in May 1999. In many cases the data from the two different sources differed significantly. In those cases, because NDEP information is believed to be more current, NDEP's acreage and bond amounts are shown. The disturbed acre figures are based on permitted acres, and the actual disturbed acres may be less.

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Mine Name	Ownership	Commodity	Type	Status	Disturbed Acres ⁷	Bond Amount
Coeur Rochester	Coeur Rochester Inc.	Gold, Silver	Open Pit, Heap Leach	Operating	1,447	\$8,435,268
Copper Leach Project	Cyprus Tonopah Mining Corp.	Copper	Open Pit, SX/EW	Closed – Reclamation	1,636	\$6,500,000
Cortez	Placer Dome U.S.	Gold, Silver	Open Pit, Heap Leach, Mill	Operating	730	\$2,460,546
County Line	Arimetco International Inc.	Gold, Silver	Open Pit Heap Leach	Closed – Reclamation	115	\$210,000
Crescent Pit	Placer Dome U.S.	Gold, Silver	Open Pit	Operating	219	\$617,489
Crofoot/Lewis	Hycroft Resources and Development Inc.	Gold, Silver	Open Pit, Heap Leach	Operating	2,061	\$5,100,837
Daisy	Rayrock Mines Inc.	Gold, Silver	Open Pit, Heap Leach	Operating	262	\$1,249,441
Dee	Dee Gold Mining Co.	Gold, Silver	Open Pit, Heap Leach, Mill	Closed – Suspended	802	\$3,700,000
Denton Rawhide	Kennecott Rawhide Mining Co.	Gold, Silver	Open Pit, Heap Leach	Operating	1,369	\$5,191,500
Easy Junior	Alta Gold Co.	Gold, Silver	Open Pit, Heap Leach	Closed - Reclamation	208	\$365,517
Elder Creek	Alta Gold Co.	Gold, Silver	Open Pit, Heap Leach	Closed- Reclamation	102	\$256,062
Florida Canyon	Florida Canyon Mining Inc.	Gold, Silver	Open Pit, Heap Leach	Operating	2,149	\$16,936,130
Fondaway Canyon	Tenneco Minerals Co.	Gold, Silver	Open Pit, Heap Leach	Closed – Reclamation	122	\$389,400
Getchell	Getchell Gold Corp.	Gold, Silver	Open Pit, Underground, Heap Leach, Mill	Operating	1,357	\$4,500,000
Gold Acres	Placer Dome U.S.	Gold, Silver	Open Pit, Heap Leach	Operating	349	\$1,383,457
Gold Bar	Atlas Gold Mining Inc.	Gold, Silver	Open Pit, Heap Leach, Mill	Operating	1,273	\$2,608,000
Gold Canyon	Atlas Gold Mining Inc.	Gold, Silver	Open Pit, Heap Leach, Mill	Operating	58	\$453,000
Gold Quarry/ Maggie Creek	Newmont Gold Co.	Gold, Silver	Open Pit, Underground, Heap Leach, Mill	Operating	8,004	\$61,000,000
Golden Butte	Alta Gold Co.	Gold, Silver	Open Pit, Heap Leach	Closed – Reclamation	89	\$328,942
Golden Eagle	America Eagle Resources Inc.	Gold, silver	Open Pit, Heap Leach	Closed – Reclamation	100	\$581,389
Goldfield	American Pacific Minerals ltd.	Gold, Silver	Open Pit, Heap Leach	Operating	210	\$841,161
Goldstrike	Barrick Goldstrike Mines Inc.	Gold, Silver	Open Pit, Heap Leach, Mill	Operating	5,955	\$35,029,800

Mine Name	Ownership	Commodity	Type	Status	Disturbed Acres⁷	Bond Amount
Gooseberry	Pallas Resources	Gold, Silver	Underground, Mill	Closed – Suspended	85	\$269,195
Griffon	Alta Gold Co.	Gold, Silver	Open Pit, Heap Leach	Operating	161	\$756,927
Mooney Basin	Placer Dome U.S.	Gold, Silver	Open Pit, Heap Leach	Operating	9	\$2,672,196
Ivanhoe/ Hollister	Newmont Gold Co.	Gold, Silver	Open Pit, Heap Leach	Operating	340	\$7,691,000
Jerritt Canyon	Independence Mining Co.	Gold, Silver	Open Pit, Heap Leach, Mill	Operating	3,411	\$7,153,932
Kinsley Mtn.	Alta Gold Co.	Gold, Silver	Open Pit, Heap Leach	Operating	309	\$857,193
Lone Tree	Santa Fe Pacific Gold Corp.	Gold, Silver	Open Pit, Heap Leach, Mill	Operating	2,691	\$8,375,000
Manhattan	Round Mountain Gold Corp.	Gold, Silver	Open Pit, Heap Leach, Mill	Closed – Reclamation	219	\$1,621,000
Marigold	Marigold Mining Co.	Gold, Silver	Open Pit, Heap Leach, Mill	Operating	1,084	\$3,495,000
McCoy/Cove	Echo Bay Minerals Co.	Gold, Silver	Open Pit, Underground, Heap Leach, Mill	Operating	4,348	\$21,996,600
Miekle	Barrick Goldstrike Mines Inc.	Gold, Silver	Underground, Mill	Operating	114	\$8,000,000
Mineral Ridge	Mineral Ridge Resources Inc.	Gold, Silver	Open Pit, Heap Leach	Operating	420	\$1,640,086
Mt. Hamilton	Mt. Hamilton Mining Co.	Gold, Silver	Open Pit, Heap Leach	Closed – Reclamation	548	\$1,650,000
Mule Canyon	Santa Fe Pacific Gold Corp.	Gold, Silver	Open Pit, Heap Leach, Mill	Operating	2,931	\$22,200,000
North Area Leach	Newmont Gold Co.	Gold, Silver	Heap Leach	Operating	744	\$7,166,000
Northumberland	Western States Minerals Corp.	Gold, Silver	Open Pit, Heap Leach	Closed – Suspended	285	\$1,100,000
Paradise Peak/ Ketchup Flat	Arimetco International Inc.	Gold, Silver	Open Pit, Heap Leach, Mill	Closed – Reclamation	899	\$1,157,000
Pinson	Pinson Mining Co.	Gold, Silver	Open Pit, Heap Leach, Mill	Operating	1,107	\$2,053,400
Pipeline	Placer Dome U.S.	Gold, Silver	Open Pit, Heap Leach	Operating	1,827	\$15,610,659
Preble	Pinson Mining Co.	Gold, Silver	Open Pit, Heap Leach, Mill	Closed – Reclamation	217	\$685,600
Post / Mill #4	Newmont Gold Co.	Gold, Silver	Open Pit, Underground, Heap Leach, Mill	Operating	1,179	\$5,228,0000
Rain	Newmont Gold Co.	Gold, Silver	Open Pit, Underground, Heap Leach, Mill	Operating	935	\$9,882,500

Hardrock Reclamation Bonding Practices

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Mine Name	Ownership	Commodity	Type	Status	Disturbed Acres⁷	Bond Amount
Robinson	BHP Minerals International	Copper, Gold	Open Pit, Heap Leach, Mill	Operating	4,987	\$7,116,522
Rosebud	Hecla Mining Co.	Gold, Silver	Open Pit, Heap Leach	Operating	162	\$718,182
Round Mountain	Round Mountain Gold Corp.	Gold, Silver	Open Pit, Heap Leach, Mill	Operating	4,431	\$41,702,744
Ruby Hill	Homestake Mining Co.	Gold, Silver	Open Pit, Heap Leach	Operating	696	\$7,021,200
Santa Fe/ Calvada	Homestake Mining Co.	Gold, Silver	Open Pit, Heap Leach	Closed – Reclamation	895	\$2,346,500
Sleeper	AMAX Gold Inc.	Gold, Silver	Open Pit, Underground, Mill	Closed – Reclamation	1,650	\$7,837,200
Sterling JV	Cathedral Gold U.S.	Gold, Silver		Operating	146	\$609,309
Toiyabe	Inland Resources Inc.	Gold, Silver	Open Pit, Heap Leach	Closed – Reclamation	81	\$547,400
Tonkin Springs	Tonkin Springs Venture	Gold, Silver	Open Pit, Heap Leach, Mill	Closed – Suspended	537	\$1,300,000
Trenton Canyon	Santa Fe Pacific Gold Corp.	Gold, Silver	Open Pit, Heap Leach, Mill	Operating	2,325	\$13,900,000
Triplet Gulch/Robertson	Coral Resources Inc.	Gold, Silver	Open Pit, Heap Leach	Closed – Reclamation	205	\$2,045,434
Twin Creeks	Santa Fe Pacific Gold Corp.	Gold, Silver	Open Pit, Heap Leach, Mill	Operating	13,447	\$35,596,352
Wind Mountain	AMAX Gold Inc.	Gold, Silver	Open Pit, Heap Leach	Closed – Reclamation	437	\$1,249,700
Yankee	Placer Dome U.S.	Gold, Silver	Open Pit, Heap Leach	Operating	356	\$3,439,139
Yerrington	Arimetco International Inc.	Copper	Open Pit, SX/EW	Closed – Reclamation	510	\$945,000
Total					88,663	\$479,846,714

Table 2.4.2 – Nevada Reclamation and Closure Bonding Features

<p>Statutes, Regulations and Guidelines</p>	<p>Reclamation of Land Subject to Mining Operations or Exploration Projects Chapter 519A, Nevada Revised Statutes (NRS) [Enacted 1989]</p> <p>Regulation of Mining Operations and Exploration Projects Chapter 519A, Nevada Administrative Codes (NAC) [Enacted 1990]</p>
<p>Authority</p> <p>Governing State Body</p> <p>Lead State Agency</p> <p>Bonding Required By State</p> <p>Relationship with Federal Agencies</p>	<p>The governing state body responsible for the adoption of regulations under the NRS is the State Environmental Commission.^{lxiv}</p> <p>The lead state agency responsible for administering and enforcing the NRS is the Division of Environmental Protection, Department of Conservation and Natural Resources.^{lxv}</p> <p>Apply to mining operations or exploration projects that are conducted on a site which includes both public land administered by a federal agency and privately owned land.^{lxvi}</p> <p>The legislature hereby directs that all agencies and political subdivisions of the State of Nevada which are involved in or whose work is related to the administration or enforcement of the provisions of this chapter shall cooperate fully with all other state and federal agencies in any related matter.^{lxvii} Enter into a memorandum of understanding with both the United States Bureau of Land Management and the United States Forest Service concerning the adoption by those agencies of plans of reclamation.^{lxviii} If a mining operation is conducted on land administered by a federal agency, an approved federal plan of operations and a surety that are consistent with the requirements of this chapter supersede the requirements for a permit and bond or other surety otherwise required by this chapter. If the mining operation is conducted on a site which includes both public and privately owned land, compliance with the federal plan suffices if that plan substantially provides for the reclamation and bond or other surety required by this chapter.^{lxix}</p>
<p>Exemptions to Reclamation Bonding</p> <p>Activities Prior to Regulation</p> <p>Size Limitations</p>	<p>Reclamation of affected land which was disturbed: (1) On or after January 1, 1981, and before October 1, 1990, must be required as part of a permit if the land was disturbed by the current operator. The standards for reclamation required by the Bureau of Land Management, the United States Forest Service or another federal land management agency at the time the disturbance was created apply to federal and privately owned land. (2) Before January 1, 1981, is not required. (3) By someone other than the current operator must not be required, unless the current operator is using the affected land in an active project or operation.^{lxx}</p> <p>“Small Mining Operation” means a person who does not remove from the earth in any calendar year material in excess of 36,500 tons and who disturbs less than 5 acres of land in any calendar year. To determine the area of the surface disturbed, all land disturbed and left unreclaimed by an operator within a 1-mile radius of the center of the project must be considered.^{lxxi} <i>Small Mining Operations are not required to post a reclamation bond.</i></p>
<p>Reclamation Plan Requirements</p>	<p>A plan for reclamation must provide.^{lxxii}</p> <p>(1) (a) That reclamation activities, particularly those relating to the control of erosion, must be conducted simultaneously with the mining operation to the extent practicable, and otherwise must be initiated promptly upon the completion or abandonment of the mining operation in any</p>

<p>Reclamation Plan Requirements (continued)</p>	<p>area that will not be subject to further disturbance. Reclamation activities must be completed within the time set by the regulations adopted by the commission pursuant to NRS 519A.160.</p> <p>(b) For vegetative cover if appropriate to the future use of the land.</p> <p>(c) For the reclamation of all land disturbed by the exploration project or mining operation to a stability comparable to that of adjacent areas.</p> <p>(2) The operator may request the division to grant an exception for open pits and rock faces which may not be feasible to reclaim. If an exception is granted, the division shall require the operator to take sufficient measures to protect public safety.^{lxxiii}</p> <p>(3) Except in cases of emergency, an operator shall not depart from an approved plan for reclamation without prior written approval from the division.</p> <p>(4) Reclamation activities must be economically and technologically practicable in achieving a safe and stable condition suitable for the use of the land.</p>
<p>Bonding Requirements</p> <p>Bond Amount And Calculation</p> <p>Phased Bonding</p> <p>Type of Bond Allowed</p>	<p>A person who desires to engage in a mining operation must file with the division a bond or other surety in a form and amount required by regulations adopted by the commission pursuant to NRS 519A.160^{lxxiv}</p> <p>1. The operator shall provide surety in an amount sufficient to ensure reclamation of: (a) The entire area to be affected by his project or operation; or (b) A portion of the area to be affected if, as a condition of the issuance of the permit, filing additional surety is required before the operator disturbs land not covered by the initial surety.</p> <p>2. Except as otherwise provided in subsection 6. The amount of surety must be based on an estimate of the cost of executing the plan for reclamation which would be incurred by the state or federal agency having jurisdiction over the land.</p> <p>3. The operator's estimate of the cost for reclamation must be based on either: (a) The costs of equipment rental, operation and labor appropriate for the geographic area; (b) Estimated costs provided by an outside contractor; or (c) Any other method which is acceptable to the administrator, the Bureau of Land Management, the United States Forest Service or another federal land management agency, if applicable.</p> <p>4. In determining the cost of executing the plan for reclamation, all activities in the plan for reclamation must be considered, including, if appropriate: (a) Earth moving, regrading, stabilization of heaps and dumps, recontouring of roads and erosion control; (b) Revegetation, preparation of seedbed and planting; (c) Demolition of buildings and other structures; (d) Removal and disposal or salvage of buildings, structures, equipment, piping, scrap and reagents; (e) Any ongoing or long-term activities which are required to maintain the effectiveness of reclamation or are necessary in lieu of reclamation, including periodic clean-out of sediment basins or maintenance of berms and fences which are used to prevent access to areas which pose a threat to the public safety; (f) Equipment mobilization and demobilization; (g) Administration and management by the division, Bureau of Land Management, the United States Forest Service and another federal land management agency, if applicable.^{lxxv}</p> <p><i>No specific statute or regulation, but implied in bond amount and bond calculation (see 1.(b) above).</i></p> <p>An operator shall file a surety with the division or a federal land management agency, as applicable, to ensure that reclamation will be completed on privately owned and federal land. The surety may be: (a) A trust fund; (b) A bond; (c) An irrevocable letter of credit; (d) Insurance; (e) A corporate guarantee; or (f) Any combination thereof.^{lxxvi}</p>
<p>Reclamation and Bonding Oversight Reclamation Monitoring and Compliance</p>	<p>1. The division may inspect an exploration project or mining operation to determine if it is in compliance with the terms and conditions of a permit and the status of activities for reclamation.</p>

Reclamation Monitoring and Compliance (continued)	Such an inspection must be conducted during normal business hours and the operator may be given adequate notice so that personnel familiar with the permit and its requirements may be present. 2. Pursuant to NRS 519A.140, the division, the Bureau of Land Management, the United States Forest Service or another federal land management agency may inspect a permitted mining operation which is located on federal land or on both federal and private land to determine compliance with the terms and conditions of a permit and the status of activities for reclamation. ^{lxxvii}
Bond Review	Within 3 years after the effective date of the permit and at least every 3 years thereafter, an operator shall review the amount of surety filed to cover the cost of reclamation to determine whether it is still adequate to execute the approved plan for reclamation taking into inflation into consideration. ^{lxxviii}
Bond Forfeiture	A surety filed with the division, Bureau of Land Management, the United States Forest Service or another federal land management agency is subject to forfeiture if: (a) A mining operation has been completed, abandoned, or temporarily closed for a period greater than allowed pursuant to NAC 519A.285 without initiating activities for reclamation; (b) The permit is suspended or revoked pursuant to NAC 519A220; or (c) The operator ceases to conduct business in the State of Nevada and does not transfer the permit to a new operator. ^{lxxix}
Bond Release	1. The division may release a surety either in whole or in part at the request of the operator. 2. The entire surety must not be released until all of the requirements of the permit have been fulfilled, except that: (a) A portion of the surety covering the reclamation of a discrete part of a disturbance must be released when the requirements of the permit regarding the discrete part of the disturbance have been fulfilled. (b) That portion of the surety covering a discrete activity must be released when the requirements of the permit regarding that discrete activity have been fulfilled. (c) Except as otherwise provided in subsection 3, if revegetation is part of the plan for reclamation, 60 percent of the posted surety must be released upon completion of the earthwork. After revegetation has been performed by the operator on the regraded lands, according to the approved plan for reclamation, the division may release an additional 25 percent of the surety. The remaining surety must not be released until all requirements of the permit have been satisfied. 3. Percentages greater than those specified in paragraph (c) of subsection 2 may be released if the operator demonstrates that the remaining surety is sufficient to ensure completion of the required reclamation. ^{lxxx}
Public Participation in Bonding	No specific provisions for public participation are provided. General provisions for public participation in permitting, typically prior to bond determination, are provided. ^{lxxxi}
Other Significant Features	Program for the Pooling of Reclamation Performance Bonds ^{lxxxii} Nevada BLM Process for Plans of Operations Authorized by 43 CFR 3802/3809

2.4.3 Reclamation and Closure Bonding Case Studies

2.4.3.1 Florida Canyon Mine

The Florida Canyon mine is located in the Humboldt mining district of Nevada, approximately 40 miles west of Winnemucca. The mine, which began operation in 1986, is owned by Apollo Gold Co. (an enterprise formed from the assets of Pegasus Gold Co., which recently filed for bankruptcy). The operation consists of a conventional open-pit heap leach operation. Leached ore is both run-of-mine (ROM) and crushed and agglomerated prior to being placed on the heap pads by a stacking conveyor operation.

Reclamation Bonding

In 1997, the company received approval for its Plan of Operation for Florida Canyon's Mine Expansion and Comprehensive Reclamation Plan Project. In 1998, the company submitted a reclamation cost estimate to the Bureau of Land Management (BLM) and Nevada Department of Environmental Protection (NDEP). Florida Canyon Mining estimated the cost of reclaiming 1,618 acres to be \$15,646,544.^{lxxxiii} The BLM, upon whose lands the mine is located, previously held a bond of \$16,936,130 which became effective in 1997; thus, the existing bond was considered adequate for reclamation.

Table 2.4.3, **Reclamation and Closure Cost Estimate, Florida Canyon, NV, Cost Summary** depicts the estimated reclamation costs for the Florida Canyon mine. Additional information describing the proposed reclamation and the company's basis for the costs used to determine the bond is provided below.

Basis for Costs

Apollo Gold Co. estimated reclamation costs on the basis of labor, equipment and materials to perform the described tasks. Hourly labor rates were based on outside contractors performing the work at Davis-Bacon wage and benefits. Hourly owning and operating costs for each type of equipment were based on Quick Estimator Hourly Owning and Operating Costs for severe job conditions from the Caterpillar Performance Handbook (CPH Ed. 26).

Leach Pad

The cost of rinsing and detoxification of the heap leach pad includes labor, power consumption, reagents, supplies and equipment. Labor is based on rinsing and detoxification operations over a six-year period. Power consumption is based on spray pumps, wells, the recovery plant and miscellaneous power needs for pumping clean rinse water to the facility.

Following rinsing and detoxification, all leach pad slopes will be reduced to at least 3H:1V for final reclamation. Following recontouring, a suitable growth medium will be applied to a minimum depth of one foot. The leach pad area will then be seeded and fertilized.

Waste Rock Dump

All waste rock dump slopes will be reduced to at least 3H:1V for final reclamation. After slope recontouring, scarification will be performed on all compacted surfaces, followed by application of at least one foot of suitable growth medium. Each dump area will then be seeded and fertilized.

Open Pit

The total pit disturbance will be approximately 482 acres. Highwalls constitute approximately 204 acres of the pit disturbance and, for the most part, will not be reclaimed. Partial backfilling will be performed in some pit areas to cover exposed sulfide material. This will also raise the pit bottom above the pre-mining water table elevation to prevent formation of a pit lake. Backfilling will create a five percent slope that will direct stormwater away from the pit and into Florida Canyon.

Facilities, Roads, Diversions and Other

All facilities and other disturbed areas will be reduced to at least 3H:1V as needed during final reclamation. After slope recontouring, scarification will be performed on all compacted surfaces, followed by application of at least one foot of suitable growth medium. Each area will then be seeded and fertilized.

Reclamation of lined ponds will consist of removing any water remaining in the ponds at closure and drying the sludge until it's manageable enough to be left in place. The liners will be cut, folded over the dried sludge and welded shut. The pond embankment will then be pushed over the encapsulated material and the area will be contoured, fertilized and seeded.

At the end of mining, 31 acres of mine haul and access roads will require reclamation. Roads will be reclaimed by ripping compacted surfaces as needed, pulling up as much of the fill slope as is practical and filling the cut slope to approximate the form of the land prior to disturbance. Suitable plant growth material will be spread as required and the area will be fertilized and seeded.

Indirect Costs

As noted in Table 2.4.3, the estimated reclamation costs for the Florida Canyon mine include indirect costs for on-site liability (one percent of labor cost), contract administration (10 percent), contractor performance bonding (three percent) and contractor profit (10 percent). Mobilization and demobilization were included in the direct costs.

The total indirect costs equal 23.7 percent of the direct costs, or approximately 18 percent of the total estimated cost of mine reclamation.

Solution Management Contingency

Beginning in year 1998, pursuant to BLM and NDEP requirements, an additional \$720,000 was to be included in the total bond estimate for the Florida Canyon Mine. The amount is considered an interim operations contingency fund to be used for sufficient labor, equipment and materials for continued management of process solutions, for up to six months, in the event of a mine shutdown.

**Table 2.4.3 - Reclamation and
Closure Bond Estimate
Florida Canyon, NV
Cost Summary**

Item	Task	Description	Volume Cu. Yd.	Thickness Ft.	Acres	Unit	Unit Cost	Estimated Cost
1	Leach Pad Reclamation	Detoxification			415	Acre	\$14,962	\$6,209,158
		Regrading/Contouring			415	Acre	\$1,647	\$683,696
		Revegetation/Stabilization			415	Acre	\$234	\$97,024
		Sub-total			415	Acre	\$16,843	\$6,989,878
2	Waste Rock Dump Reclamation	Regrading/Contouring			538	Acre	\$1,509	\$812,060
		Revegetation/Stabilization			538	Acre	\$236	\$126,909
		Sub-total			538	Acre	\$1,745	\$938,969
3	Open Pit	Regrading/Contouring			278	Acre	\$1,665	\$462,829
		Revegetation/Stabilization			278	Acre	\$231	\$64,262
		Sub-total			278	Acre	\$1,896	\$527,091
4	Facilities, Roads, Diversions and Other	Facilities Demolition, Mob-Demob and Monitoring						\$2,125,651
		Regrading/Contouring			204	Acre	\$1,796	\$366,448
		Revegetation/Stabilization			204	Acre	\$254	\$51,893
		Drainage Diversion Construction			43	Acre		\$589,616
		Exploration			203	Acre	\$3,226	\$654,974
Sub-total			407	Acre		\$3,788,582		
	Sub-total Direct Costs							\$12,244,520
5	Indirect Costs	Insurance (on-site liability) @ 1.5% of labor cost						\$86,150.00
		Contract Administration @10.0%						\$1,224,452
		Bond @3.0%						\$367,335.60
		Profit @ 10%						\$1,224,452
Sub-total							\$2,902,390	
	Sub-total Direct + Indirect Costs							\$15,146,910
6	Solution Management Contingency							\$720,000
	Total Reclamation Cost							\$15,866,910

2.4.3.2 Trenton Canyon Mine

The Trenton Canyon Project, originally owned by Santa Fe Pacific Gold Corp., and presently owned by Newmont Gold Co., is located on public and private lands south of Interstate Highway 80, approximately 35 miles southeast of Winnemucca and 18 miles northwest of Battle Mountain. In 1998, Newmont Gold Co. received the necessary permits from the BLM and NDEP to expand the operation. The company proposed to increase the size of the existing open pits and waste rock storage areas, develop new pits and waste rock storage areas, develop new heap leach facilities, haul roads, exploration roads, solution ponds, diversion channels, growth media stockpiles, drill sites and other ancillary facilities, and realign the primary access road.

The mine expansion would disturb 1,480 acres, of which 633 are public and 847 are private. The project expansion would extend the life of the mine to 2005 plus three years of reclamation.

Reclamation Bonding

The company's revised reclamation plan includes an estimate of the reclamation cost.^{lxxxiv} The cost estimate is also summarized in the final environmental impact statement.^{lxxxv}

The cost to reclaim 2,325 acres of the Trenton Canyon mine following expansion is estimated as \$13,808,817.

Table 2.4.4, **Reclamation and Closure Cost Estimate, Trenton Canyon, NV, Cost Summary** provides a summary of the estimated reclamation costs for the Trenton Canyon Mine. Additional information describing the proposed reclamation and the company's basis for the costs used to determine the bond amount is provided below.

Basis for Costs

An outside contractor (Shepherd Miller, Inc.) estimated the reclamation costs on the basis of labor, equipment and materials to perform the described tasks. Hourly labor rates are based on the cost for outside contractors to perform the work at Davis-Bacon wages and benefits. Equipment rates include fuel maintenance, depreciation, field indirect costs and office overhead.

Leach Pad

As all heap leach facilities are located on private lands, no detoxification costs are included in the reclamation cost estimate.

Following rinsing and detoxification, all leach pad slopes will be recontoured and regraded, loose growth medium will be applied to a depth of one foot (if necessary), followed by seedbed preparation and seed application.

Waste Rock Dump

All waste rock dump slopes will be recontoured and regraded, followed by placement of six inches of growth medium (if necessary), seedbed preparation and seed application.

Open Pit

Berms will be constructed around the perimeters of the Valmy, Trenton Canyon and North Peak open pits. The formation of pit lakes is not expected.

Facilities, Roads, Diversions and Other

The cost estimate includes the demolition and removal of the office, shop and associated structures as well as concrete pads and equipment. Disposal will include the burial of concrete foundation material. If necessary, this material will be decontaminated prior to placement in the approved disposal facility.

All disturbed areas will be recontoured and all compacted surfaces ripped as necessary. Application of growth medium to a depth of six inches will follow if necessary, as will seedbed preparation and seed application.

Reclamation of the three lined process ponds will consist of folding the liner inward and covering it with fill, recontouring the area to its original condition, ripping some areas, placing six inches of growth medium if necessary, preparing seed beds and applying seed.

At closure, 814 acres of mine haul and access roads will require reclamation. Roads will be reclaimed by recontouring, ripping compacted surfaces, pulling up as much of the fill slope as practical and placing six inches of growth medium over the disturbed area. Roads that provide access to private lands will remain open but will be downsized to a suitable width.

Indirect Costs

As noted in Table 2.4.4, the estimated bond costs for the Trenton Canyon mine include indirect costs for on-site liability insurance (two percent of labor cost), contract administration (10 percent), contractor performance bonding (three percent), and contractor profit (10 percent). Mobilization and demobilization are included in the direct costs.

The total indirect costs equal 23.4 percent of the direct costs, or approximately 19 percent of the total estimated cost of mine reclamation.

**Table 2.4.4 - Reclamation and
Closure Bond Estimate
Trenton Canyon, NV
Cost Estimate**

Item	Task	Description	Volume Cu. Yd.	Thickness Ft.	Acres	Unit	Unit Cost	Estimated Cost
1	Leach Pad Reclamation	Detoxification			203	Acre	\$66	\$13,478
		Regrading/Contouring			203	Acre	\$4,113	\$834,973
		Revegetation/Stabilization			203	Acre	\$426	\$86,511
		Sub-total			203	Acre	\$4,606	\$934,962
2	Waste Rock Dump Reclamation	Regrading/Contouring			680	Acre	\$6,225	\$4,232,665
		Revegetation			680	Acre	\$430	\$292,738
		Sub-total			680	Acre	\$6,655	\$4,525,403
3	Open Pit	Regrading/Contouring			20	Acre	\$2,519	\$50,372
		Revegetation/Stabilization			20	Acre	\$389	\$7,773
		Sub-total			20	Acre	\$2,907	\$58,145
4	Facilities, Roads, Diversions and Other	Facilities Demolition, Mob-Demob and Monitoring						\$551,813
		Regrading/Contouring			966	Acre	\$3,566	\$3,444,634
		Revegetation			966	Acre	\$412	\$397,924
		Drainage Diversion Construction			26	Acre		\$815,978
		Exploration			456	Acre	\$1,007	\$459,222
Sub-total			1,422	Acre		\$5,669,571		
	Sub-total Direct Costs							\$11,188,081
5	Indirect Costs	Insurance (on-site liability) @ 2.0% of labor cost						\$47,478.00
		Contract Administration @10.0%						\$1,118,808
		Bond @3.0%						\$335,642.43
		Profit @ 10%						\$1,118,808
	Sub-total						\$2,620,737	
	Total Reclamation Cost				2,325	Acre		\$13,808,818

2.4.3.3 Twin Creeks Mine

The Twin Creeks mine is located in the Valmy mining district, about 40 miles northeast of Winnemucca. Once known separately as the Chimney Creek mine (which started in 1988) and the Rabbit Creek mine (which started in 1990), Twin Creeks was formed when the two smaller mines were joined in 1993. The project was originally owned by Santa Fe Pacific Gold Corp., but recently became the property of Newmont Gold Co.

The operation initially consisted of an open-pit mine which processed lower grade oxide ores by cyanide heap leaching and higher-grade ores by conventional cyanide CIL/CIP (Closure In Leach/Closure in Pulp) operations. More recently, Twin Creeks began processing refractory sulfide ores utilizing pressure-oxidation followed by CIL/CIP cyanide leaching.

Reclamation Bonding

In 1996, the company revised its BLM Plan of Operations and NDEP Reclamation Plan for the project. A revised cost calculation was included with the revised plan. The new calculation estimated that reclamation and closure of 9,417 acres would cost \$33,840,213.^{lxxxvi} The mine is located on a combination of BLM lands and private lands.

Table 2.4.5, **Reclamation and Closure Cost Estimate, Twin Creeks, NV, Cost Summary**, displays the estimated reclamation costs for the Twin Creeks mine. The information presented in the cost estimate does not lend itself to the detailed task breakdown that is similar to other case studies in this report. Additional information describing the proposed reclamation and the company's basis for the costs used to determine the bond is provided below.

Basis for Costs

The cost estimate is based on the reclamation of both existing and proposed facilities over the life of the mine. The current bond estimate, however, includes only bonding for the first of two phases of the mine life. The second phase will disturb an additional 3,874 acres with an estimated reclamation cost of \$15,183,515.

The hourly rates for equipment operators and manual labor are based on information contained in the *State of Nevada Labor Rates*. The equipment costs are taken from the *Caterpillar Performance Handbook, 25th Edition*.

Leach Pad

Detoxification costs are included only for those facilities located on public lands (450 out of 857 acres). The detoxification cost estimate is based on the following assumptions:

1. A fresh water rinse will be applied at 0.5 tons of water/ton of ore at a rate of 1,250 gpm.
2. Costs include pumping costs, labor, consumable materials, analytical costs and capital costs for additional carbon adsorption facilities.
3. The cost estimate assumes an 8-year detoxification operation life.

Earthwork activities for the heap leach pads reclamation include breaching the liners, regrading, growth media hauling and placement, ripping and revegetation.

The heap leach pads are assumed to have a 50-foot bench height and total height of 200 feet. The pads are assumed to be constructed at an overall slope of 2H:1V, which will be regraded to 3H:1V with intermediate slopes of 2.5H:1V for the purposes of the estimate.

Waste Rock Dump

Earthwork activities for the waste rock dump reclamation include regrading, growth media hauling and placement, ripping and revegetation.

The cost estimate assumes a 50-foot bench height and a total height of 400 feet for waste rock dump areas. These areas will be constructed at an overall slope of 3H:1V with intermediate benches at heights of 50 feet. The intermediate slopes will be constructed at angle of repose of 2.5H:1V prior to regrading.

Tailings Pond

Costs for tailings pond reclamation include costs for seepage evaporation. The costs assume that tailings pond area closures will be conducted concurrently with heap leach detoxification activities. Costs also assume that any tailings solution remaining at the end of milling will be evaporated from the pond surface area and that tailings seepage will be collected and returned for evaporation. The costs of labor are included in heap detoxification.

Earthwork activities for the tailings ponds reclamation include backfilling the former operating pool area, growth media hauling and placement, ripping and revegetation. Earthwork activities for the reclamation of tailings ponds embankments include regrading, growth media hauling and placement, ripping and revegetation.

The volume of backfill required to account for solution evaporation from the operating pool was calculated by multiplying the average pool depth by the average pool area.

Tailings embankments are assumed to have been constructed at an average slope of no more than 2.25H:1V and will be regraded to slopes of 2.5H:1V. The average height of the embankments is assumed to be 67.5 feet.

Open Pit

An estimated five percent of the south pit and area above the post-mining pit lake will be large enough for reclamation. Reclamation will include ripping, growth media hauling and placement and revegetation.

Revegetation Costs

Revegetation activities will be conducted in the fall, so that the newly planted vegetation can take advantage of winter moisture. Revegetation activities will include broadcast seeding followed by harrowing. For cost estimating purposes, an average seed mix cost of \$300 per acre was used. Soil amendments such as mulch or fertilizers are not included in the estimate.

Facilities, Roads, Diversions and Other

Earthwork activities for the pond reclamation include perforation, folding and disposing of liners, backfilling ponds, regrading, growth media hauling and placement, ripping and revegetation. Reclamation of roads and exploration disturbances will involve ripping, minor regrading, culvert removal, growth media hauling and placement and revegetation. Ancillary facilities (including stockpiles, areas adjacent to buildings, parking areas and other disturbed areas) will be reclaimed by ripping, growth media hauling and placement and revegetation.

Indirect Costs

Administrative costs (including administrative and engineering personnel), engineering specifications and plans, permits, utilities, insurance, legal fees, and travel costs were calculated on an 11.5 percent basis of the direct reclamation cost. Profit was calculated at 10 percent of direct costs while liability and bond insurance were each calculated at 1.5 percent of the direct costs and are included in the direct costs..

Water Management

Upon cessation of pit dewatering operations, the infiltration basin/injection well system will be closed. Reclamation of the area will include equipment removal, backfilling and growth media placement on basins and associated disturbances, ripping and revegetation.

**Table 2.4.5 - Reclamation and Closure Bond Cost Estimate
Twin Creeks, NV
Cost Estimate**

Item	Task	Description	Volume Cu. Yd.	Thickness Ft.	Acres	Unit	Unit Cost	Estimated Cost
1	Leach Pad Reclamation	Detoxification			857	Acre	\$8,371	\$7,174,050
		Regrading/Contouring			857	Acre	\$0	
		Revegetation/Stabilization			857	Acre	\$2,324	\$1,991,425
		Sub-total			857	Acre	\$10,695	\$9,165,475
2	Waste Rock Dump Reclamation	Regrading/Contouring			3,878	Acre	\$0	
		Revegetation			3,878	Acre	\$0	
		Sub-total			3,878	Acre	\$1,240	\$4,807,106
3	Tailings Pond Reclamation	Regrading/Contouring			1,277	Acre	\$0	
		Revegetation			1,277	Acre	\$0	
		Sub-total			1,277	Acre	\$949	\$1,211,968
4	Open Pit	Regrading/Contouring			1,461	Acre	\$0	
		Revegetation/Stabilization			1,461	Acre	\$0	
		Sub-total			1,461	Acre	\$55	\$80,355
5	Facilities, Roads, Diversions and Other	Facilities Demolition, Mob-Demob and Monitoring						\$10,226,784
		Regrading/Contouring			122	Acre		\$293,166
		Revegetation			1,292	Acre		\$2,535,815
		Drainage Diversion Construction			8	Acre		\$10,982
		Exploration			200	Acre		\$254,400
Sub-total			1,622	Acre		\$13,321,147		
	Sub-total Direct Costs				9,095			\$28,586,051
6	Indirect Costs	Insurance (on-site liability)						
		Contract Administration						
		Bond Profit						
		Sub-total						\$3,490,246
7	Other	Water Management			322			\$1,763,916
	Total Reclamation Cost				9,417	Acre		\$33,840,213

2.5 NEW MEXICO

Historically, New Mexico's metals mining industry was fairly diverse with significant production of lead, zinc, copper, gold, silver and molybdenum. Today however, nearly all of New Mexico's significant mining operations are either closed and undergoing reclamation, suspended or operating at reduced levels due to low metals prices. The mines that remain currently active are the Chino and Tyrone copper mines and the Questa molybdenum mining operation.

Hardrock reclamation and closure bonding has only recently become a standard process in the state in a substantive form. By the end of 1999, New Mexico should, until final reclamation and closure plans are determined, have at least interim plans and bonding in place for all of its major mines. All of these mines have previous operating histories (some for more than 20 years), and signs point to the likelihood of significant surface reclamation and/or water quality issues. For these reasons, formulating reclamation plans that meet New Mexico's stringent regulations becomes a significant task, both for the companies and the state's regulatory authorities.

2.5.1 Major Mines

The major mines in New Mexico that are likely to require reclamation and closure permitting and bonding are listed in Table 2.5.1, **New Mexico Major Hardrock Mines, Mines with Existing Permits**. As previously mentioned, none of the existing mines currently holds reclamation permits or bonds relevant to the New Mexico Mining Act of 1993. In some cases, as is noted in the table, the New Mexico Environment Department holds interim water quality bonds, primarily to ensure water quality monitoring activities.

The table shows an \$850,000 bond for reclamation of the Deming Mill facility. The tailings dam at the facility was reclaimed and closed in 1993. The reclamation plan and bond covers the actual mill site only. The plan addresses demolition and removal of various buildings and facilities as well as conversion of the site into an industrial use area. The cost estimate is based primarily on demolition and removal. Because the site is to be converted to an industrial facility, no topsoil or growth medium placement, ripping, seeding or revegetation will be performed.

**Table 2.5.1 – New Mexico Major Hardrock Mines
Mines with Existing Permits**

Mine Name	Ownership	Commodity	Type	Status	Disturbed Acres	Bond Amount
Chino	Phelps Dodge Corp.	Copper	Open pit , Flotation, SX/EW	Operating	9,200	
Chino – Continental Pit	Phelps Dodge Corp.	Copper	Open pit	Operating	400	\$1,787,000 ⁸
Copper Flat	Alta Gold	Copper	Open Pit, Heap Leach	Inactive	1,300	
Deming Mill	Asarco Inc.	Lead, Zinc, Copper	Flotation Mill	Closed – Reclamation	10	\$850,000
Cunningham Hill	LAC Minerals	Gold, Silver	Open Pit, Heap Leach	Inactive	250	\$5,000,000 ²
Questa Mine	Molycorp	Molybdenum	Open Pit, Underground, Flotation	Operations Suspended	3,000	\$4,240,000 ⁹
Tyrone	Phelps Dodge Corp.	Copper	Open pit , Flotation, SX/EW	Operating	6,000	
Tyrone – Little Rock Pit	Phelps Dodge Corp.	Copper	Open pit	Inactive	125	
Total					20,305	

⁸ Interim joint bond with New Mexico Environment Department.

⁹ Interim water quality bond held by New Mexico Environment Department only.

2.5.2 Reclamation and Closure Bonding Regulatory Features

In 1993, New Mexico became the second to last state to establish a mined land reclamation Act. Rules for the New Mexico Mining Act were promulgated in 1994. These rules called for reclamation plans and bonds to be approved by the end of 1997, although a variance of up to two years could be approved at the discretion of the Mining and Minerals Division. All of New Mexico's major mining facilities were granted this variance, and were given until the end of 1999 to submit reclamation plans and bonds. New Mexico recently proposed to extend the deadline an additional two years, to the end of 2001.

The New Mexico Mining Act contains some of the most extensive, specific and substantive performance and reclamation requirements of all the western states. The Act specifically addresses wildlife protection, hydrologic balance, stream diversions, surface stability and erosion control and revegetation.

The Act is unique among the western states in that it specifically prohibits new mining operations from using perpetual treatment to meet the requirements of the Act or other laws (including for water quality). Enforcement of the Act by the Mining and Minerals Division as it relates to water quality and the release of acids or toxic substances is conducted in cooperation with the New Mexico Environment Department's enforcement of the New Mexico Water Quality Act.

Another unique component of the New Mexico Mining Act includes specific provisions for public participation in the reclamation plan and bond determination process. The New Mexico Mining Act is the only state statute that specifically provides the public an opportunity to comment on reclamation plans when the bond is determined (for both new and existing projects). There is also opportunity to comment during periodic bond reviews and at the time of release.

Additional information on the New Mexico Mining Act and its associated rules are contained in Table 2.5.2, **New Mexico Reclamation and Closure Bonding Features**. It should be noted that the reclamation plan requirements provided are for new mine "units" rather than for entirely new mining operations, which are treated slightly differently.

Table 2.5.2 – New Mexico Reclamation and Closure Bonding Features

<p>Statutes, Regulations and Guidelines</p>	<p>New Mexico Mining Act NMSA 1978, Section 69-36-1 et. Seq. [2-15-96] (NMMA) [Enacted 1978, revised 1996]</p> <p>New Mexico Mining Act Rules Title 19, Chapter 10, Part 2 New Mexico Mining Act Implementation (NMMAR) [Enacted 1994, revised 1996]</p> <p>Permit Requirements for Energy and Minerals in New Mexico New Mexico Energy, Minerals and Natural Resources Department, Mining and Minerals Division, 1995</p>
<p>Authority</p> <p>Governing State Body</p> <p>Lead State Agency</p> <p>Bonding Required By State And Relationship with Federal Agencies</p>	<p>The governing body is the Mining Commission^{lxxxvii}</p> <p>The Director of the Mining and Minerals Division of the Energy, Minerals and Natural Resources Department is responsible for enforcement of the NMMA.</p> <p>The director shall: enter into agreements with appropriate federal and state agencies for coordinating the review and issuance of all necessary permits to conduct new and existing mining operations and exploration in New Mexico.^{lxxxviii}</p>
<p>Exemptions to Reclamation Bonding</p> <p>Activities Prior to Regulation</p> <p>Size Limitations</p>	<p>An application for a permit for an existing mining operation shall be submitted by December 31, 1994. The application shall include: a closeout plan; or a compliance schedule for completion of, within the shortest time practicable, a closeout plan, which shall be submitted no later than December 31, 1995, unless the applicant requests an extension and the Director grants approval for good cause shown. Every existing mining operation must have a permit and closeout plan approved by the Director by December 31, 1997, unless the Director grants a non-renewable extension of time not to exceed two years for good cause shown.^{lxxxix}</p> <p>Operations meeting the general permit provisions are not required to provide financial assurance.^{xc} Mining operations not occurring in intermittent streams, perennial streams or other bodies of water may apply to the Director for a general permit if they meet the following requirements: 1. the operation does not have any of the disqualifying characteristics listed in Sections 107.W1.a through 107.W1.i.; 2. not excavate greater than 200 cubic yards per year, with no more than 25 cubic yards and no more than 2 acres of unreclaimed surface disturbance at any time with all new disturbances including roads included in these amounts. For the purposes of this subsection, "unreclaimed" means the failure to meet the commitments of section 301.D2.b. through d.; and 3. not cause a discharge of process water or drilling mud.^{xcii} Mining operations occurring in intermittent streams, perennial streams or other bodies of water may apply to the Director for a general permit if they meet the following requirements: 1. the operation does not have any of the disqualifying characteristics listed in Sections 107.W1.b through 107.W1.i.; 2. not excavate greater than 2 cubic yards per day and 100 cubic yards per year; 3. maintain a distance of at least 50 yards from other mining operations; 4. not excavate into stream banks; and 5. not drill.^{xcii}</p>

<p>Reclamation Plan Requirements</p>	<p>Performance and Reclamation Standards and Requirements^{xciii}</p> <p>507.A The permit area will be reclaimed to a condition that allows for re-establishment of a self-sustaining ecosystem appropriate for the life zone of the surrounding areas following closure unless conflicting with the approved post-mining land use. Each closeout plan must be developed to meet the site-specific characteristics of the mining operation and the site. The closeout plan must specify incremental work to be done within specific time frames to accomplish the reclamation.</p> <p>507.B Waiver for Pits and Waste Units - An operator may apply for a waiver for open pits or waste units from the requirement of achieving a post-mining land use or self-sustaining ecosystem. The operator must show that achieving a post-mining land use or self-sustaining ecosystem is not technically or economically feasible or is environmentally unsound. The Director may grant the waiver for an open pit or waste unit if he finds: measures will be taken to ensure that the open pit or waste unit will meet all applicable federal and state laws, regulations and standards for air, surface water and ground water protection following closure; and he open pit or waste unit will not pose a current or future hazard to public health or safety.</p> <p>507.C New Units – New discrete processing, leaching, excavation, storage or stockpile units located within the permit area of an existing mining operation and not identified in the permit of an existing mining operation, and for each expansion of such a unit identified in the permit for an existing mining operation that exceeds the design limits specified in the permit must meet the reclamation standard set forth in Section 507.A above and must also comply with the standards and requirements set forth below. Site-specific characteristics, including the existing mining operation, must be considered in applying the standards and requirements.</p> <p>1. Most Appropriate Technology and Best Management Practices - The mining operation and the reclamation plan shall be designed and operated using the most appropriate technology and the best management practices.</p> <p>2. Assure Protection – The mining operation and completed reclamation shall meet the following requirements established to assure protection of human health and safety, the environment, wildlife and domestic animals.</p> <p>Signs, Markers and Safeguarding – Measures will be taken, to safeguard the public from unauthorized entry into shafts, adits, and tunnels and to prevent falls from highwalls or pit edges. Depending on site-specific characteristics, the following measures shall be required: closing shafts, adits or tunnels to prevent entry; posting warning signs in locations near hazardous areas; restricting access to hazardous areas; marking the permit area boundaries; posting a sign at the main entrances giving a telephone number of a person to call in the event of emergencies related to the mine; or other measures as needed to protect human safety.</p> <p>Wildlife Protection – Measures shall be taken to minimize adverse impacts on wildlife and important habitat. Based on site-specific characteristics, the following measures will be required: restricting access of wildlife and domestic animals to toxic chemicals or otherwise harmful materials; minimizing harm to wildlife habitat during mining; and reclaiming areas of wildlife habitat if not in conflict with the approved post-mining land use.</p> <p>Cultural Resources – Cultural resources listed on or eligible for listing on the National Register of Historic Places or the State Register of Cultural Properties, and any cemeteries or burial grounds shall be protected until clearance has been granted by the State Historic Preservation Office or other appropriate authority.</p> <p>Hydrologic Balance – Operations shall be planned and conducted to minimize negative impact to the hydrologic balance in both the permit and potentially affected areas. Operations shall be designed so that non-point source surface releases of acid or other toxic substances shall be</p>
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<p>Reclamation Plan Requirements (continued)</p>	<p>contained within the permit area, and that all other surface flows from the disturbed area are treated to meet all applicable state and federal regulations. The disturbed areas shall not contribute suspended solids above background levels, or where applicable the Water Quality Control Commission's standards, to intermittent and perennial streams. To provide data to determine background levels for surface water entering the permit area, appropriate monitoring shall be conducted on drainages leading into the permit area. All diversions of overland flow shall be designed, constructed and maintained to minimize adverse impacts to the hydrologic balance and to assure the safety of the public. No diversion shall be located so as to increase the potential for landslides. Unless site-specific characteristics require a different standard which is included in the approved permit, diversions which have watersheds larger than 10 acres shall be designed, constructed and maintained to safely pass the peak runoff from a 10-year, 24-hour precipitation event. All diversion designs which have watersheds larger than 10 acres shall be certified by a professional engineer registered in New Mexico as having been designed in accordance with this Part. Diversion designs shall be kept on-site or otherwise be made available, upon request, to the Director for inspection. When no longer needed, temporary diversions shall be removed and the disturbed area reclaimed.</p> <p>Stream Diversions – When streams are to be diverted, the stream channel diversion shall be designed, constructed, and removed in accordance with the following: Unless site-specific characteristics require different measures to meet the performance standard and are included in the approved permit, the combination of channel, bank and flood plain configurations shall be adequate to safely pass the peak run-off of a 10-year, 24-hour precipitation event for temporary diversions, a 100-year, 24-hour precipitation event for permanent diversions; The design and construction of all intermittent and perennial stream channel diversions shall be certified as meeting this Part by a professional engineer registered in New Mexico. As-built drawings shall be completed promptly after construction and be retained on site or otherwise made available upon request to the Director; and When no longer needed, temporary stream channel diversions shall be removed and the disturbed area reclaimed.</p> <p>Impoundments - If impoundments are required they shall be designed, constructed and maintained to minimize adverse impacts to the hydrologic balance and adjoining property and to assure the safety of the public. Unless site-specific characteristics require different measures to meet the performance standard and are included in the approved permit, impoundments having earthen embankments but not subject to the jurisdiction of the Mine Safety and Health Administration or the State Engineer shall: have a minimum elevation at the top of the settled embankment of 1.0 foot above the water surface in the pond with the spillway flowing at the design depth; have a top width of the embankment not less than 6 feet; have combined upstream and downstream side slopes of the settled embankment not less than 5 horizontal : 1 vertical with neither slope steeper than 2 horizontal : 1 vertical. Slopes shall be vegetated or otherwise stabilized to control erosion; have the embankment foundation cleared of all vegetative matter, all surfaces sloped to no steeper than 1 horizontal : 1 vertical and the entire foundation area scarified; have fill material free of vegetative matter and frozen soil; have spillways provided to safely discharge the peak runoff of a 25-year, 24-hour precipitation event, or an event with a 90-percent chance of not being exceeded for the design life of the structure; have other site-specific design criteria for embankments as long as they result in a minimum static safety factor of 1.3 with water impounded to the design level; be designed and certified by a professional engineer registered in New Mexico as having been designed and constructed in accordance with this Part. As-built drawings shall be completed promptly after construction and be retained on site or otherwise made available upon request to the Director; and if necessary for sediment control, be in place before any other disturbance is made to the watershed for the impoundment. When no longer required, impoundments shall be graded to achieve positive drainage unless: the surface estate owner has requested in writing that they be retained; they are consistent with the approved reclamation plan; and they are appropriate for the post-mining land use or the self-sustaining ecosystem.</p>
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<p>Reclamation Plan Requirements (continued)</p>	<p>Minimization of Mass Movement - All man-made piles such as waste dumps, topsoil stockpiles and ore piles shall be constructed and maintained to minimize mass movement.</p> <p>Riparian and Wetland Areas – Disturbance to riparian and wetland areas shall be minimized during mining. Adverse effects to riparian and wetland areas shall be mitigated during reclamation unless the mitigation conflicts with the approved post-mining land use.</p> <p>Roads - Roads shall be constructed and maintained to control erosion. Drainage control structures shall be used as necessary to control runoff and to minimize erosion, sedimentation and flooding. Drainage facilities shall be installed as road construction progresses and shall be capable of safely passing a 10-year, 24 hour precipitation event unless site-specific characteristics indicate a different standard is appropriate and is included in the approved permit. Culverts and drainage pipes shall be constructed and maintained to avoid plugging, collapsing, or erosion. Roads to be constructed in or across intermittent or perennial streams require site-specific designs to be submitted with the permit application. Roads to be made permanent must be approved by the surface owner and be consistent with the approved post-mining land use.</p> <p>Subsidence Control – Underground and in situ solution mining activities shall be planned and conducted, to the extent technologically and economically feasible, to prevent subsidence which may cause material damage to structures or property not owned by the operator. Underground and in situ solution mining activities near any aquifer that serves as a significant source of water supply to a public water system shall be conducted so as to avoid disruption of the aquifer and consequent exchange of ground water between the aquifer and other strata. Underground and in situ solution mining activities conducted beneath or adjacent to any perennial stream must be performed in a manner so that subsidence is not likely to cause material damage to streams, water bodies and associated structures.</p> <p>Explosives - Blasting shall be conducted to prevent injury to persons or damage to property not owned by the operator. Fly rock shall be confined to the permit area. The Director may require a detailed blasting plan, pre-blast surveys or specify blast design limits to control possible adverse effects to structures.</p> <p>Site Stabilization and Surface Configuration - The permit area shall be stabilized, to the extent practicable, to minimize future impact to the environment and protect air and water resources. The final surface configuration of the disturbed area shall be suitable for achieving a self-sustaining ecosystem or approved post-mining land use. Final slopes and drainage configurations must be compatible with a self-sustaining ecosystem or approved post-mining land use. All reconstructed slopes, embankments and roads shall be designed, constructed and maintained to minimize mass movement. Measures must be taken to reduce, to the extent practicable, the formation of acid and other toxic drainage that may otherwise occur following closure to prevent releases that cause federal or state standards to be exceeded. Nonpoint source surface releases for acid or other toxic substances shall be contained within the permit area.</p> <p>Erosion Control – Reclamation of disturbed lands must result in a condition that controls erosion. Acceptable practices to control erosion include but are not limited to the following: stabilizing disturbed areas through land shaping, berming, or grading to final contour; minimizing reconstructed slope lengths and gradients; diverting runoff; establishing vegetation; regulating channel velocity of water; lining drainage channels with rock, vegetation or other geotechnical materials; and mulching. Revegetated lands must not contribute suspended solids above background levels to intermittent and perennial streams.</p> <p>Revegetation - To obtain the release of financial assurance revegetated lands must meet the following standards: Revegetation success for a self-sustaining ecosystem shall be determined through comparison of ground cover, productivity and diversity and shall be made on the basis of the following approved reference areas; through the use of technical guidance procedures published by the U. S. Department of Agriculture; other reasonably attainable standards</p>
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2.6 UTAH

There are currently seven major hardrock mines permitted in Utah. The state's largest mine, and by far its most significant, is the Bingham Canyon copper mining operation, which has been in operation since the late 1800's. In addition, Utah has five gold and silver mines that are in various stages of operation or reclamation. Another mine, the Lisbon Valley copper project, has been proposed.

Utah established its Mined Land Reclamation Act in 1975. Hardrock reclamation bonding has been a standard process in the state in a substantive form since at least the early 1980's. As mentioned, the Bingham Canyon copper mining operation has been on-going for over a century. Reclamation permitting and bonding is obviously complicated for any operations conducted prior to the Act.

2.6.1 Major Mines with Existing Permits and Bonds

Utah's major permitted and bonded mines are listed in Table 2.6.1, **Utah Major Hardrock Mines, Mines with Existing Permits and Bonds.**

In terms of disturbed acres, the Bingham Canyon copper mines is the largest single mine operation in the United States. The greatest amount of disturbance at the Bingham Canyon operations is for the pit and associated waste rock dumps which, because of their "historic site" status, are not applicable in determining reclamation and closure bonding under Utah's statutes.

The Mercur and Barney's Canyon gold and silver mines, which range in size from about 1,070 to 1,719 acres, are the only large precious metals mining operations currently active in Utah. (Several smaller operations are closed and in reclamation.) The Summo USA Corp.'s proposed Lisbon Valley Copper mine, although permitted in 1997, has yet to be put into operation.

2.6.2 Reclamation and Closure Bonding Regulatory Features

In 1975, Utah became one of the earlier states to establish a mined land reclamation Act. Since that time, the Utah Mined Land Reclamation Act has remained without significant revision. However, the rules of the Minerals Regulatory Program were not promulgated until 1988.

The Utah Mined Land Reclamation Act contains broad, but fairly brief, reclamation plan requirements, which address elements of hydrology, erosion control, deleterious materials, slope stability and revegetation. The Division of Oil, Gas and Mining has substantial discretion as to the application of the requirements.

Although not specifically mentioned in the Act or rules, Utah does perform monitoring and compliance inspections, typically on a yearly basis. The bond amount is reviewed at five year intervals.

Additional information on Utah's Mined Land Reclamation Act and associated are contained in Table 2.6.2, **Utah Reclamation and Closure Bonding Features.**

Table 2.6.1 – Utah Major Hardrock Mines, Mines with Existing Permits and Bonds

Mine Name	Ownership	Commodity	Type	Status	Disturbed Acres ¹⁰	Bond Amount ¹
Barneys Canyon	Kennecott Barneys Canyon Mining	Gold, Silver	Open Pit, Heap Leach	Operating	1,072	\$4,604,000
Bingham Canyon	Kennecott Utah Copper	Copper, gold, silver, molybdenum	Open Pit, SX/EW, Flotation, Smelter	Operating	Bingham Pit	\$N/A
Fourth Line Expansion					168	\$5,300,000
Modernization Project					588	\$10,429,000
Tailings Modernization					3,334	\$17,485,000
Drum Mine	Western States Minerals	Gold, Silver	Open Pit, Heap Leach	Closed – Reclamation	144	\$264,080
Escalante Silver	Hecla Mining Co.	Silver		Closed – Reclamation	108	\$389,300
Goldstrike Project	USMX Inc.	Gold, Silver	Open Pit, Heap Leach	Closed – Reclamation	387	\$929,200
Lisbon Valley Copper	Summo USA Corp.	Copper	Open Pit, SX/EW	Pre-production	395	\$2,689,000
Mercur Mine	Barrick Mercur	Gold, Silver	Open Pit, Mill, Heap Leach	Operating	1,719	\$8,808,891
Total					29,843	\$50,898,471

¹⁰ Data from Utah Mineral Program – Surety Agreements database provided by Division of Oil, Gas and Minerals, November, 1998.

Table 2.6.2 – Utah Reclamation and Closure Bonding Features

<p>Statutes, Regulations and Guidelines</p>	<p>Utah Mined Land Reclamation Act Title 40, Chapter 8, Utah Code Annotated (UCA) [Enacted 1975]</p> <p>Minerals Regulatory Program Title R647, Utah Administrative Code (UAC) [1988]</p>
<p>Authority</p> <p>Governing State Body</p> <p>Lead State Agency</p> <p>Bonding Required By State</p> <p>Relationship with Federal Agencies</p>	<p>The governing state body responsible for the promulgation of rules is the Utah Board of Oil, Gas and Mining.^{cxix}</p> <p>The lead state agency responsible for administering the Minerals Regulatory Program is the Division of Oil, Gas and Mining of the Department of Natural Resources.</p> <p>The Board and the division have jurisdiction and authority over all persons and property, both public and private, necessary to enforce this chapter.^{cx} This act shall apply to all lands in the state of Utah lawfully subject to its police power.^{cxii} These rules apply to all lands within the state of Utah lawfully subject to its police power, regardless of surface or mineral ownership, and regardless of the type of mining operation being conducted.</p> <p>(1) The division shall cooperate with other state agencies, local governmental bodies, agencies of the federal government, and appropriate private interest in the furtherance of the purposes of this act.</p> <p>(2) The division is authorized to enter into cooperative agreements with these agencies, as may be approved by the board, in furtherance of the purposes of this act and may accept or commit funds in connection thereto as may be appropriated or otherwise provided for the purpose and as specifically approved by the board, except that such actions shall not result in any delegation of powers, responsibility, or authority conferred upon the board or division by this act.^{cxiii}</p>
<p>Exemptions to Reclamation Bonding</p> <p>Activities Prior to Regulation</p> <p>Size Limitations</p>	<p>This act and the rules and regulations promulgated under it shall be fully effective for all operators and mining operations active on the effective date of this act [1975] or commenced or reactivated on and after July 1, 1977.^{cxiii} Effective November 1, 1988, the following rules apply to all previously exempted mining operations and to mining operations planning to commence, or resume operations within the state of Utah. These rules do not apply to existing mining operations approved prior to the effective date of these rules, or to notices of intention or amendments prior to these rules. However, these rules will apply to any revisions to an approved notice of intention filed subsequent to the effective date of these rules.^{cxiv}</p> <p>Approval of a notice of intention for small mining operations is not required.^{cxv} “Small mining operations” means mining operations which disturb or will disturb five or less surface acres at any given time.^{cxvi}</p>
<p>Reclamation Plan Requirements</p>	<p>Every operator shall be obligated to conduct reclamation and shall be responsible for the costs and expenses thereof.^{cxvii} Each notice of intention shall include a reclamation plan . . .^{cxviii}</p> <p>During reclamation, the operator shall conform to the following practices unless the Division grants a variance in writing:</p> <p>1. Public Safety and Welfare – The operator shall minimize hazards to the public safety and welfare following completion of operations. Methods to minimize hazards shall include but not be limited to: 1.11 The permanent sealing of shafts and tunnels; 1.12 The disposal of trash,</p>

<p>Reclamation Plan Requirements (continued)</p>	<p>scrap metal and wood, buildings, extraneous debris, and other materials incident to mining; 1.13 The plugging of drill, core, or other exploratory holes as set forth in Rule R647-4-108; 1.14 The posting of appropriate warning signs in locations where public access to operations is readily available; 1.15 The construction of berms, fences and/or barriers above highwalls or other excavations when required by the Division.</p> <p>2. Drainages – If natural channels have been affected by mining operations, then reclamation must be performed such that channels will be left in a stable conditions with respect to actual and reasonably expected water flow so as to avoid or minimize future damage to the hydrologic system.</p> <p>3. Erosion Control – Reclamation shall be conducted in a manner such that sediment from disturbed areas is adequately controlled. The degree of erosion control shall be appropriate for the site-specific and regional conditions of topography, soil, drainage, water quality or other characteristics.</p> <p>4. Deleterious Materials – All deleterious or potentially deleterious material shall be safely removed from the site or left in an isolated or neutralized condition such that adverse environmental effects are eliminated or controlled.</p> <p>5. Land Use – The operator shall leave the on-site area in a condition which is capable of supporting the postmining land use.</p> <p>6. Slopes – Waste piles, spoil piles and fills shall be regraded to a stable configurations and shall be sloped to minimize safety hazards and erosion while providing for successful revegetation.</p> <p>7. Highwalls – In surface mining and in open cuts for pads or roadways, highwalls shall be reclaimed and stabilized by backfilling against them or by cutting the wall back to achieve a slope angle of 45 degrees or less.</p> <p>8. Roads and Pads – On-site roads and pads shall be reclaimed when they are no longer needed for operations.</p> <p>9. Dams and Impoundments – Water impounding structures shall be reclaimed so as to be self-draining and mechanically stable unless shown to have sound hydrologic design and to be beneficial to the postmining land use.</p> <p>10. Trenches and Pits – Trenches and small pits shall be reclaimed.</p> <p>11. Structures and Equipment – Structures, rail lines, utility connections, equipment and debris shall be buried or removed.</p> <p>12. Topsoil Redistribution – After final grading, soil materials shall be redistributed on a stable surface, so as to minimize erosion, prevent undue compaction and promote revegetation.</p> <p>13. Revegetation – The species seeded shall include adaptable perennial species that will grow on the site, provide basic soil and watershed protection, and support the postmining land use. Revegetation will be accomplished when: 13.11 The revegetation has achieved 70 percent of the premining vegetative ground cover. If the premining vegetative ground cover is unknown, the ground cover of an adjacent undisturbed area that is representative of the premining ground cover will be used as a standard. Also, the vegetation has survived three growing seasons following last seeding, fertilization or irrigation, unless such practices are to continue as part of the postmining land use; or 13.12 The Division determines that revegetation has been satisfactorily completed within practical limits.^{cxix}</p>
<p>Bonding Requirements</p> <p>Bond Amount And Calculation</p> <p>Phased Bonding</p>	<p>After receiving notification that a notice of intention for mining operations other than small mining operations has been approved, but prior to commencement of those operations, the operator shall provide surety to the division, in a form and amount determined by the division or board as provided by this section.^{cxix}</p> <p>As part of the review of the notice of intention, the Division shall determine the required surety amount based on site specific calculations reflecting the Division’s cost to reclaim the site. An operator’s estimate will be accepted if it is accurate and verifiable.^{cxix}</p> <p>Not specifically addressed but inferred in state practice.</p>

Type of Bond Allowed	The operator shall submit a completed Reclamation Contract (FORM MR-RC) with the required surety. The form and amount of the surety must be approved by the Division, except as provided in subpart 4.16. Acceptable forms may include: 4.11 Corporate surety bond; 4.12 Federally-insured certificate of deposit payable to the State of Utah, Division of Oil, Gas and Mining; 4.13 Cash; 4.14 An irrevocable letter of credit issued by a bank organized to do business in the United States; 4.15 Escrow Accounts; 4.16 In addition the Board may accept a written self-bonding agreement in the case of operators showing sufficient financial strength. ^{cxvii}
Reclamation and Bonding Oversight	
Reclamation Monitoring and Compliance	No specific provisions provided.
Bond Review	No specific provisions provided. Division policy is to review every five years.
Bond Forfeiture	If the operator of a mining operation other than a small mining operation fails or refuses to carry out the necessary land reclamation as outlined in the approved notice of intention, the board may, after notice and hearing, declare any surety filed for this purpose forfeited. ^{cxviii}
Bond Release	Surety shall be required until such time as the reclamation is deemed complete by the Division.
Public Participation in Bonding	
Other Significant Features	Utah Water Quality Act – Utah Department of Environmental Quality

2.6.3 Reclamation and Closure Bonding Case Studies

2.6.3.1 Barneys Canyon Mine

Kennecott Minerals Co. operates the Barneys Canyon gold mining operation, which is located on private land about 15 miles southwest of Salt Lake City. The facilities are located about five miles north of the historic (and presently operating) Bingham Canyon open pit copper mine.

The Barneys Canyon operation began production in 1990 and is expected to continue operations at least through 2001. The mine uses open pit mining with crushing, agglomeration and heap leaching of the ore to produce gold and byproduct silver.

Reclamation Bonding

The original bond for the Barneys Canyon operation was submitted to the state as a part of Kennecott Minerals' approved notice of intent in 1989. The bond was based on an estimated reclamation cost of \$2,206,340, which, according to the company, would cover a disturbance area of 630 acres. The state then accounted for inflation by escalating the amount of the bond annually by anywhere from 1.3 percent to 1.8 percent per year. This set the final bond amount at \$2,320,500.

In 1992, the plan was revised to include an additional 140 acres, and the reclamation cost was recalculated using the cost per acre from the previous bond. This figure was then escalated at 1.3 percent over the next five years to account for inflation. The reclamation bond was again revised in 1995, with a

bond estimate to the year 2000. This most recent bond estimate is \$4,604,000 for a disturbance area of 1,072 acres, which equals a total unit cost of approximately \$4,300 per acre.

Table 2.6.3, **Reclamation and Closure Bond Estimate, Barney's Canyon, UT**, provides a summary of the reclamation costs estimated for the operation. The costs shown are based on the original 1989 reclamation cost estimate. These costs are corrected to reflect 1995 dollars using the same escalation factors the state used to set the bond. In 1995, an additional 442 acres were added to the disturbance area. The cost per new acre is the same as the cost per original acre, corrected to 1995 dollars. The total cost for all 1072 disturbed acres was then escalated by 2.01 percent per year for the five year (1995-2000) bond period to determine the total bond amount.

Leach Pad

The reclamation costs contained in the original notice of intent were based on a set of task assumptions for regrading the leach pad slopes, leach pad perimeter and ponds, topsoil loading, hauling, spreading, ripping and revegetation.

According to information provided by the Utah Division of Oil, Gas and Mining,^{cxix} the costs are based on regrading leach pad slopes at angles varying from 2H:1V to less than 2H:1V. The costs for topsoil hauling, spreading and ripping are based on a 12-inch topsoil layer. Revegetation is based on various treatment scenarios. In 1988 dollars, revegetation on slopes less than 2H:1V is estimated at \$723 per acre. On slopes of 2H:1V, estimated costs are \$1,463 per acre. Finally, for hydroseeding of non-topsoiled slopes, estimated costs are \$2,583 per acre.

The information provided does not identify the source of equipment, equipment productivity or other unit costs used in the estimate. It is probable that the productivity and costs were estimated based on the experience of the company.

The resulting cost estimate equals approximately \$3,600 per acre, with approximately 22 percent of the expenditure allotted for regrading, 42 percent for replacing topsoil and 36 percent for revegetation.

Waste Rock Dump

The costs for waste rock dump reclamation were estimated identically to those for leach pad reclamation, and were applied to the acres of waste rock dumps to be reclaimed.

Facilities, Roads, Diversions and Other

The costs for reclamation of additional disturbance areas were estimated in exactly the same way as those for the leach pad and waste rock dump areas. Additional costs were estimated for folding leach pad and solution pond liners, construction of safety berms around the pits and runoff control features.

Indirect Costs

The estimated reclamation cost estimate for the Barneys Canyon operation includes indirect costs for mobilization (0.6 percent) and supervision (5.0 percent). In addition, the estimate in 1995 dollars is escalated by 2.01 percent per year for the bond permit period (1995-2000) to account for inflation.

**Table 2.6.3 - Reclamation and
Closure Bond Estimate
Barneys Canyon, UT
Cost Summary**

Item	Task	Description	Volume Cu. Yd.	Thickness Ft.	Acres	Unit	Unit Cost	Estimated Cost
1	Leach Pad Reclamation 1988-1992 Acres	Regrading			281	Acre	\$796	\$223,407
		Haul, spread topsoil and ripping			281	Acre	\$1,505	\$422,333
		Revegetation			281	Acre	\$1,300	\$364,846
		Sub-total			281	Acre	\$3,602	\$1,010,586
2	Waste Rock Dump Reclamation 1988-1992 Acres	Regrading			203	Acre	\$704	\$143,053
		Haul, spread topsoil and ripping			203	Acre	\$1,505	\$305,838
		Revegetation			203	Acre	\$1,300	\$264,208
		Sub-total			203	Acre	\$3,509	\$713,098
3	Facilities, Roads, Diversions and Other 1988-1992 Acres	Regrading			146	Acre	\$704	\$102,784
		Haul, spread topsoil and ripping			146	Acre	\$1,505	\$219,746
		Revegetation			146	Acre	\$1,300	\$189,834
		Fold Leach Pad and Solution Pond Liners						\$5,305
		Construct safety berms around pits						\$3,665
		Runoff Control						\$27,205
		Sub-total				146	Acre	\$3,757
	Sub-total Direct Costs				630		\$3,608	\$2,272,223
5	Indirect Costs 1988-1992 Acres	Mobilization						\$14,397
		Supervision @5%						\$114,332
		Sub-total						\$128,729
	Sub-Total				630		\$3,812	\$2,400,952
6	Additional Disturbed Acres, 1995-2000	Reclamation @\$3,812/acre			442		\$3,812	\$1,685,775
	Sub-Total				1072		\$3,812	\$4,086,726
7	Indirect Costs	Inflation @ 2.01%/year for year 1995-2000						\$518,299
	Total Reclamation Bond				1072		\$4,295	\$4,604,300

Endnotes for Part II

- ⁱ ARS §27-902
- ⁱⁱ Id. §27-903
- ⁱⁱⁱ Id. §27-932
- ^{iv} Id. §27-922(A)
- ^v Id. §27-922 (D)
- ^{vi} Id. §27-923
- ^{vii} AR §11-2-601
- ^{viii} ARS §27-975
- ^{ix} AR §11-2-602
- ^x Id. §11-2-603
- ^{xi} Id. §11-2-701
- ^{xii} Id. §11-2-702, See also ARS §27-974.
- ^{xiii} ARS §27-992 (A)
- ^{xiv} Id. §27-992 (B), (C)
- ^{xv} AR §11-2-802
- ^{xvi} ARS §27-995
- ^{xvii} Id. §27-991(B), See also AR§27-804 thru 812.
- ^{xviii} Id. §27-1021
- ^{xix} Id. §27-992 (D)
- ^{xx} AR §11-2-818
- ^{xxi} ARS §27-996
- ^{xxii} AR §27-929(D)
- ^{xxiii} Pinto Valley Operation Facility Closure Plan, March 1997, BHP Copper, Inc., Prepared by Hargis and Associates, Inc.
- ^{xxiv} Letter dated September 6, 1996 from Judith P. Kaaua, BHP Copper North America to Arizona Department of Environmental Quality.
- ^{xxv} Cyprus Sierrita Corporation Reclamation Plan, October 1996, Cyprus Sierrita Corp., Prepared by Environet Inc., Phoenix, AZ.
- ^{xxvi} SMARA § 2755
- ^{xxvii} Id. § 2728
- ^{xxviii} Id. § 3501
- ^{xxix} Id. § 3505. (a) (1)
- ^{xxx} Id. § 3700
- ^{xxxi} Id. § 2770. (a)
- ^{xxxii} Id. § 2773.1. (a)
- ^{xxxiii} Id. § 3702
- ^{xxxiv} Id. § 3804, see also Financial Assurance Guidelines Appendix A – Reclamation Cost Estimate Calculations
- ^{xxxv} Id. § 2773.1. (a) (3)
- ^{xxxvi} Id. § 2773.1. (a) (1)
- ^{xxxvii} Id. § 3803
- ^{xxxviii} Id. § 2208
- ^{xxxix} Id. § 3804 (c)
- ^{xl} Id. § 2773.1. (a) (4) (b)
- ^{xli} Id. § 2773.1. (a) (3), see also Financial Assurance Guidelines (20)
- ^{xlii} Briggs Project Reclamation Surety Calculation, April 1995, CR Briggs Corp, Golden, CO.
- ^{xliiii} McLaughlin Mine Addendum to Reclamation Plan, January 1996, Homestake Mining Co.
- ^{xliiv} Exhibit “C” [1984], attached to letter from Homestake Mining Co. to Bureau of Land Management, February 6, 1991.
- ^{xli v} The estimate presented may be slightly different from that of the 1995 estimate withheld by Homestake. This is the only case in which the requested information was not made available, by any state agency, to the author.
- ^{xli vi} CRS §34-32-105 (1)
- ^{xli vii} Ibid.
- ^{xli viii} Hard Rock/Metal Mining Rule §1.2.4
- ^{xli x} Id. §34-32-116, See also §34-32-110 and Hard Rock/Metal Mining Rule §3: Reclamation Performance Standards, Inspection, Monitoring, and Enforcement and Rule §6.

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- ^l See also §34-2-116 (7) (k), (l), (m), (n), (o), (p)
- ^{li} See also exceptions §34-2-116 (7) (q) (I), (II), (III), (IV)
- ^{lii} CRS §34-2-117, See also Hard Rock/Metal Mining Rule §4: Performance Warranties and Financial Warranties
- ^{liii} Id. §34-2-117 (4) (a)
- ^{liiv} Id. §34-2-117 (4) (b)
- ^{liv} Id. §34-2-117 (3) (f)
- ^{lvi} Hard Rock/Metal Mining Rule §3.2 (8)
- ^{lvii} CRS §34-2-117 (4) (c)
- ^{lviii} Id. §34-2-118 (1)
- ^{lix} Id. §34-2-117 (5). See also §34-2-117 (5.5).
- ^{lx} Hard Rock/Metal Mining Rule §4.17, see also Rule 1, 2, 4.16.4 (1).
- ^{lxi} CRS §34-2-116.5 – An environmental protection plan shall be required for all designated mining operations.
- ^{lxii} Id. §34-2-122.
- ^{lxiii} Cresson Mine Reclamation Surety Costs, provided by Division of Minerals and Geology.
- ^{lxiv} NRS §519A.160
- ^{lxv} Id. §519A.140, 150
- ^{lxvi} Id. §519A.140
- ^{lxvii} Id. §519A.010
- ^{lxviii} Id. §519A.140
- ^{lxix} Id. §519A.240, See also NAC §519A.150, 155
- ^{lxx} NAC §519A.245
- ^{lxxi} Id. §519A.085
- ^{lxxii} Id. §519A.230
- ^{lxxiii} See also NAC §519A.250
- ^{lxxiv} NRS §519A.210, See also NAC §519A.350
- ^{lxxv} NAC §519A.360, See also NAC §519A.365, 370
- ^{lxxvi} Id. §519A.350
- ^{lxxvii} Id. §519A.395, See also NAC §519A.400
- ^{lxxviii} Id. §519A.380, See also NAC §519A.370
- ^{lxxix} Id. §519A.390, See also NAC §519A.400
- ^{lxxx} Id. §519A.385
- ^{lxxxii} See NAC §519A.175-210
- ^{lxxxiii} Id. §519A.290
- ^{lxxxiii} Amendment to Reclamation Permit No. 0126, Volume I, July 1998, Florida Canyon Mining, Inc.
- ^{lxxxiv} Plan of Operations, Appendix C – Reclamation Plan Modifications, October 1997, Santa Fe Pacific Gold Corp.
- ^{lxxxv} Trenton Canyon Project, Final Environmental Impact Statement, August 1998, U.S. Department of the Interior, Bureau of Land Management.
- ^{lxxxvi} Revised Final BLM Plan of Operations and NDEP Reclamation Plan and Permit Application, Volume I, November 1996, Santa Fe Pacific Gold Corp.
- ^{lxxxvii} NMMA §69-36-1-6
- ^{lxxxviii} Id. §69-36-1-9.B
- ^{lxxxix} NMMAR §19-10-2-501.A-C
- ^{xc} Id. §19-10-2-301.E
- ^{xci} Id. §19-10-2-301.B
- ^{xcii} Id. §19-10-2-301.C
- ^{xciii} Id. §19-10-2-507
- ^{xciv} Id. §19-10-2-508.A
- ^{xcv} Id. §19-10-2-508.B
- ^{xcvi} Id. §19-10-2-603.H
- ^{xcvii} Id. §19-10-2-1201.A
- ^{xcviii} Id. §19-10-2-1201.B
- ^{xcix} Id. §19-10-2-1205.A
- ^c Id. §19-10-2-1205.B
- ^{ci} Id. §19-10-2-1202.A.2
- ^{cii} Id. §19-10-2-1203.A
- ^{ciii} Id. §19-10-2-1203.B

- civ Id. §19-10-2-1101.A-B
- cv Id. §19-10-2-1206.A
- cvi Id. §19-10-2-1211.A
- cvi Id. §19-10-2-1204.A
- cvi Id. §19-10-2-901.A
- cix UCA §40-8-6
- cx Id. §40-8-5 (1) (a)
- cxii Id. §40-8-20, see also UAC §R647-1-102 (1.13)
- cxii Id. §40-8-22 see also UAC §R647-1-102 (2)
- cxiii Id. §40-8-23 (5)
- cxiv UAC §R647-1-102 (1.11)
- cxv UCA §40-8-13 (4)
- cxvi Id. §40-8-4 (15)
- cxvii Id. §40-8-12.5
- cxviii UAC §R647-1-110
- cxix Id. §R647-1-111, see also UCA §40-8-12
- cxx UCA §40-8-14 (1)
- cxxi UAC §R647-1-113 (3), see also UCA §40-8-14 (2)
- cxxii Id. §R647-1-113 (4), see also UCA §40-8-14 (3)
- cxxiii UCA §40-8-14 (7)
- cxxiv Surety Estimate Update dated March 8, 1995; Page 41 from March 1, 1994 Plan; Table 7.01 and Appendix H-1 from Barneys Canyon Original Notice of Intent, 1989.

HARDROCK

Reclamation Bonding Practices In the Western United States

Part III – AN ANALYSIS OF PRESENT RECLAMATION BONDING MECHANISMS IN THE WESTERN UNITED STATES – NORTHERN REGION

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HARDROCK

Reclamation Bonding Practices In the Western United States

Part III – AN ANALYSIS OF PRESENT RECLAMATION BONDING MECHANISMS IN THE WESTERN UNITED STATES – NORTHERN REGION

Part III of the study of Hardrock Mining Reclamation Bonding Practices in the United States contains information on each Northern Region states' reclamation and closure bonding mechanisms. A list of each state's major mines¹ with existing permits and bonds is included, showing the various mine's names and their operating company, the disturbed acreage covered by bonding and the total bond amount. Each state's statutes and regulations were reviewed and the relevant information extracted for its various bonding features. In addition, mine sites were selected in each state and included as case studies, providing additional information as to the specific reclamation and closure plans and bonding cost estimates.

Part III also includes a summary of the reclamation and closure bonding mechanisms used by the federal land management agencies in the West – the U.S. Forest Service and Bureau of Land Management.

¹ As defined for the purposes of this study by a reclamation and closure bond amount of more than \$250,000.

3.1 ALASKA

Alaska currently has four major hardrock mines operating. The operation of one major gold and silver mine has been suspended, but it may restart for a final year of mining. One other major mine—Kensington—is permitted, but it has yet to go into production. A major gold mine called the Pogo project is currently undergoing exploration and permitting. Some other mines might also be considered “major” operations, but their participation in Alaska’s bond pool precludes their exposure to bond amounts greater than \$250,000 (Nixon Fork Mine, for example). Because the potential for discovery of additional, economically viable mineral deposits is considered high, there continues to be active interest in mining exploration in Alaska.

Hardrock reclamation and closure bonding has been a standard feature in the state’s permitting process since the 1980’s. Until recently however, Alaska’s bonding approach has been relatively simplistic. This simplicity is primarily due to a bond limit of \$750 per acre. The limit was established with the intention of incorporating funds into a bond pool which would be available to address reclamation at all of the participating mines. Although some large mines may have been bonded under the \$750 limit in the past, all the current mines have waived it. There is no limit under Alaska solid waste regulations.

3.1.1 Major Mines with Existing Permits and Bonds

Alaska’s four permitted and bonded major hardrock mines are listed in Table 3.1.1, **Alaska Major Hardrock Mines, Mines with Existing Permits and Bonds**. Alaska’s total reclamation and closure bond amount of approximately \$14.5 million for 3,261 acres disturbed equals \$4,435 per acre disturbed. This amount is within the mid-range of bonding values in the western United States.

The Fort Knox Project is a large open pit and cyanide vat leach gold and silver mining operation that began production in 1995. The existing bond amount was initially set on project start-up. The bond will be reviewed and is likely to be revised in 1999, in conjunction with the Fort Knox voluntary five-year environmental audit.

The Red Dog zinc, lead, silver project is a large open pit mining and flotation milling project that began in 1990. The Red Dog deposit is considered to be one of the largest lead-zinc deposits in the world, and is expected to have a 30 year mine life.

The Greens Creek mine began operation in 1989 and was temporarily closed in 1993. It restarted operation in 1996 and continues today. ADEC has not issued a solid waste disposal permit for the tailings impoundment.

Mining began at the Illinois Creek mine in 1996. USMX of Alaska—the operators of the mine and a wholly owned subsidiary of Dakota Mining Corp.—declared bankruptcy in 1998. The mine was Alaska’s only operating open pit cyanide heap leach gold and silver project. The state’s cold climate made this type of operation problematic (more difficult to operate). When gold prices fell from \$400 to \$300 per ounce, the proposed eight year mine life was reduced to two years. The state has evaluated the original \$1.6 million bond amount and determined the actual cost of reclamation to be approximately \$2.65 million. The amount could be somewhat less if no additional mining occurred. The new bond and closure plan requires 30 years of post-closure monitoring originally excluded from the bond calculation.

The Kensington project received final project permits in 1998, but has yet to go into production, reportedly due to unfavorable economics. The company has recently suggested modifying its

proposed plan of operations. This modification could result in a change to the project's reclamation and closure bond amount.

3.1.2 Reclamation and Closure Bonding Regulatory Features

Although in 1963 Alaska was the first western state to establish a reclamation Act, bonding was not required in a substantive form until 1991, when the Alaska Reclamation Act was codified. Since that time, the Alaska Department of Natural Resources (ADNR), Division of Mining and Water Management has been restricted by a \$750 per acre statutory limitation on bonding. All the major existing mining operations, however, have waived the limitation. Solid waste disposal permits issued by the Alaska Department of Conservation (ADEC) allow for tailings ponds and heap leach facilities to be bonded at a higher level.

The lead agency for mine permitting in Alaska depends upon the mine location. Mining operations on state and private lands are overseen by the ADNR and ADEC. Mining operations on lands administered by the U.S. Forest Service and Bureau of Land Management are overseen by the respective federal agencies and ADEC, in cooperation with the ADNR.

The Alaska Mining Reclamation Act contains general performance standards which address elements of surface reclamation, surface water flow and acid rock drainage potential. The reclamation performance standards leave the agencies with substantial discretion as to the application of the regulations.

Additional information on Alaska's Reclamation Act and associated rules are contained in Table 3.1.2, **Alaska Reclamation and Closure Bonding Features**.

**Table 3.1.1 – Alaska Major Hardrock Mines
Mines with Existing Permits and Bonds**

Mine Name	Ownership	Commodity	Type	Status	Disturbed Acres	Bond Amount
Fort Knox	Fairbanks Gold Mining, Inc. (AMAX Gold Inc.)	Gold, Silver	Open Pit, Vat Leach	Operating	1,528	\$6,834,451
Greens Creek	Kennecott Greens Creek Mining Co.	Gold, Silver, Lead, Zinc	Underground, Gravity and Flotation Mill	Operating		
Illinois Creek	Dakota Mining Corp.	Gold, Silver	Open Pit, Heap Leach	Suspended – Bankruptcy	386	\$1,618,209
Red Dog	Cominco Alaska Inc.	Zinc, Lead, Silver	Open Pit, Flotation Mill	Operating	1,347	\$6,010,250
Total					3,261	\$14,462,910

Table 3.1.2 – Alaska Reclamation and Closure Bonding Features

<p>Statutes, Regulations and Guidelines</p>	<p>Reclamation Act Title 27, Chapter 19, Alaska Statutes (AS) [Enacted 1963, Amended]</p> <p>Mining Reclamation Section 11, Chapter 097, Alaska Administrative Codes (AAC) [1991]</p> <p>Laws and Regulations for Mineral Rights on State Land Department of Natural Resources, Division of Mining and Water Management [1995]</p>
<p>Authority</p> <p>Governing State Body</p> <p>Lead State Agency</p> <p>Bonding Required By State</p> <p>And</p> <p>Relationship with Federal Agencies</p>	<p>(a) The commissioner of natural resources shall implement this chapter.ⁱ</p> <p>(a) The department has charge of all matters affecting exploration, development, and mining of the mineral resources of the state, the collection and dissemination of all official information relative to the mineral resources, and mines and mining projects of the state, and the administration of the laws with respect to all kinds of mining. (b) The department is the lead agency for all matters relating to the exploration, development, and management of mining, and, in its capacity as lead agency, shall coordinate all regulatory matters concerning mineral resource exploration, development, mining, and associated activities. Before a state agency takes action that may directly or indirectly affect the exploration, development, or management of mineral resources, the agency shall consult with and draw upon the mining expertise of the department.ⁱⁱ</p> <p>(b) This chapter applies to state, federal, municipal, and private land and water subject to mining operations.ⁱⁱⁱ</p> <p>The department may negotiate with the federal departments and other agencies for arrangements that it considers expedient for cooperation with those departments and agencies in formulating and carrying out policies and projects designed to encourage and assist in the development of the mineral resources of the state.^{iv}</p> <p>The commissioner, on a determination that an agreement is in the best interest of the state, may enter into a cooperative management agreement with the federal government or a state agency to implement a requirement of this chapter or a regulation adopted under it.^v</p>
<p>Exemptions to Reclamation Bonding</p> <p>Activities Prior to Regulation</p> <p>Size Limitations</p>	<p>(f) The commissioner may not require a miner to reclaim under this chapter that portion of a previously mined area that was a part of a mining operation activity occurring before October 15, 1991.^{vi}</p> <p>Exemption for small operations. (a) AS 27.19.030 (a) and 27.19.040 do not apply to a mining operation: (1) where less than five acres are mined at one location in any year and there is a cumulative unreclaimed mined area of less than five acres at one location; or (2) where less than five acres and less than 50,000 cubic yards of gravel or other materials are disturbed or removed at one location in any year and there is a cumulative disturbed area of less than five acres at one location.^{vii}</p>

<p>Reclamation Plan Requirements</p>	<p>Reclamation standard. A mining operation shall be conducted in a manner that prevents unnecessary and undue degradation of land and water resources, and the mining operation shall be reclaimed as contemporaneously as practicable with the mining operation to leave the site in a stable condition.^{viii}</p> <p>RECLAMATION PERFORMANCE STANDARDS^{ix}</p> <p>LAND RECLAMATION PERFORMANCE STANDARDS.</p> <p>(a) A miner shall reclaim areas disturbed by a mining operation so that any surface that will not have a stream flowing over it is left in a stable condition.</p> <p>(1) For the purposes of AS 27.19.100 (6) and this section, a stable condition that "allows for the reestablishment of renewable resources on the site within a reasonable period of time by natural processes" means a condition that can reasonably be expected to return waterborne soil erosion to pre-mining levels within one year after the reclamation is completed, and that can reasonably be expected to achieve revegetation, where feasible, within five years after the reclamation is completed, without the need for fertilization or reseeding. If rehabilitation of a mined site to this standard is not feasible because the surface materials on the mined site have low natural fertility or the site lacks a natural seed source, the department recommends that the miner fertilize and reseed or replant the site with native vegetation to protect against soil erosion; however, AS 27.19 does not require the miner to do so. Rehabilitation to allow for the reestablishment of renewable resources is not required if that reestablishment would be inconsistent with an alternate post-mining land use approved under AS 27.19.030 (b) on state, federal, or municipal land, or with the post-mining land use intended by the landowner on private land.</p> <p>(2) If topsoil from an area disturbed by a mining operation is not promptly redistributed to an area being reclaimed, a miner shall segregate it, protect it from erosion and from contamination by acidic or toxic materials, and preserve it in a condition suitable for later use.</p> <p>(3) If the natural composition, texture, or porosity of the surface materials is not conducive to natural revegetation, a miner shall take measures to promote natural revegetation, including redistribution of topsoil, where available. If no topsoil is available, a miner shall apply fines or other suitable growing medium, if available. However, a miner may not redistribute topsoil and fines over surfaces likely to be exposed to annual flooding, unless the action is authorized in an approved reclamation plan and will not result in an unlawful point- or non-point-source discharge of pollutants.</p> <p>(b) A miner shall reclaim an area disturbed by a mining operation so that the surface contours after reclamation is complete are conducive to natural revegetation or are consistent with an alternate post mining land use approved under AS 27.19.030 (b) on state, federal, or municipal land, or with the post-mining land use intended by the landowner on private land. Measures taken to accomplish this result may include backfilling, contouring, and grading, but a miner need not restore the site's approximate original contours. A miner shall stabilize the reclaimed site to a condition that will retain sufficient moisture for natural revegetation or for an alternate post-mining land use approved under AS 27.19.030 (b) on state, federal, or municipal land, or for the post-mining land use intended by the landowner on private land.</p> <p>(c) A pit wall, subsidence feature, or quarry wall is exempt from the requirements of (a) and (b) of this section if the steepness of the wall makes them impracticable or impossible to accomplish. However, a miner shall leave the wall in a condition such that it will not collapse nor allow loose rock that presents a safety hazard to fall from it.</p>
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<p>Reclamation Plan Requirements (continued)</p>	<p>(d) If a operation diverts a stream channel or modifies a flood plain to the extent that the stream channel is no longer stable, a miner shall reestablish the stream channel in a stable location. A miner may not place a settling basin in the way of the reestablished channel location unless the fines will be properly removed or protected from erosion.</p> <p>DISPOSAL OF BUILDINGS, STRUCTURES, AND DEBRIS ON STATE LAND.</p> <p>A miner shall remove, dismantle, or otherwise properly dispose of buildings and structures constructed, used, or improved on state land unless the surface owner or manager authorizes that the buildings and structures may stay. A miner shall remove or otherwise properly dispose of all scrap iron, equipment, tools, piping, hardware, chemicals, fuels, waste, and general construction debris on state land.</p> <p>UNDERGROUND MINES.</p> <p>A miner shall stabilize and properly seal the openings of all shafts, adits, tunnels, and air vents to underground mine workings after mine closure to ensure protection of the public, wildlife, and the environment.</p> <p>HEAP LEACH OPERATIONS.</p> <p>After neutralization of heaps, pads, ponds, and other such facilities has been approved by the appropriate regulatory authority (the Environmental Protection Agency or the Department of Environmental Conservation), a miner shall reclaim the site of a heap leach operation to the standards of AS 27.19 and this chapter.</p> <p>ACID ROCK DRAINAGE.</p> <p>A miner shall reclaim a mined area that has potential to generate acid rock drainage (acid mine drainage) in a manner that prevents the generation of acid rock drainage or prevents the offsite discharge of acid rock drainage.</p>
<p>Bonding Requirements</p> <p>Bond Amount And Calculation</p> <p>Phased Bonding</p>	<p>(a) The commissioner shall require an individual performance bond in an amount not to exceed an amount reasonably necessary to ensure the faithful performance of the requirements of the approved reclamation plan. The commissioner shall establish the amount of the performance bond to reflect the reasonable and probable costs of reclamation, but the bond may not exceed \$750 for each acre of mined area.^x</p> <p>(a) The amount of the performance bond required by 11 AAC 97.400 is \$750 per acre, or the reduced per-acre amount determined by the commissioner under (b) of this section, multiplied by the acreage total determined under 11 AAC 97.415 . (b) If a miner shows to the commissioner's satisfaction that the reasonable and probable costs of reclamation under an approved reclamation plan are less than \$750 per acre, the commissioner will reduce the bond to those costs. The miner's showing must be submitted along with the proposed reclamation plan and must include an estimate of the labor and equipment costs that would be incurred to hire a third-party contractor to perform the reclamation in accordance with the plan. In evaluating a miner's proposal for reduction of the bond amount, the commissioner will consider the nature of the surface, its uses, improvements in the vicinity of the land, the degree of risk involved in the mining operation, and all other relevant factors. The commissioner will make a determination on this request of bond reduction in the time schedules set out in 11 AAC 97.300. (c) A miner may provide a bond for more than the amount required by (a) and (b) of this section.^{xi}</p> <p>(a) Acreage that must be bonded before a mining operation begins in any calendar year is limited to any area to be mined during that calendar year, plus any mined area (as that term is defined in 11 AAC 97.990) mined in a previous year for which reclamation must be completed under this chapter; it is not necessarily the same as the entire acreage of the mining operation. For an</p>

Bond Release (continued)	been completed. The commissioner will, in his or her discretion, require the miner to submit photographs or other information documenting the reclamation, and, if no inspection takes place, the commissioner will base his or her finding and bond release on the miner's documentary evidence and sworn statement. If reclamation was done in accordance with the plan and with the miner's sworn statement, the commissioner's finding constitutes approval of the reclaimed area and releases the miner from liability under AS 27.19. If reclamation was not done in accordance with the plan and with the miner's sworn statement, the miner remains liable under AS 27.19, notwithstanding the commissioner's finding. (c) If another agency with jurisdiction over the mining operation agrees to accept the miner's posting of a bond or bond pool deposit with the commissioner as satisfying its own bond requirement, and has filed a written request or entered into a cooperative management agreement under AS 27.19.060 to be notified before the commissioner releases or reduces the bond or bond pool deposit, the commissioner will give the other agency reasonable notice. ^{xv}
Public Participation in Bonding	No specific provisions for Public Participation in bonding are provided. General information on bond determination is included in the permitting public review process.
Other Significant Features	Bond Pool - (b) The commissioner shall establish a statewide bonding pool for mining operations as an alternative to individual performance bonds. A miner participating in the bonding pool shall contribute an initial deposit not to exceed 15 percent of the reclamation bond plus an additional nonrefundable annual fee not to exceed five percent of the reclamation bond. The commissioner shall refund the 15 percent deposit upon satisfactory completion of the approved reclamation plan. ^{xvi}

3.1.2.1 Department of Environmental Conservation Regulations

Chapter 46.03. ENVIRONMENTAL CONSERVATION

Sec. 46.03.100. Waste disposal permit.

(a) A person who conducts an operation that results in the disposal of solid or liquid waste material or heated process or cooling water into the waters or onto the land of the state shall procure a permit from the department before disposing of the waste material or water. The permit shall be obtained for direct disposal and for disposal into publicly operated sewerage systems.

(b) A permit for disposal of a hazardous waste may not be issued under this section unless the applicant for the permit has furnished proof to the commissioner of financial ability to control the hazardous waste. Proof of financial responsibility may be demonstrated by self-insurance, insurance, surety, or guarantee, under regulations adopted by the department.

See also 18 AAC 60 for specific regulations on financial assurance.

3.1.3 Reclamation and Closure Bonding Case Studies

3.1.3.1 Fort Knox Mine

Introduction and Background

In 1995, Fairbanks Gold Mining, Inc., a subsidiary of the merger between AMAX Gold and Kinross, began production at the Fort Knox gold mine. The operation, located approximately 25 miles northeast of Fairbanks, is a large open pit mine cyanide mill facility which rests entirely on state lands. Approximately 1,500 acres were disturbed through the end of 1998.

Reclamation Bonding

Bonding was established with the start of operations in 1995, in accordance with a reclamation and closure plan submitted as part of the mine's original plan of operations. During the permitting process, the company committed to bonding for the actual costs to complete the reclamation plan. The company provided a cost estimate for each year during a 5-year bonding interval.

The information provided by the company for 1998 (Year 3) estimates a disturbance area of 608 acres with a cost of \$1,617,301 for surface reclamation—an amount that the Alaska Department of Natural Resources, Division of Mining and Water Management (ADNR) has bonded. In addition, the Alaska Department of Environmental Conservation (ADEC) issued a solid waste disposal permit for the tailings facility, with a total bond of \$4,532,141. The mining company and the regulatory agencies also agreed to a post-reclamation bond for operation and maintenance of a freshwater reservoir and access roads to enable recreational land use, totaling \$685,009. The total bond amount is \$6,834,451.

Table 3.1.3, **Reclamation and Closure Bond Estimate, Fort Knox, AK, Cost Summary** provides a summary of reclamation and closure costs as provided by the bonds. Additional information is provided in the following sections.

Cost Estimate Sources and Assumptions

Reclamation costs for surface disturbance were based on Fairbanks Gold Mining, Inc.'s costs for the proposed reclamation activities.

Tailings Impoundment

Existing stockpiles of growth medium would cover disturbed areas to a depth of approximately two feet. The bond estimate includes costs for revegetation only. The company is required to stockpile topsoil, but has projected that it can achieve reclamation revegetation standards without doing so because the tailings are expected to serve as adequate growth media.

Closure costs for the tailings facility include treatment of tailings water (seepage and decant water) for two years, and ground water seepage for 10 years. The methods of water treatment and flow rates have not been indicated in the estimate.

Waste Rock Dumps

Existing stockpiles of growth medium would cover disturbed areas to a depth of approximately two feet. The bond estimate includes costs for regrading and revegetation only. As in the tailings impoundment, the company is required to stockpile topsoil but has projected that reclamation

revegetation standards can be met without applying topsoil because the waste rock is expected to serve as adequate growth media.

Indirect Costs

Indirect costs for contract administration were applied to the reclamation costs required by the ADNR at five percent of total costs.

Post Reclamation Bond

Post-reclamation bonding was agreed to by the company and agencies during assessment of environmental and land use impacts performed during mine planning. The post-reclamation activities include operation and maintenance of the fresh water reservoir and access roads. These activities will enable post-closure recreational land use.

3.1.3.2 Red Dog Mine

Introduction and Background

In 1990, Cominco began production from the Red Dog lead, zinc and silver mine. The mine is located in remote northwestern Alaska, approximately 82 miles north of Kotzebue. The large-scale project includes an open pit mine, flotation concentrator and support facilities. Development of the mine cost approximately \$450 million; the operation is expected to have a minimum 50-year lifetime. The Red Dog mine is considered to be one of the largest single resources of zinc in the world.

The Red Dog Mine is located on lands owned by the NANA Regional Corporation, Inc., which was established in accordance with the Alaska Native Claims Settlement Act of 1971. The project disturbed approximately 1,347 acres through 1998.

Reclamation Bonding

The Red Dog mine went into production prior to the enactment of the State Reclamation Act in 1991. Initially, Cominco had an operating agreement with NANA that required certain reclamation actions and financial guarantees. In 1994, Cominco submitted a reclamation plan for the project that covered the five-year period from 1994 to 1998.^{xvii} The reclamation plan identified 1,387 acres of disturbance area by the end of 1998, which the Alaska Department of Natural Resources, Division of Mining and Water Management (ADNR) has bonded at the \$750/acre statutory limit.

The Alaska Department of Environmental Conservation (ADEC) has not issued a solid waste disposal permit for the tailings facility. At the time the Red Dog Mine was developed and permitted, solid waste regulations did not include provisions for permitting or bonding the tailings impoundment. ADEC and Cominco are currently developing a solid waste disposal permit, and a \$5 million bond is now maintained to fund groundwater studies around the tailings impoundment for the life of the mine, plus 30 years.

**Table 3.1.3 - Reclamation and
Closure Bond Cost Estimate
Fort Knox, AK
Cost Summary**

Item	Task	Description	Volume Cu. Yd.	Thickness Ft.	Acres	Unit	Unit Cost	Estimated Cost
1	Tailings Facilities	Water Treatment and Monitoring			920	Acre	\$2,131	\$1,960,880
		Regrading/Contouring			920	Acre	\$0	\$0
		Topsoil or Growth Medium			920	Acre	\$0	\$0
		Revegetation/Stabilization			920	Acre	\$2,016	\$1,854,783
		Stormwater Diversions and Channels			920	Acre	\$779	\$716,478
		Sub-total			920	Acre	\$4,926	\$4,532,141
2	Waste Rock Dump Reclamation	Regrading/Contouring			170	Acre	\$2,931	\$498,291
		Topsoil or Growth Medium			170	Acre	\$0	\$0
		Revegetation			170	Acre	\$1,697	\$288,563
		Sub-total			170	Acre	\$4,629	\$786,854
3	Open Pit	Regrading/Contouring			223	Acre	\$303	\$67,588
		Topsoil or Growth Medium			223	Acre	\$0	\$0
		Revegetation/Stabilization			223	Acre	\$6	\$1,360
		Sub-total			223	Acre	\$309	\$68,948
4	Facilities, Roads, Diversions and Other	Facilities Demolition, Mob-Demob						\$0
		Regrading/Contouring			215	Acre	\$2,183	\$469,317
		Topsoil or Growth Medium			215	Acre	\$0	\$0
		Revegetation			215	Acre	\$1,001	\$215,170
		Minumum Impact Areas			0	Acre	\$0	\$0
		Sub-total			215	Acre	\$3,184	\$684,487
	Sub-total Direct Costs							\$6,072,430
5	Indirect Costs	Contract Administration @5.0% of ADNR						\$77,014
		Costs						
	Sub-total							\$77,014
6	Post-Closure Reclamation Bond							\$685,009
	Total Reclamation Cost				1,528	Acre		\$6,834,453

Table 3.1.4, **Reclamation and Closure Bond Estimate, Red Dog, AK, Cost Summary**, provides a summary of reclamation and closure costs as provided by the state-held bonds. Additional information describing the required reclamation and the basis for the estimated costs is provided in the following sections.

Cost Estimate Sources and Assumptions

Reclamation costs for surface disturbance were based on the statutory limit of \$750/acre by the ADNR for all areas disturbed by the mining operation.

Tailings Impoundment

The tailings impoundment will be a potential source of acid mine drainage, which can impact surface water quality. Cominco has proposed to utilize submergence as the reclamation activity for the tailings impoundment. Initially, before chemical and physical stabilization occurs, the resulting body of water will contain elevated concentrations of contaminants. As required, water will be monitored and processed through a treatment plant until baseline water quality is obtained.

As previously mentioned, ADEC and Cominco are currently developing a solid waste disposal permit, and a \$5 million bond is presently maintained to fund groundwater studies around the tailings impoundment for the life of the mine, plus 30 years.

Waste Rock Dumps

The waste rock dumps will be capped and revegetated to control infiltration of precipitation and minimize migration of acid mine drainage.

Open Pit

The open pit will also be a potential source of acid mine drainage. Cominco has proposed to utilize submergence as the reclamation activity for the open pit. Until chemical and physical stabilization occurs, the resulting body of water will contain elevated concentrations of contaminants. As required, water will be monitored and processed through a treatment plant until baseline water quality is obtained.

Facilities, Roads, Diversions and Other

Selected areas will be capped and revegetated. Facilities areas require further analysis to determine reclamation methods and feasibility.

Additional Water Quality Costs

ADNR and ADEC acknowledge that acid mine drainage generation and water quality are significant issues for the tailings impoundment and open pit closure method of submergence proposed by Cominco. The agencies have decided to address those issues as more detailed information is developed over the life of the mine. Currently, costs for water treatment are not included in the reclamation and closure estimate.

**Table 3.1.4 - Reclamation and
Closure Bond Cost Estimate
Red Dog, AK
Cost Summary**

Item	Task	Description	Volume Cu. Yd.	Thickness Ft.	Acres	Unit	Unit Cost	Estimated Cost
1	Tailings Facilities	Monitoring			475	Acre	\$10,526	\$5,000,000
		Regrading/Contouring			475	Acre	\$0	\$0
		Topsoil or Growth Medium			475	Acre	\$0	\$0
		Revegetation			475	Acre	\$0	\$0
		ADNR Statutory Bond			475	Acre	\$750	\$356,250
		Sub-total			475	Acre	\$0	\$5,356,250
2	Waste Rock Dump Reclamation	ADNR Statutory Bond			127	Acre	\$750	\$95,250
		Sub-total			127	Acre	\$750	\$95,250
3	Open Pit	ADNR Statutory Bond			200	Acre	\$750	\$150,000
		Sub-total			200	Acre	\$750	\$150,000
4	Facilities, Roads, Diversions and Other	ADNR Statutory Bond			545	Acre	\$750	\$408,750
		Sub-total			545	Acre	\$750	\$408,750
	Sub-total Direct Costs				1,347	Acre		\$6,010,250
5	Indirect Costs	Sub-total						\$0
	Total Reclamation Cost				1,347	Acre		\$6,010,250

3.2 IDAHO

Historically, most of Idaho's major hard rock mines were underground operations that produced lead, zinc, silver and gold. Many of those mines—such as the Coeur, Galena, Lucky Friday and Sunshine mines—still contain additional mineral resources, and either continue to operate or have suspended operations for economic reasons. Idaho attracted some interest during the gold mining boom of the 1980's, resulting in seven major gold and silver surface mines currently permitted and bonded in the state. In addition, the state has one major molybdenum mine at Thompson Creek.

Hardrock reclamation bonding has been a facet of Idaho's statutes since 1971. Idaho's historic underground mines, however, are exempt from the Idaho Surface Mining Act and associated regulations.

All the existing major gold and silver surface mines in the state, as well as the Thompson Creek molybdenum open-pit mine, have been permitted since the 1980's, and have had reclamation plans and bonds since their inception.

3.2.1 Major Mines with Existing Permits and Bonds

Idaho's seven major permitted surface mines are listed in Table 3.2.1, **Idaho Major Hardrock Mines, Mines with Existing Permits and Bonds**. Idaho's gold and silver surface mines are medium in size, generally ranging from 255 to 1,072 acres disturbed. The Thompson Creek molybdenum mine is a large open pit operation, with approximately 2,100 acres disturbed.

Idaho's total bond amount of \$40,110,000 for 5,790 acres equals \$6,928 per acre disturbed. This cost is within the mid-range of bonding values in the western United States. All of the major present-day mining operations in Idaho utilize open pit mining methods. All of the ores are non-refractory and are processed using standard cyanidation techniques such as heap leaching and vat leaching.

The Beartrack mine is the only major gold and silver surface mine operating in Idaho. The Grouse Creek, DeLamar and Stone Cabin mines have suspended operations pending improvements in gold and silver prices. The Black Pine and Stibnite mines have completed mining and are currently undergoing reclamation.

The Thompson Creek molybdenum mine has been continuously operating since 1982. In 1994, the mine submitted a plan to the state and federal agencies to deal with the occurrence of pyrite and the potential for acid mine drainage in mine tailings. A supplemental EIS for the plan to deal with acid mine drainage has been completed. The Forest Service is currently in the process of making its final decision on the project. Upon completion of the EIS, recalculation of the existing bond should take place. With inflation and other factors affecting the reclamation plan, the value of the bond—currently \$11,300,000—should nearly double.

The two mines currently in final reclamation are also the subjects of potential foreclosure and bankruptcy proceedings. The Black Pine Mine is owned by Pegasus Gold Inc., which declared bankruptcy in 1998. Court-designated trustees, who will continue rinsing the heaps to recover residual gold through this next year, are currently operating the mine. It is anticipated that the state and/or Forest Service will work with the trustee to ensure that the required reclamation is carried out, using funds from the existing bond. The Forest Service has not projected any major shortfalls in reclamation and closure funding.

**Table 3.2.1 – Idaho Major Hardrock Mines
Mines with Existing Permits and Bonds**

Mine Name	Ownership	Commodity	Type	Status	Disturbed Acres	Bond Amount
Beartrack	FMC Gold Co. (Meridian)	Gold, Silver	Open Pit, Heap Leach	Operating	711	\$6,578,000
Black Pine	Black Pine Mining (Pegasus Gold, Inc.)	Gold, Silver	Open Pit, Heap Leach	Closed – Reclamation	410	\$3,027,018
DeLamar	Kinross DeLamar Mining Co.	Gold, Silver	Open Pit, Heap Leach and Vat Leach	Suspended	1,072	10,743,570
Grouse Creek	Hecla Mining Co.	Gold, Silver	Open Pit and Underground, Vat Leach	Suspended	524	\$7,038,945
Stibnite	Dakota Mining Corp.	Gold, Silver	Open Pit, Heap Leach	Closed – Reclamation	255	\$691,000
Stone Cabin	Kinross DeLamar Mining Co.	Gold, Silver	Open Pit	Suspended	718	\$726,000
Thompson Creek	Thompson Creek Mining Co.	Molybdenum	Open Pit, Flotation Mill	Operating	2,100	\$11,305,703
Total					5,790	\$40,110,236

The Stibnite Mine, owned by Dakota Mining Corp., has been the subject of on-going cleanup activities since its closure in 1998. In July of 1998, the company voluntarily forfeited its reclamation bonds and turned the Stibnite Mine site over to the regulatory agencies. In addition, the Environmental Protection Agency performed an emergency response action under the Comprehensive Environmental Recovery and Cleanup Liability Act (CERCLA). Because of water quality issues emanating from seepage from the spent ore disposal area, remediation on the spent ore disposal site cost \$4 million. Presently, the state and Forest Service have a \$691,000 bond for surface reclamation. The state anticipates the likelihood that water treatment will likely be necessary because of seepage from the leach pad—a situation that could result in an additional cost to the state for reclamation and closure. Dakota Mining declared bankruptcy in 1999, leaving the state potentially liable for the additional costs of reclamation.

3.2.2 Reclamation and Closure Bonding Regulatory Features

Idaho was among the first states to enact a mined land reclamation Act, with its Surface Mining Act of 1971. However, because most mines were underground, implementation of the Act essentially did not become effective until the gold and silver mining boom of the 1970's and 1980's. In 1989 rules were promulgated under authority of the Act.

In 1996 the Act was significantly revised. Major revisions to the rules followed in 1998. Since the time of the revisions, no existing mines have been permitted, nor have any bond amounts been revised. All mines are now required to submit an operating plan addressing geotechnical and reclamation issues. The Delamar mine is expected to be the first existing mine to comply with that requirement, with a final abandonment plan to be submitted in 1999.

The bond amount will be revised by the state, in cooperation with federal authorities, in accordance with a final abandonment plan and an estimation of reclamation and closure costs. Idaho currently has a maximum bond amount of \$2,500 per acre. If necessary, a bond in excess of \$2,500 per acre may be obtained with the approval of the State Board of Land Commissioners.

Idaho's rules governing land reclamation contain extensive and detailed performance standards. These standards address sediment control, clearing and grubbing, overburden and topsoil salvage, roads, backfilling and grading, waste disposal areas, settling ponds, tailings impoundments, time limits and revegetation. They do not contain any specific provisions to hydrological or geochemical bonding.

In addition to the bonding authority of the Idaho Department of Lands, the Idaho Department of Water Resources has authority for rules and standards applying to tailings impoundments over 30 feet high. Under those rules, the Department of Water Resources (DWR) has responsibility for the bonding of most tailings impoundment facilities constructed or modified after July 1, 1978.

The Department of Health and Welfare's Division of Environmental Quality (DEQ) has authority under the Rules for Ore Processing by Cyanidation to require cyanide processing operations to post bonds for detoxification/closure provisions. The bond amount is limited to a maximum of \$100,000.

Additional information on Idaho's Surface Mining Act and associated rules as they pertain to reclamation and closure bonding are contained in Table 3.2.2, **Idaho Reclamation and Closure Bonding Features**.

Table 3.2.2 – Idaho Reclamation and Closure Bonding Features

<p>Statutes, Regulations and Guidelines</p>	<p>Surface Mining Act Title 47, Chapter 15, Idaho Code (IC) [Enacted 1971, revised 1996]</p> <p>Rules Governing Exploration and Surface Mining in Idaho IDAPA 20, Title 03, Chapter 02 Idaho Administrative Code (IAC) [Promulgated 1989, revised 1998]</p>
<p>Authority</p> <p>Governing State Body</p> <p>Lead State Agency</p> <p>Bonding Required By State</p> <p>And</p> <p>Relationship with Federal Agencies</p>	<p>The state board of land commissioners is charged with the responsibility of administering this act in accordance with the purpose of the act and the intent of the legislature.^{xviii}</p> <p>The director of the department of lands shall, upon authorization of the board, exercise the powers and discharge the duties vested in the board by this act.^{xix}</p> <p>These rules apply to surface mining operations or exploration operations conducted on all lands within the state, regardless of ownership, commenced after the effective date of these rules.^{xx}</p> <p>b. Any bond provided to the federal government that also meets the requirements of this section shall be sufficient for the purposes of these rules.^{xxi}</p>
<p>Exemptions to Reclamation Bonding</p> <p>Activities Prior to Regulation</p> <p>Size Limitations</p>	<p>This act shall be in full force and effect on and after May 31, 1971. An operator shall not be required to perform the reclamation activities referred to in this act as to any surface mining operations performed prior to May 31, 1972, and further, shall not be required to perform such reclamation activities as to any pit or overburden pile as it exists prior to May 31, 1972.^{xxii}</p> <p>None provided.</p>
<p>Reclamation Plan Requirements</p>	<p>BEST MANAGEMENT PRACTICES AND RECLAMATION FOR SURFACE MINING OPERATION INTRODUCTION:</p> <p>The use of the word "shall" with respect to any practice, act, or result specified in this rule means that employment of such practice, doing of such act, or the attainment of such result is mandated by these rules. The use of the word "should" with respect to any act or result specified in these rules means that the utilization of such practice, the doing of such act, or the attainment of such result is advisable and will constitute compliance with these rules, but does not mandate utilization of such practice, the doing of such act, or the attainment of such result if other acceptable practices, acts, or results are available. Enumeration of a practice, act, or result in Section 140 shall not be construed to require its specific inclusion in a reclamation plan submitted for approval under Subsection 070.04.</p> <p>01. Nonpoint Source Sediment Control.</p> <p>a. Appropriate best management practices for nonpoint source sediment controls shall be designed, constructed, and maintained with respect to site-specific surface mining operations. Operators shall utilize best management practices designed to achieve state water quality standards and protect existing beneficial uses of adjacent surface waters, but shall not be required to do more than is necessary to preserve the condition of water runoff from the affected land prior to commencement of the subject surface mining or exploration operations. These</p>

<p>Reclamation Plan Requirements (continued)</p>	<p>measures shall be among the first to be taken, if necessary, to protect water quality. State water quality standards including protection of existing beneficial uses, shall be the standard that must be achieved by best management practices unless the operator can show, and the director determines, that a lesser standard of surface water quality had existed, in the area to be affected, prior to the commencement of the subject surface mining or exploration operations. In addition to proper mining techniques and reclamation measures, the operator shall take necessary steps at the close of each operating season to assure that sediment movement associated with surface runoff over the area is minimized in order to achieve water quality standards, or to preserve the condition of water runoff from the mined area prior to commencement of the subject surface mining or exploration operations, whichever is the lesser standard. Sediment control measures refer to best management practices carried out within and, if necessary, adjacent to the disturbed area and consist of utilization of proper mining and reclamation measures, as well as specific necessary sediment control methods, separately or in combination. Specific sediment control methods may include, but are not limited to:</p> <ul style="list-style-type: none">i. Keeping the disturbed area to a minimum at any given time through progressive reclamation;ii. Shaping waste to help reduce the rate and volume of water runoff by increasing infiltration;iii. Retaining sediment within the disturbed area;iv. Diverting surface runoff around the disturbed area;v. Routing runoff through the disturbed area using protected channels or pipes so as not to increase sediment load;vi. Use of riprap, straw dikes, check dams, mulches, temporary vegetation, or other measures to reduce overland flow velocities, reduce runoff volume, or retain sediment; andvii. Use of adequate sediment ponds, with or without chemical treatment. <p>b. If best management practices utilized by the operator do not result in compliance with Subsection 140.01.a., the director shall require the operator to modify or improve such best management practices to meet the controlling standard of surface water quality as determined by the director under Subsection 140.01.a., or as water quality standards are adjusted pursuant to law.</p> <p>02. Clearing and Grubbing.</p> <p>Clearing and grubbing of land in preparation for mining exposes mineral soil to the erosive effects of moving water. Operators are cautioned to keep such areas as small as possible (preferably no more than one (1) year's mining activity) as the operator shall be required to meet the controlling standard of surface water quality established in Subsection 140.01.a. on all such areas. Where practicable, trees and slash should be stockpiled for use in seedbed protection and erosion control.</p> <p>03. Overburden/Topsoil.</p> <p>To aid in the revegetation of affected land where surface mining operations result in the removal of substantial amounts of overburden, including any topsoil, the operator should remove the available topsoil or other growth medium as a separate operation for such area. Unless there are previously affected lands which are graded and immediately available for placement of the newly removed topsoil or other growth medium, the topsoil or other growth medium shall be stockpiled and protected from erosion and contamination until such areas become available.</p> <p>a. Overburden/topsoil removal: i. Any overburden/topsoil to be removed should be removed prior to any other mining activity to prevent loss or contamination; ii. Where overburden/topsoil removal exposes land area to potential erosion, the director, under the reclamation plan, may require best management practices necessary to prevent violation of water quality standards; and iii. Where the operator can show that an overburden material other than topsoil is equally conducive to plant growth, or where overburden other than topsoil is the only material</p>
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<p>Reclamation Plan Requirements (continued)</p>	<p>reasonably available, such overburden may be allowed as a substitute for or a supplement to the available topsoil.</p> <p>b. Topsoil storage – Topsoil stockpiles shall be placed to minimize rehandling and exposure to excessive wind and water erosion. Topsoil stockpiles shall be protected as necessary from erosion by use of temporary vegetation or by other methods which will control erosion, including, but not limited to, silt fences, chemical binders, seeding, and mulching.</p> <p>c. Overburden storage – Stockpiled ridges of overburden shall be leveled in such a manner as to have a minimum width of ten (10) feet at the top. Peaks of overburden shall be leveled in such a manner as to have a minimum width of fifteen (15) feet at the top. The overburden piles shall be reasonably prepared to control erosion using best management practices; such activities may include terracing, silt fences, chemical binders, seeding, mulching or slope reduction.</p> <p>d. Abandoned affected lands shall be topped with topsoil or other type of overburden conducive to the growth of vegetation to achieve a general stable uniform thickness to the extent that such materials are reasonably available from the mine. Excessive compaction of overburden and topsoil is to be avoided. Topsoil redistribution shall be timed so that seeding, or other protective measures, can be readily applied to prevent compaction and erosion.</p> <p>e. Backfill and fill materials should be compacted in a manner to ensure stability.</p> <p>04. Roads.</p> <p>a. Roads shall be constructed to minimize soil erosion. Such construction may require, but is not limited to, restrictions on length and grade of roadbed, surfacing of roads with durable non-toxic material, stabilization of cut and fill slopes, and other techniques designed to control erosion.</p> <p>b. All access and haul roads shall be adequately drained. Drainage structures may include, but are not limited to, properly installed ditches, water-bars, cross drains, culverts, and sediment traps.</p> <p>c. Culverts that are to be maintained for more than one (1) year shall be designed to pass peak flows from not less than a twenty (20) year, twenty-four (24) hour precipitation event and have a minimum diameter of eighteen (18) inches.</p> <p>d. Roads and water control structures shall be maintained at periodic intervals as needed. Water control structures serving to drain roads shall not be blocked or restricted in any manner to impede drainage or significantly alter the intended purpose of the structure.</p> <p>e. Roads which will not be recontoured to approximate original contour upon abandonment shall be cross-ditched and revegetated, as necessary, to control erosion.</p> <p>f. Roads, not abandoned, which are to continue in use under the jurisdiction of a governmental or private landowner, shall comply with the nonpoint source sediment control provisions of Subsection 140.01.a. until the successor assumes control.</p> <p>05. Backfilling and Grading.</p> <p>a. Every operator who conducts surface mining operations which disturb less than two (2) acres shall, where possible, contour the disturbed land to its approximate previous contour. These lands shall be revegetated in accordance with Subsection 140.10. For showing discovery on federal mining claims, unless otherwise required by a federal agency, one (1) pit may be left open on each claim pending verification by federal mining examiners, but must not create a hazard to humans or animals. Such pits and trenches shall be reclaimed within one (1) year of verification.</p> <p>b. An operator who conducts surface mining operations which disturb two (2) acres or more shall reduce all waste piles and depressions to the lowest practicable grade. This grade shall not exceed the angle of repose or maximum slope of natural stability for such waste or generate erosion in which sediment enters waters of the state of Idaho. For showing discovery on federal mining claims, unless otherwise required by a federal agency, one (1) pit may be left open on each claim pending verification by federal mining examiners, but must not create a hazard to humans or animals. Such pits and trenches shall be reclaimed within one (1) year of verification.</p> <p>c. Backfill and fill materials should be compacted in a manner to ensure mass and surface stability.</p>
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<p>Reclamation Plan Requirements (continued)</p>	<p>d. After the disturbed area has been graded, slopes will be measured for compliance with the reclamation plan.</p> <p>06. Disposal of Waste in Areas Other Than Mine Excavation.</p> <p>Waste material not used in backfilling mined areas shall be transported and placed in a manner designed to stabilize the waste piles and control erosion.</p> <p>a. The available disposal area should be on a moderately sloped, naturally stable area. The site should be near the head of a drainage to reduce the area of watershed above the fill.</p> <p>b. All surface water flows within the disposal area shall be diverted and drained using accepted engineering practices such as a system of French drains, to keep water from entering the waste pile. These measures shall be implemented in accordance with standards prescribed by the Idaho Stream Channel Protection Act, Title 42, Chapter 38, Idaho Code, and the Idaho Dam Safety Act, Sections 42-1710 through 42-1721, Idaho Code, if applicable.</p> <p>c. The waste material not used in backfilling mined areas should be compacted, where practical, and should be covered and graded to allow surface drainage and ensure long-term stability.</p> <p>d. The operator may, if appropriate, use terraces or slope reduction to stabilize the face of any fill. Slopes of the fill material should not exceed angle of repose or generate erosion in which sediment enters waters of the state of Idaho.</p> <p>e. Unless adequate drainage is provided through a fill area, all surface water above the fill shall be diverted away from the fill area into protected channels, and drainage shall not be directed over the unprotected face of the fill.</p> <p>f. The operator shall conduct revegetation activities with respect to such waste piles in accordance with Subsection 140.10.</p> <p>07. Settling Ponds; Minimum Criteria</p> <p>a. Sediment storage volume -- Settling ponds shall provide adequate sediment storage capacity to achieve compliance with applicable water quality standards and protect existing beneficial uses, and may require periodic cleaning and proper disposal of sediment.</p> <p>b. Water detention time -- Settling ponds shall have an adequate theoretical detention time for water inflow and runoff entering the pond, but theoretical detention time may be reduced by improvements in pond design, chemical treatment, or other methods.</p> <p>c. Emergency Spillway -- In addition to the sediment storage volume and water detention time, settling ponds shall be designed to withstand and release storm flows as required by the Idaho Dam Safety Act, Section 42-1710 through 42-1721 and Safety of Dams Rules, where applicable.</p> <p>08. Tailings Impoundments.</p> <p>All tailings, dams, or other types of tailings impoundments shall be designed, constructed, operated, and decommissioned so that upon their abandonment, the dam and impoundment area will not constitute a hazard to human or animal life.</p> <p>a. Design criteria, construction techniques, and decommission techniques for tailings dams and impoundments shall comply with the Idaho Dam Safety Act, Sections 42-1710 through 42-1721, Idaho Code, and applicable rules and regulations.</p> <p>b. Topsoil shall be removed from the area to be affected by the impounding structure and tailings reservoir in accord with Subsection 140.03.</p> <p>c. Abandonment and decommissioning of tailings impoundments: Dewatering – Tailings ponds shall be dewatered to the extent necessary to provide an adequate foundation for the approved post-mining use. ii. Control of surface waters – Surface waters shall either be channeled around the reservoir and impoundment structure or through the reservoir and breached structure. Permanent civil structures shall be designed and constructed to implement either method of channeling. The structure shall provide for erosion-free passage of waters and adequate energy dissipation prior to entry into the natural drainage below the impounding structure. iii. Detoxification -- Hazardous chemical residues within the tailings pond shall be detoxified or covered with an adequate thickness of non-toxic material, to the extent necessary to</p>
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<p>Reclamation Plan Requirements (continued)</p>	<p>achieve water quality standards in adjacent surface waters. iv. Reclamation – Following the required dewatering, detoxification, and surface drainage control measure operations, the reservoir and impounding structure shall be retopped with stockpiled topsoils or other soils conducive to plant growth. Where such soils are limited in quantity or not available, physical or chemical methods of erosion control may be used. All such areas are to be revegetated in accord with Subsection 140.10, unless otherwise specified in the reclamation plan.</p> <p>d. Tailings impoundment structures and reservoirs retained as fresh water reservoirs after abandonment of the mining operation, shall be required at the time the operator requests termination of the reclamation plan, to conform with the Idaho Dam Safety Act, Sections 42-1710 through 42-1721, Idaho Code, if applicable.</p> <p>09. Permanent Cessation and Time Limits for Planting.</p> <p>a. Seeding and planting of affected lands should be conducted during the first normal period for favorable planting conditions after final seedbed preparation. b. Reclamation activities, where possible, are encouraged to be concurrent with the mining operation and may be included in the approved reclamation plan. Final reclamation shall begin within one (1) year after the surface mining operations have permanently ceased on a mine panel. If the operator permanently ceases disposing of overburden on a waste area or permanently ceases removing minerals from a pit or permanently ceases using a road or other affected land, the reclamation activity on each given area shall start within one (1) year of such cessation, despite the fact that all operations as to the mine panel, which included such pit, road, overburden pile, or other affected land, has not permanently ceased. c. An operator shall be presumed to have permanently ceased surface mining operations on a given portion of affected land when no substantial amount of mineral or overburden material has been removed or overburden placed on an overburden dump, or no significant use has been made of a road during the prior three (3) years. If an operator does not plan to use an affected area for three (3) or more years but intends thereafter to use the affected area for surface mining operations and desires to defer final reclamation until after its subsequent use, the operator shall submit a notice of intent and request for deferral of reclamation to the director, in writing. If the director determines that the operator plans to continue the operation within a reasonable period of time, the director shall notify the operator and may require actions to be taken to reduce degradation of surface resources until operations resume. If the director determines that use of the affected land for surface mining operations will not be continued within a reasonable period of time, the director shall proceed as though the surface mining operation has been abandoned, but the operator shall be notified of such decision at least thirty (30) days before taking any formal administrative action.</p> <p>10. Revegetation Activities.</p> <p>a. The operator shall select and establish plant species that can be expected to result in vegetation comparable to that growing on the affected lands prior to surface mining operations. Certified weed free seed should be used in revegetation. The operator may use available technical data and results of field tests for selecting seeding practices and soil amendments which will result in viable revegetation. These practices of selection may be included in an approved reclamation plan.</p> <p>b. Standards for success of revegetation -- Revegetative success, unless otherwise specified in the approved reclamation plan, shall be measured against the existing vegetation on site prior to mining, or against an adjacent reference area supporting similar types of vegetation. i. The ground cover of living plants on the revegetated area should be comparable to the ground cover of living plants on the adjacent reference area for two (2) full growing seasons after cessation of soil amendment or irrigation. ii. For purposes of this rule, ground cover shall be considered comparable if it has, on the area actually planted at least seventy percent (70%) of the premining ground cover for the mined area or adjacent reference area; iii. For locations with an average annual precipitation of more than twenty-six (26) inches, the director, in approving a reclamation plan, may set a minimum standard for success of revegetation as follows: Vegetative cover of seventy percent (70%) for two (2) full growing seasons in areas planted to herbaceous species</p>
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<p>Reclamation Plan Requirements (continued)</p>	<p>only; or fifty percent (50%) vegetative cover for two (2) full growing seasons and six hundred (600) woody plants per acre in areas planted to a mixture of herbaceous and woody species. iv. As used in this section, "herbaceous species" means grasses, legumes, and other forbs; "woody plants" means woody shrubs, trees, and vines; and "ground cover" means the area of the ground surface covered by the combined aerial parts of vegetation and the litter that is produced naturally on-site, expressed as a percentage of the total area measured. Rock surface areas will be excluded from this calculation. v. For previously mined areas that were not reclaimed to the standards required by Section 140, and which are affected by the surface mining operations, vegetation should be established to the extent necessary to control erosion, but shall not be less than that which existed before redisturbance; and vi. Vegetative cover shall not be less than that required to control erosion.</p> <p>c. Introduced species may be planted if they are known to be comparable to previous vegetation, or if known to be of equal or superior use for the approved post-mining use of the affected land, or, if necessary, to achieve a quick, temporary cover for soil stabilization purposes. Species classified as poisonous or noxious weed species shall not be used in revegetation.</p> <p>d. By mutual agreement of the director, the landowner, and the operator, a site may be converted to a different, more desirable, or more economically suitable habitat.</p> <p>e. Planting of grasses and forbs should be done in a manner which promotes rapid stabilization of the soil surface. Wherever terrain permits, grasses and forbs should be drilled or compacted into the ground using agricultural grass planting equipment or other seeders specifically designed for mine revegetation applications. Broadcast and hydroseeding may be used on areas where other methods are impractical or unavailable.</p> <p>f. The operator should plant shrubs or shrub seed, as required, where shrub communities existed prior to mining. Shrub seed may be planted as a portion of a grass seed mix or planted as bare-root transplants after grass seeding. Where the landowner desires a specific land use such as grazing or cropland, shrubs will not be required in the revegetation species mix. Shrub lands undergoing revegetation with shrubs shall be protected from erosion by vegetation, chemical, or other acceptable means during establishment of the shrubs.</p> <p>g. Reforestation -- Tree stocking of forestlands should meet the following criteria: i. Trees that are adapted to the site should be planted on the area to be revegetated in a density which can be expected over time to yield a timber stand comparable to premining timber stands; ii. Trees shall be established for two (2) full growing seasons after cessation of any soil amendments and irrigation before they are considered to be established; and iii. Forestlands undergoing revegetation with trees should be protected from erosion by vegetation, chemical binders, or other acceptable means during seedling establishment.</p> <p>h. Revegetation is not required on the following areas: i. Affected lands, or portions thereof, where planting is not practicable or reasonable because the soil is composed of excessive amounts of sand, gravel, shale, stone, or other material to such an extent to prohibit plant growth; ii. Any mined area or overburden piles proposed to be used in the mining operations for haulage roads, so long as those roads are not abandoned; iii. Any mined area or overburden pile, where lakes are formed by rainfall or drainage run-off from adjoining lands;</p> <p>iv. Any mineral stockpile; v. Any exploration trench which will become a part of any pit or overburden disposal area; and vi. Any road which is to be used in mining operations, so long as the road is not abandoned.</p> <p>i. Mulching -- Mulch should be used on severe sites and may be required by the reclamation plan where slopes are steeper than three to one (3:1) or mean annual rainfall is less than twelve (12) inches. When used, straw or hay mulch should be obtained from certified weed free sources. "Mulch" means vegetation residues or other suitable materials to aid in the stabilization of soil and soil moisture conservation which will provide a micro-climate more suitable for germination and growth on severe sites. Annual grains such as rye, oats, and wheat may be used as a substitute for mulch where they will provide adequate protection and will be replaced by permanent species within a reasonable length of time.</p>
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<p>Reclamation Plan Requirements (continued)</p>	<p>11. Petroleum Base Products and Chemicals.</p> <p>All refuse, chemical and petroleum products and equipment should be stored and maintained in a designated location away from surface water and disposed of in such a manner as to prevent their entry into a waterway.^{xxiii}</p>
<p>Bonding Requirements</p> <p>Bond Amount And Calculation</p> <p>Phased Bonding</p> <p>Type of Bond Allowed</p>	<p>Prior to beginning any surface mining on a mine panel covered by a plan, an operator shall submit to the director, on a surface mining reclamation bond form, a performance bond meeting the requirements of this rule.^{xxiv}</p> <p>The amount shall be the amount necessary to pay the estimated reasonable costs of reclamation required under the reclamation plan for each acre of land to be affected during the first year of operation, plus ten (10%) percent. No performance bond shall exceed two thousand five hundred (\$2,500) for a given acre of affected land except as provided by the rules. A performance bond in excess of two thousand five hundred (\$2,500) for any given acres of affected land may be required by the board only when the following conditions have been met:</p> <p>a. The board has determined that such performance bond is necessary to meet the requirements of Sections 060, 068, 069, 070, and 140. b. The board has delivered to the operator, in writing, a notice setting forth the reasons the director believes such performance bond is necessary. c. The board has conducted a hearing where the operator is allowed to give testimony concerning the amount of the proposed bond. The hearing shall be held under such rules as promulgated by the board. This requirement for a hearing may be waived in writing, by the operator. Any hearing shall not extend the period of time limit in which the board must act on a plan submitted.^{xxv}</p> <p>Only bonds obtained subsequent to January 1, 1997, may be assessed at actual costs plus ten percent (10%), not to exceed two thousand five hundred dollars (\$2,500) per acre except as provided by Subsection 120.01, or if a material change arises in accordance to Subsection 090.01. Any revision to the amount, term and conditions of a performance bond due to a material change in the reclamation plan shall apply only to the affected lands covered by the material change in the reclamation plan.^{xxvi}</p> <p>No specific provisions for phased bonding are provided, but it is inferred in annual review.</p> <p>Form of Performance Bond. a. Corporate surety bond; This is an indemnity agreement executed for the operator and a corporate surety licensed to do business in the state of Idaho, on a surface mine bond form supplied by the director. The bond is to be conditioned that the operator shall faithfully perform all requirements of these rules in effect as of the date of approval of the reclamation plan, and will be payable to the state of Idaho. b. Collateral bond; This is an indemnity agreement executed by or for the operator, and payable to the state of Idaho, pledging cash deposits, governmental securities, or negotiable certificates of deposit of any financial institution authorized to do business in Idaho. c. Letters of credit: i. A letter of credit is an instrument executed by a bank doing business in Idaho, made at the request of a customer, which states that the issuing bank will honor drafts for payment upon compliance with the terms of the credit.^{xxvii}</p>
<p>Reclamation and Bonding Oversight</p> <p>Reclamation Monitoring and Compliance</p> <p>Bond Review</p>	<p>Right of Inspection. Authorized officers of the Department of Lands, upon presentation of Appropriate credentials, shall have the right to enter upon lands affected or proposed to be affected by exploration or surface mining operations to determine compliance with these rules. Inspections shall be conducted at reasonable times in the presence of the operator or his authorized employee or representative. The operator shall make such a person available for the purpose of inspection. This rule shall not prevent the department from making an inspection of the site if the operator fails to make a representative available on request.^{xxviii}</p> <p>Annual Bond Review. At the beginning of each calendar year, the operator shall notify the director of any increase in the acreage of affected land which will result from planned surface</p>

Bond Review (continued)	mining activity within the next twelve (12) months. A correlative increase in the bond will be required for an increase in affected acreage. a. The bond shall be submitted on the appropriate bond form within ninety (90) days of operator's receipt of notice that additional bond is required, but in no event shall surface mining operations be conducted that would affect such additional acreage until the appropriate bond form has been submitted. Acreage on which reclamation is complete shall be reported in accord with Subsection 120.09 and after release of this acreage from the plan by the director, the bond may be reduced by the amount appropriate to reflect the completed reclamation. ^{xxix}
Bond Forfeiture	Criteria for Forfeiture. A bond may be forfeited in accordance with Section 47-1513, Idaho Code, when the operator has not conducted the reclamation in accord with the approved reclamation plan and the applicable requirements of these rules. ^{xxx}
Bond Release	Upon completion of the reclamation specified in the plan, the operator shall notify the director of his desire to secure release from bonding. When the director has verified that the requirements of the reclamation plan have been met as stated in the plan, the bond shall be released. a. Any request for bond release shall be answered by the director within thirty (30) days of receiving such request unless weather conditions prevent inspection. b. If the director finds that a specific portion of the reclamation has been satisfactorily completed, the bond may be reduced to the amount required to complete the remaining reclamation. The following schedule will be used to complete these bond reductions unless the director determines in a specific case that this schedule is not appropriate and specifies a different schedule: i. Sixty percent (60%) of the bond may be released when the operator completes the required backfilling, regrading, topsoil replacement, and drainage control of the bonded area in accordance with the approved reclamation plan; and ii. After revegetation activities have been performed by the operator on the regraded lands, according to the approved reclamation plan, the department may release an additional twenty-five percent (25%) of the bond. c. The remaining bond shall not be released: i. As long as the affected lands are contributing suspended solids to surface waters outside the affected area in excess of state water quality standards and in greater quantities than existed prior to the commencement of surface mining operations; ii. Until final removal of equipment and structures related to the mining activity or until any remaining equipment and structures are brought under an approved reclamation plan and bond by a new operator; and iii. Until all temporary sediment or erosion control structures have been removed and reclaimed or until such structures are brought under an approved reclamation plan and bond by a new operator. ^{xxxi}
Public Participation in Bonding	No specific provisions for Public Participation in bonding are provided.
Other Significant Features	Idaho Dam Safety Act , IC Sections 42-1710-42-1721, and IAC Section 37.03.05 – Mines Tailings Impoundment Structures Rules . Specific tailings impoundment bonding provisions. Rules for Ore Processing by Cyanidation , IAC Section 16.01.13, and IC Section 39-118A. Cyanide operations detoxification/closure bonding provisions. USDA Forest Service Reclamation and Closure Bonding Provisions

3.2.2.1 Idaho Dam Safety Act

In 1993, pursuant to the Idaho Dam Safety Act, Section 42-1714, Idaho Code, the Idaho Department of Water Resources promulgated the Mines Tailings Impoundment Structures Rules. The rules or standards only apply to tailings impoundments constructed, lifted, enlarged or altered after July 1, 1978.

Rule 40 of the Mines Tailings Impoundment Structures rules contains the following sections particular to reclamation and closure bonding:

Idaho Dam Safety Act (continued)

040. Bonding

An active surety bond or other means of acceptable surety payable to the Director of the Department of Water Resources shall be on file with the Director throughout the life of the tailings disposal site. The purpose of this bond is to provide a means by which the tailings impoundment can be placed in a safe maintenance-free condition if abandoned by the owner without conforming to an abandonment plan approved by the Director.

01. Filing of Bond. The bond shall be filed prior to any issuance by the Director of a certificate of approval for use for the mine tailings impoundment structure to impound mine tailings slurry and shall run for the two (2) year approval period covered on the certificate of approval.

02. Provisions of Bond. Bond provisions provide that the surety may be held liable for a period of up to five (5) years following notice of default on the bond.

03. Amount of Bond. The bond amount will be set by the Director and is subject to revision each time it is renewed. The owner must obtain approval for the amount of his surety bond prior to each renewal.

04. Cost Estimate Submitted by Engineer. In order to provide a basis for setting the bond amount, the engineer shall submit a cost estimate acceptable to the Director, together with conceptual details needed to arrive at the estimate, for abandonment of the facility at each proposed stage of its construction.

05. Current Costs for Abandonment. Bond amount will be based on current costs for abandonment of the facility based on the approved cost estimate for abandonment at the present construction condition or the next approved proposed stage, whichever represents the larger bond amount.

06. Determination of Bond Amount. If the final abandonment is determined to be the most costly conditions, the owner may elect to use this as a basis for bonding throughout the life of the project. The Director may, however, revise the bond amount to reflect updated costs when he feels it is necessary in order to maintain a realistic bond.

07. Filing Initial Bond. The initial bond shall be filed upon completion of the first stage of construction and before the required certificate of approval is issued to allow storage of mine tailings slurry in the impoundment. No certificate of approval shall be renewed prior to filing by the owner of a bond renewal in an amount approved by the Director.

08. Filing Copy of Performance Bond. Upon the filing of a copy of a performance bond with the Director, covering the terms and conditions of a state of Idaho mineral lease or an approved reclamation plan, in which these documents specify compliance with a plan of restoration of all mining operation, including the tailings impounding structure, the Director may determine the bond required of this section has been met, if the amount of the bond accurately reflects the cost associated with the abandonment plan provided by the owner.

3.2.2.2 Rules for Ore Processing by Cyanidation

Promulgated in 1988, Title 39, Chapter 1, Idaho Code, grants the authority to the Board of Health and Welfare to adopt rules, regulations and standards to protect the environment and the health of the State; grants authority to the Director to issue permits as prescribed by law and by the rules of the Board; and requires Department of Health and Welfare review and approval of plans and specifications for all new facilities, or for modifications or expansions to existing facilities, that process ore by cyanidation; and authorizes the Director to require a reasonable fee for processing permit applications and to require financial assurance for permanent closure.^{xxxii}

The Idaho Department of Health and Welfare Rules, IDAPA 16.01.13, "Rules for Ore Processing by Cyanidation," establish the procedures and requirements for the issuance and maintenance of a permit to construct, operate and close that portion of an ore processing facility which utilizes cyanidation and is intended to contain, treat or dispose process water or process-contaminated water containing cyanide. The provisions of these rules also establish requirements for water quality protection which address performance, construction, operation and closure of that portion of any ore processing facility that is intended to contain, treat, or dispose process water or process-contaminated water containing cyanide. These rules are intended to ensure that process water and process-contaminated water generated in ore processing operations that utilize cyanide as a primary leaching agent and pollutants associated with the cyanidation process are safely contained, controlled, and treated so that they do not interfere with the beneficial uses of the waters of the state and do not endanger public safety or the environment.^{xxxiii}

FINANCIAL ASSURANCE.

01. Financial Assurance Required. Prior to commencing cyanidation operations an applicant shall establish financial assurance for permanent closure of the facility meeting the requirements of these rules.

02. Amount. The amount of financial assurance shall be determined by multiplying five cents (\$.05) by the number of tons of untreated processed ore and the projected number of tons to be leached with cyanide within the next calendar year, unless the permittee requests an amount based on a projection for more than one (1) year; however, the minimum amount of financial assurance shall be the sum of twenty-five thousand dollars (\$25,000) and the maximum amount shall be the sum of one hundred thousand dollars (\$100,000). a. The amount of financial assurance shall be reviewed on an annual basis. The permittee shall submit in writing on or before December 1 each year the number of tons of untreated processed ore and the projected number of tons to be leached with cyanide for the succeeding calendar year. b. In the event there is a material change in the tons of ore leached with cyanide over the tons of ore projected under Subsection 650.02.a., the permittee shall submit written notification to the Department of the change and an adjustment will be made accordingly.

03. Form. An applicant may comply with the financial assurance requirements of these rules through one (1) or more of the following options: a. A corporate surety bond evidenced by an indemnity agreement, executed by or for the applicant and a corporate surety, and payable to the Department. b. A collateral bond evidenced by an indemnity agreement, executed by or for the applicant and payable to the Department, pledging cash deposits, negotiable bonds of the United States, this State or political subdivisions of this State, or negotiable certificates of deposit of any bank doing business in the United States. c. A corporate surety or collateral bond payable to another state agency and the Department, or the federal government, and meeting the applicable bonding requirements of these rules. d. One (1) or more insurance policies. . . e. A closure trust fund. . .

04. Cancellation and Replacement of Bonds. a. Any surety cancelling a bond shall give the Department and the bonded principal at least ninety (90) days notice prior to cancellation of an agreement. The Department shall not release a surety from liability under existing bonds until the permittee has submitted to the Department an acceptable replacement bond or other form of financial assurance under these rules. b. If a surety cancels a bond or fails to maintain a valid license to do business in the United States, the permittee shall, within forty-five (45) days of notice from the Department, substitute a sufficient surety. A replacement bond or other financial assurance under these rules shall cover any liability accrued against the bonded principal at the facility in addition to the amount determined under Subsection 650.02. If the permittee fails to secure a replacement bond or

other alternative financial assurance under these rules, the permittee shall cease operations at the facility covered by the bond until sufficient financial assurance is filed with the Department.

05. Release of Financial Assurance. Financial assurance, or a portion thereof, required under these rules may be released as follows: a. If at any time the value of a bond, insurance or trust is greater than the total amount of financial assurance required under Subsection 650.02, the permittee may submit a written request to the Department for release of the amount in excess of the amount required under Subsection 650.02. b. If the permittee substitutes alternative financial assurance under these rules for all or part of a bond, insurance or trust, the permittee may submit a written request to the Department for release of the amount in excess of the financial assurance required under Subsection 650.02. c. Upon completion of permanent closure in accordance with an approved plan, the permittee may request release from financial assurance by the Department. If the Department determines that permanent closure is in accordance with an approved plan financial assurance shall be released. If the Department determines that a portion of permanent closure has been satisfactorily completed the Department may proportionately reduce the amount of financial assurance required and release the balance. d. Within thirty (30) days after receiving a request from a permittee for release of a bond, insurance or trust, or any portion thereof, the Department shall either order release or provide the permittee with a detailed written statement of reasons why financial assurance will not be released.

06. Insufficiency. In the event the amount of financial surety is insufficient to implement an approved permanent closure plan, the Department may commence legal action against the permittee to recover the amount necessary to implement permanent closure under an approved plan and these rules.

3.2.3 Reclamation and Closure Bonding Case Studies

3.2.3.1 Beartrack Mine

Introduction and Background

The Beartrack mine, located near Salmon, Idaho, began production in 1995. Due to low gold prices, Meridian Gold, the mine owner, revised its plan to complete mining in early 1999. The medium-sized open pit heap leach mine is currently leaching the remaining gold from the heaps, and initiating heap rinsing/detoxification to be followed by reclamation and closure.

The mine is located on public lands managed by the U.S. Forest Service. Under its project-specific Memorandum of Understanding with the state agencies, the Forest Service is the lead agency and holds the reclamation and closure bond in cooperation with the Idaho Department of Lands and Idaho Department of Water Resources.

Reclamation Bonding

The current bond amount is based on an estimate for disturbances at the mine through 1997 provided to the U.S. Forest Service by the company.^{xxxiv} Table 3.2.3, **Reclamation and Closure Bond Estimate, Beartrack, ID, Cost Summary** provides a summary of costs as contained in the estimate. Additional information describing the required reclamation and the basis for the estimated costs is provided in the following sections.

Cost Estimate Sources and Assumptions

The costs are intended to provide an estimate for reclamation and closure assuming a worst case situation wherein the agencies are left with the job and must contract the work to a third party. The permit application commits to an annual phased bond estimate. The estimate is based on planned disturbance and reclamation activity projected one year in advance.

Most of the equipment production values are based on the *Caterpillar Performance Handbook*. The equipment and manpower costs are estimated based on unit contract costs including fuel, supervision, fringe benefit, profit and maintenance costs for the specific area (as dictated in *Cost Estimating Guide for Road Construction*, Regions 2, 3, and 4, prepared by the Division of Engineering, U.S.F.S., April, 1997). *HEAPREC* (version 1.02) was also used as a guide and reference.

Heap Leach Dumps

Detoxification is based on approximately 13.8 million tons of ore on the pad at the end of 1997. Rinsing is to consist of 3 pore volumes precipitation and fresh (or treated) water to achieve a <0.2 mg/L WAD cyanide value. Rinsing would take place over a two and half year period. The cost estimate includes a \$600,000 contingency for rinsate solution treatment (including cyanide destruction and/or metals removal) and \$414,000 for the cost for land application of neutralized process solution.

The leach pad slopes will be regraded to 3H:1V. Twelve inches of topsoil will be placed over the leach pad surface, followed by ripping to a depth of 12 inches. Revegetation and reseeding will consist of seed bed preparation (scarifying to a depth of two to six inches), mulch at one to 1.5 tons per acre, initial and maintenance fertilization (100 pounds per acre each), seeding, planting shrubs and weed control.

Waste Rock Dumps

The waste rock dump would be regraded to 3H:1V slopes with 12 inches of topsoil placed over the dump surface, followed by ripping to a depth of 12 inches. Revegetation and reseeding will consist of seed bed preparation (scarifying to a depth of two to six inches), mulch at one to 1.5 tons per acre, initial and maintenance fertilization (100 pounds per acre each), seeding, planting shrubs and weed control.

Open Pit

The pit highwalls are to be “landshaped and rock sculpted.” This process involves providing approximately 1/3 of the bench area with soil cover and revegetated. Another 1/3 of the bench area is selectively blasted, which in turn covers the remaining 1/3 of the bench area with talus.

The north pit may require recontouring to reestablish a free-draining condition. The south pit is projected to have a 10-acre pit lake.

**Table 3.2.3 - Reclamation and
Closure Bond Cost Estimate
Beartrack, ID
Cost Summary**

Item	Task	Description	Volume Cu. Yd.	Thickness Ft.	Acres	Unit	Unit Cost	Estimated Cost
1	Leach Pad Reclamation	Detoxification/Neutralization			171	Acre	\$12,123	\$2,073,000
		Regrading/Contouring			171	Acre	\$146	\$25,000
		Topsoil or Growth Medium			171	Acre		\$513,000
		Revegetation/Stabilization			171	Acre	\$1,526	\$261,000
		Sub-total			171	Acre	\$16,795	\$2,872,000
2	Waste Rock Dump Reclamation	Regrading/Contouring			107	Acre	\$561	\$60,000
		Topsoil or Growth Medium			107	Acre	\$2,907	\$311,000
		Revegetation			107	Acre	\$1,383	\$148,000
		Sub-total			107	Acre	\$4,850	\$519,000
3	Open Pit	Regrading/Contouring			131	Acre	\$458	\$60,000
		Topsoil or Growth Medium			131	Acre	\$2,040	\$267,000
		Revegetation/Stabilization			131	Acre	\$955	\$125,000
		Sub-total			131	Acre	\$3,453	\$452,000
4	Facilities, Roads, Diversions and Other	Facilities Demolition, Mob-Demob and Monitoring						\$35,000
		Regrading/Contouring			236	Acre	\$169	\$40,000
		Topsoil or Growth Medium			236	Acre	\$2,640	\$624,000
		Revegetation			236	Acre	\$1,366	\$323,000
		Minumum Impact Areas			66	Acre	\$100	\$8,000
		Sub-total			302	Acre	\$3,406	\$1,030,000
	Sub-total Direct Costs						\$4,873,000	
5	Indirect Costs	Mob/Demob @ 6.0%						\$292,000
		Contract Administration @15.0%						\$731,000
		Insurance and Bond @4.0%						\$195,000
		Profit @ 10%						\$487,000
		Sub-total						\$1,705,000
	Total Reclamation Cost				711	Acre		\$6,578,000

Facilities, Roads, Diversions and Other

Following removal of equipment and infrastructure, all facilities, roads and other areas will be regraded to 3H:1V slopes with 12 inches of topsoil placed over the disturbed surface. Ripping to a depth of 12 inches will follow. Revegetation and reseeding will consist of seed bed preparation (scarifying to a depth of two to six inches), mulch at one to 1.5 tons per acre, initial and maintenance fertilization (100 pounds per acre each), seeding, planting shrubs and weed control.

Areas where the soil and vegetation have not been disturbed are referred to as “minimum impact” disturbances. The reclamation costs for these areas are based on a bond of \$100 per acre.

Indirect Costs

As noted in Table 3.2.3, the estimated reclamation bond costs for the Beartrack mine includes indirect costs for mobilization (6.0 percent), administration (15.0 percent), insurance and bond (4.0 percent) and profit (10 percent). The indirect costs total about \$1,705,000, which equals 35 percent of the direct costs or about 26 percent of the total costs for reclamation.

3.2.3.2 Thompson Creek Mine

Introduction and Background

The Thompson Creek mine, located near Challis, Idaho, began production in 1982, and has operated continuously since that time. The open pit mine is a major world class producer of molybdenum, primarily used in steel strengthening.

In 1994, the mine submitted a plan to deal with the occurrence of pyrite and the potential acid mine drainage in mine tailings. A draft of a supplemental EIS on the plan to deal with acid mine drainage was completed and released in 1998 for public comment. The Forest Service recently completed the Final Supplemental EIS for the project.

The mine and mill are located on approximately 500 acres of private land. Ancillary facilities such as the tailings impoundment on public lands are managed by the U.S. Forest Service and Bureau of Land Management (BLM). The Forest Service is the lead agency under its project-specific Memorandum of Understanding with the BLM and state agencies. Bonds are held separately by the BLM, Idaho Department of Lands, Idaho Department of Water Resources and the U.S. Forest Service.

Reclamation Bonding

The bond amount is based on an original *Conceptual Reclamation Plan and Cost Estimate* based on the 1980 Environmental Impact Statement. The cost estimate for the tailings facilities at Thompson Creek was updated in 1988 to reflect inflation and other factors which affect reclamation costs. It was again updated in 1994.^{xxxv} At the same time, the bonds for the other lands affected by the mine appear to have remained the same since they were established in 1982.^{xxxvi}

Table 3.2.4, **Reclamation and Closure Bond Estimate, Thompson Creek, ID, Cost Summary** provides a summary of costs as contained in the estimate. Additional information describing the required reclamation and the basis for the estimated costs is provided in the following sections.

Hardrock Reclamation Bonding Practices
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The total bond amount of \$11,305,703 is designated to the various state and federal agencies according to authority. The Idaho Department of Water Resources holds the largest part of the bond amount—\$9,105,470—based on reclamation of the tailings impoundment. The Idaho Department of State Lands holds \$1,543,275 for reclamation bonding of disturbed private/state lands and the U.S. Forest Service and BLM hold \$307,136 and \$349,300, respectively, for additional disturbance on public lands managed by each agency.

Cost Estimate Sources and Assumptions

In 1982, costs for disturbances other than the tailings impoundment appear to have been based on the state lands legal bond limit of \$1800 per acre. Similar estimates, ranging from \$250 to \$1250 per acre for reclamation of specific areas (including waste rock dumps, mine pits, roads and facilities) were also used.

The costs for reclamation of tailings facilities incorporated information from similar recent projects, vendor quotes and *Means Heavy Construction Cost Data*, 1994 edition. Tasks and materials quantities were not changed from the original 1982 reclamation plan. Waste rock hauling costs were decreased based on an estimate by the Thompson Creek Mine of \$0.15/mile.

Tailings Facilities

Tailings facilities reclamation consists of recontouring the tailings impoundment. This is accomplished by installing additional tailings pipeline, adding rock fill and armoring the embankment crest against erosion with a one-foot thick clay layer, a nine-inch thick layer of filter gravel and a 2.5 foot thick layer of minus 24 inch rip-rap. Recontouring also consists of constructing an upper and lower spillway and a seepage return dam spillway. The impoundment surface and embankment terraces are stabilized with a one-foot thick layer of argillite buffer material, one-foot thick layer of waste rock subsoil and six-inch layer of topsoil. Finally, fertilization and revegetation of the impoundment surface and embankment terrace are performed.

Waste Rock Dumps, Open Pit, Facilities, Roads, Diversions and Other

The existing bond estimate costs for waste rock dumps, open pit, facilities, roads, diversions and other at cost estimates range from \$250 to \$1250 per acre, averaging approximately \$700 per acre.

Indirect Costs

As noted in Table 3.2.4, there are no indirect costs included in the cost estimate.

**Table 3.2.4 - Reclamation and Closure Bond Cost Estimate
Thompson Creek, ID
Cost Summary**

Item	Task	Description	Volume Cu. Yd.	Thickness Ft.	Acres	Unit	Unit Cost	Estimated Cost
1	Tailings Facilities	Regrading/Contouring			256	Acre	\$8,609	\$2,204,010
		Topsoil or Growth Medium			256	Acre	\$12,539	\$3,210,040
		Revegetation			256	Acre	\$596	\$152,500
		Other - Spillways and Misc.			256	Acre	\$13,854	\$3,546,610
		Sub-total			256	Acre	\$35,598	\$9,113,160
2	Waste Rock Dump Reclamation	Sub-total			596	Acre	\$788	\$469,525
3	Open Pit	Sub-total			379	Acre	\$756	\$286,625
4	Facilities, Roads, Diversions and Other	Sub-total			1,130	Acre	\$1,271	\$1,436,399
	Sub-total Direct Costs				2,361			\$11,305,709
5	Indirect Costs	Sub-total						\$0
	Total Reclamation Cost				2,361	Acre		\$11,305,709

3.3 MONTANA

3.3.1 Introduction

Hardrock mining accounts for the majority of Montana's production of nonfuel minerals. Currently, 12 major hardrock mines are permitted in the state—eight produce gold and silver, two produce copper and byproduct metals and two mines produce platinum and palladium. One major copper mine—Montanore—is permitted to operate but is yet to be developed. Another copper mine—Rock Creek—is currently in the permitting process. Exploration for additional hardrock mines has been relatively minor in recent years, and few additional mines are expected to be proposed in the near future, with the possible exception of the McDonald Gold Project. In November 1998, the electorate approved Initiative I-137. This controversial initiative bans the use of cyanide technology in new open-pit heap leach and vat leach gold and silver mines.

Reclamation bonding is a relatively mature process in the state, in part because of the early establishment of Montana's Metal Mine Reclamation Act in 1971, the first Act of its kind among western states. Bonding in Montana is also well developed because of the nature of actions and controversies that have taken place in mine permitting, mine operation and reclamation bonding. Those issues are particularly relevant to several key projects highlighted by demonstrable environmental problems (especially with respect to water quality). As a result of these projects, the bonds for some mine sites in Montana are among the highest in the nation.

3.3.2 Major Mines with Existing Permits and Bonds

Montana's 12 permitted major hardrock mines are listed in Table 3.3.1, **Montana Major Hardrock Mines, Mines with Existing Permits and Bonds**. Eight of Montana's mines are medium-sized, with disturbed areas of 30 to 603 acres. Montana has four larger mines: the Montana Tunnels lead and zinc mine disturbs 1,143 acres, the gold and silver producing Zortman-Landusky and Golden Sunlight mines disturb 2,380 and 2,964 acres, respectively, and the Continental Pit copper mining operation (which is adjacent to the Berkeley Pit and Butte-Silver Bow Superfund site) disturbs 5,342 acres.

Montana's total bond amount, which covers 13,527 acres, is \$213,800,000, or approximately \$15,800 per acre disturbed. This amount is in the high-range of per acre bonding values in the western United States.

Most of the modern day major gold and silver mining operations in Montana utilize open pit mining methods. Typically, oxide and other non-refractory ores are processed using cyanidation techniques including heap leaching and vat leaching. Most of the mines use carbon adsorption, desorption, electrowinning and refining on-site to produce a relatively small, but valuable quantity of precious metals.

Of Montana's seven primary gold and silver mines, only one—the Golden Sunlight Mine—is currently in production. Four are closed and in various stages of reclamation, and operations are currently suspended due to low metals prices at the two remaining operations.

Five of Montana's mines—Basin Creek, Beal Mountain, Diamond Hill, Montana Tunnels and Zortman-Landusky—were affected by Pegasus Gold Co.'s bankruptcy. These bankruptcies have resulted in a net reclamation liability of approximately \$100 million. Montana may be forced to rely upon existing bonds to provide for this liability if the company or its predecessors (bankruptcy trustees and new corporations) fail to perform reclamation. In addition, reclamation costs greater than the bond funds held for any individual mine will have to be covered by the state and/or federal agencies,

and ultimately the taxpayer. Conservative estimates for unfunded reclamation at these bankrupt mines range from several million dollars to more than \$100 million at the Zortman-Landusky mine.

The Continental open pit mine produces both gold and molybdenum concentrates on-site in a copper flotation concentrator. Tailings are stored in a large tailings pond adjacent to the Berkeley Pit Superfund site. The mine's current reclamation plan and bond were grandfathered with the operating plan prior to 1980's, resulting in a comparatively small bond for the operation. The company recently proposed a modification to its operating permit, which will probably result in additional costs being added to the current bond amount.

In addition, Montana has three major underground metals mines. The Troy copper and silver mine has been closed since 1997, with operations suspended pending improved metals prices. The mine is believed to have approximately five years of life remaining.

The Stillwater platinum and palladium mine, the only major hardrock primary platinum group metal mine outside of South Africa, has been in production since 1985. The underground mine uses flotation to recover platinum group metals (PGM's) containing concentrate, which is then smelted in a nearby facility. The company has also recently started pre-production development at its East Boulder River mine, which was permitted in 1992, but was put on hold until this past year.

Montana currently has two projects in the permitting process. A supplemental EIS was released for public comment in 1998 for the Rock Creek underground copper and silver mine. Rock Creek has been undergoing the permitting process since the mid-1980's. A final EIS is expected sometime in 1999, and appeals from groups who oppose the project are expected. Permitting of the even-more-controversial McDonald gold mine, located adjacent to the Blackfoot River, was suspended in 1998 due to the financial difficulties of the mine's owner, Canyon Resources Corp.

**Table 3.3.1 – Montana Major Hardrock Mines
Mines with Existing Permits and Bonds**

Mine Name	Ownership	Commodity	Type	Status	Disturbed Acres	Bond Amount
Basin Creek	Pegasus Gold Co.	Gold, Silver	Open Pit, Heap Leach	Closed - Reclamation	296	\$6,276,100
Beal Mountain	Pegasus Gold Co.	Gold, Silver	Open Pit, Heap Leach	Closed - Reclamation	429	\$6,312,300
Continental	Montana Resources International	Copper, Molybdenum	Open Pit, Flotation	Operating	5,716	\$25,919,000
Diamond Hill	Pegasus Gold Co.	Gold, Silver	Underground, Flotation	Suspended	45	\$1,153,400
East Boulder	Stillwater Mining Co.	Platinum, Palladium	Underground, Flotation	Pre-production Development	222	\$2,780,000
Golden Sunlight	Placer Dome	Gold, Silver	Open Pit, Vat Leach	Operating	2,967	\$64,089,000
Kendall	Canyon Resources	Gold, Silver	Open Pit, Heap Leach	Closed – Reclamation	538	\$1,869,000 ²
Mineral Hill	TVX	Gold, Silver	Underground, Vat Leach	Suspended	106	\$8,732,600 ³
Montana Tunnels	Pegasus Gold Co.	Gold, Lead, Zinc	Open Pit, Flotation	Operating	1,143	\$15,590,000
Stillwater	Stillwater Mining Co.	Platinum, Palladium	Underground, Flotation	Operating	255	\$7,800,000
Troy	ASARCO	Copper, Silver	Underground, Flotation	Suspended	592	\$2,763,000
Zortman and Landusky	Pegasus Gold Co.	Gold, Silver	Open Pit, Heap Leach	Closed – Reclamation	1,215	\$70,510,000
Total					13,527	\$213,794,400

² Estimated – Bond of \$1,869,000 is currently undergoing review, and MDEQ expects to add approximately \$3,000,000 to bond for water treatment.

³ Estimated – Bond of \$4,234,000 is currently undergoing review, and MDEQ expects to add approximately \$5,000,000 to bond for water treatment.

3.3.3 Reclamation and Closure Bonding Regulatory Features

The features of Montana’s reclamation bonding regulatory framework are presented in Table 3.3.2, **Montana Reclamation and Closure Bonding Features**. In general, the laws and regulations afford regulators substantial discretion. However, precedent in the permitting and application of bonding measures has, after many years and much controversy, resulted in a relatively straightforward and comparatively conservative approach to bonding.

In 1971, Montana was one of the first states to establish a mined land reclamation Act. The manner in which the Act has been applied however, has significantly changed over the years. In 1995, the enactment of rules served as a significant supplement to the Act. With the exception of the Continental Pit mining operations, Montana’s permits are relatively recent and reflect the state’s current approach to bonding.

All of Montana’s reclamation and closure responsibility lies within various sections of the Department of Environmental Quality (DEQ). In addition, the DEQ has a statewide Memorandum of Understanding with the U.S. Forest Service and BLM that gives it primary authority over bonding, monitoring and enforcing reclamation and closure provisions.

Although the Montana Metal Mine Reclamation Act does not contain extensive reclamation plan requirements, it does contain provisions for erosion control, grading, pit reclamation, vegetative cover, reclamation of all disturbed land and public safety. In addition, it contains key provisions (including measures to prevent water pollution and post-mining water discharges) that can be used to consider issues of geochemical and hydrological balance.

Table 3.3.2 – Montana Reclamation and Closure Bonding Features

Statutes, Regulations and Guidelines	<p>Montana Metal Mine Reclamation Act (MMRA) Title 82, Chapter 4, Part 3, <i>et seq.</i>, Montana Codes Annotated (MCA) [Enacted in 1971 and subsequently amended]</p> <p>Rules and Regulations Governing the Metal Mine Reclamation Act Title 17, Chapter 24, Subchapter 1, <i>et seq.</i>, Administrative Rules of Montana (ARM) [1995]</p> <p>Montana Hard Rock and Placer Mining Requirements Montana Department of Environmental Quality (MDEQ), Permitting and Compliance Division – Hard Rock Program [revised 13 January 1997]</p>
Authority	
Governing State Body	The governing state body responsible for the promulgation of rules under the MMRA is the Board of Environmental Review. ^{xxxvii}
Lead State Agency	The lead state agency responsible for administering the MMRA is the Montana Department of Environmental Quality (MDEQ). ^{xxxviii}
Bonding Required By State	The MMRA applies to all lands within Montana: federal, state, and private (except for Indian lands). For state-owned (school trust) lands, the applicant must obtain a state mineral lease and approval from the Montana Department of Natural Resources and Conservation (MDNRC). ^{xxxix}

<p>Relationship with Federal Agencies</p>	<p>The department shall cooperate with other governmental and private agencies in this state and other states and agencies of the federal government.^{xi} Where federal lands are involved, the applicant must also obtain approval from the appropriate federal agency before activities can begin (U.S. Forest Service or U.S. Bureau of Land Management).^{xii}</p>
<p>Exemptions to Reclamation Bonding</p> <p>Activities Prior to Regulation</p> <p>Size Limitations</p>	<p>The MMRA is not applicable to any exploration or mining work performed prior to the date of promulgation.^{xiii}</p> <p>Small Miner Exclusion Statement (SMES) An SMES^{xiii} excludes small operators from the stricter requirements of the MMRA if they meet the following conditions: not more than 5 acres of surface disturbance; remove less than 36,500 tons of material (both ore and waste rock) in any calendar year; and meets other requirements of the SMES. A small miner intending to operate a cyanide ore-processing facility must post an adequate reclamation bond for that part of the operation where cyanide is used (ponds, leach pads, process plant, etc.). The amount of the bond must cover the actual cost of reclamation if it had to be performed by the department.</p>
<p>Reclamation Plan Requirements</p>	<p>A proposed reclamation plan must be submitted with the mining application plan of operation and must meet the following noted specific reclamation requirements.^{xiv}</p> <p>(1) The reclamation plan must provide that reclamation activities, particularly those relating to control of erosion, to the extent feasible, must be conducted simultaneously with the operation and in any case must be initiated promptly after completion or abandonment of the operation on those portions of the complex that will not be subject to further disturbance. In the absence of an order by the department providing a longer period, the plan must provide that reclamation activities must be completed not more than 2 years after completion or abandonment of the operation on that portion of the complex.</p> <p>(2) In the absence of emergency or suddenly threatened or existing catastrophe, an operator may not depart from an approved plan without previously obtaining from the department written approval for the proposed change.</p> <p>(3) Provision must be made to avoid accumulation of stagnant water in the mined area.</p> <p>(4) All final grading must be made with non-noxious, nonflammable, noncombustible solids unless approval has been granted by the department for a supervised sanitary fill.</p> <p>(5) When mining has left an open pit exceeding 2 acres of surface area and the composition of the floor or walls of the pit are likely to cause formation of acid, toxic, or otherwise pollutive solutions (“objectionable effluents”) on exposure to moisture, the reclamation plan must include provisions that adequately provide for: (a) insulation of all faces from moisture or water contact by covering to a depth of 2 feet or more with material or fill not susceptible itself to generation of objectionable effluents; (b) processing of any objectionable effluents in the pit before they are allowed to flow or be pumped out of the pit to reduce toxic or other objectionable ratios to a level considered safe to humans and the environment by the department; (c) drainage of any objectionable effluents to settling or treatment basins when the objectionable effluents must be reduced to levels considered safe by the department before release from the settling basin; or (d) absorption or evaporation of objectionable effluents in the open pit itself; and (e) prevention of entrance into the open pit by persons or livestock lawfully upon adjacent lands by fencing, warning signs, and other devices that may reasonably be required by the department.</p> <p>(6) Provisions for vegetative cover must be required in the reclamation plan if appropriate to the future use of the land as specified in the reclamation plan. The reestablished vegetative cover must meet county standards for noxious weed control.</p> <p>(7) The reclamation plan must provide for the reclamation of all disturbed land. Proposed reclamation must provide for the reclamation of disturbed land to comparable utility and stability as that of adjacent areas, except for open pits and rock faces that may not be feasible to reclaim in the same fashion as other disturbed lands. In the case of open pits and rock faces, the reclamation plan must provide for reclamation to a condition: (a) of stability structurally</p>

<p>Reclamation Plan Requirements (continued)</p>	<p>competent to withstand geologic and climactic conditions without significant failure that would be a threat to public safety and the environment; (b) that affords utility to humans and the surrounding natural system to the extent feasible; and (c) that blends with the appearance of the surrounding area to the extent feasible.</p> <p>(8) The reclamation plan must provide sufficient measures to ensure public safety and to prevent the pollution of air or water and the degradation of adjacent lands.</p> <p>(9) A reclamation plan must be approved by the department if it adequately provides for the accomplishment of the activities specified in this section.</p> <p>(10) The reclamation plan must provide for permanent landscaping and contouring to minimize the amount of precipitation that infiltrates into disturbed areas, including but not limited to tailings impoundments and waste rock dumps. The plan must also provide measures to prevent objectionable postmining ground water discharges.</p>
<p>Bonding Requirements</p> <p>Bond Amount And Calculation</p> <p>Phased Bonding</p> <p>Type of Bond Allowed</p>	<p>A permit may not be issued until sufficient bond has been submitted pursuant to MCA 82-4-338.</p> <p>The applicant shall file a bond payable to the state of Montana with surety satisfactory to the department in the sum to be determined by the department of not less than \$200 or more than \$2,500 for each acre or fraction of an acre of the disturbed area, conditioned upon the faithful performance of the requirements of this part, the rules of the board, and the permit. Regardless of the limits in this subsection, the bond may not be less than the estimated cost to the state to ensure compliance with this part, the rules, and the permit.^{xlv}</p> <p>The department shall require submission of bond in the amount of the estimated cost to the department if it had to perform the reclamation, contingency procedures and associated monitoring activities. This amount is based on the approved permit and shall include: (a) costs estimated by using current machinery production handbooks and publications or other documented costs acceptable to the department; (b) additional estimated costs to the department which may arise from additional design work, applicable public contracting requirements or the need to bring personnel and equipment to the permit area after its abandonment by the permittee; and (c) an additional amount based on factors of cost changes during the preceding 5 years for the types of activities associated with the reclamation to be performed.^{xlvi}</p> <p>The total bond amount calculated by the department must be in place and accepted by the department prior to issuance of the permit, license, or exclusion unless: (a) the applicable plan identifies phases or increments of disturbance which may be individually identified and for which individual, incremental bonds may be calculated. The plan must provide for bonding increments to be submitted with the annual report and must expressly state that the operator, licensee or small miner may not proceed to the next phase or increment until the bond is in place and has been approved in writing by the department; or (b) mining will proceed through a progression of continuous pits and the plan provides for concurrent backfill. In this case, the bond must include the amount necessary to backfill the largest volume pit.^{xlvii}</p> <p>In lieu of a bond, the applicant may file with the board a cash deposit, an assignment of a certificate of deposit, or other surety acceptable to the department.^{xlviii,xlix}</p>
<p>Reclamation and Bonding Oversight</p> <p>Reclamation Monitoring and Compliance</p> <p>Compliance (continued)</p>	<p>The department shall inspect the permit area at least annually.ⁱ The department shall conduct an inspection at least once per quarter for each operation that: uses cyanide; has a permit requirement to monitor for acid rock drainage; or exceeds 1000 acres in permit area.ⁱⁱ The permittee shall proceed with reclamation as scheduled in the approved reclamation plan, and following written notice by the department noting deficiencies, the permittee will take corrective action until the deficiencies are corrected.ⁱⁱⁱ</p>

<p>Bond Review</p>	<p>The department shall review the amount of each bond at least every 5 years and shall consult with the licensee or permittee if the review indicates that the bond level should be adjusted. When determined by the department that the set bonding level of a permit or license does not represent the present costs of compliance with this part, the rules, and the permit, the department may modify the bonding requirements.^{lviii} The department shall make written findings, give the licensee or permittee a copy of the findings, and, for operating permits, publish notice of the findings in a newspaper of general circulation in the county in which the operation is located. The permittee or any person with an interest that may be adversely affected may obtain a contested case hearing under the provisions of the Montana Administrative Procedure Act on the adjusted bond level by filing with the department within 30 days of the notice a written request for a hearing.^{liv,lv}</p>
<p>Bond Forfeiture</p>	<p>The board shall cause the bond to be forfeited if: (a) reclamation is not pursued in accordance with the reclamation plan and action to correct deficiencies has not commenced within 30 days of notification; (b) reclamation is not properly completed in conformance with the reclamation plan within 2 years after completion or abandonment of the operation on any fraction of the permit area; (c) after default by the permittee, the surety either refuses or fails to perform the work to the satisfaction of the department within the time required.^{lvi}</p>
<p>Bond Release</p>	<p>Within 30 days after notification by the permittee and when, in the judgement of the department, reclamation of a unit of disturbed land area is properly completed, the permittee must be notified in writing and the bond on the area must be released or decreased proportionately to the acreage included within the bond coverage.^{lvii} A bond filed in accordance with this part may not be released by the department until the provisions of this part, the rules adopted pursuant to this part, and the permit have been fulfilled. A bond filed for an operating permit obtained under MCA 82-4-335 may not be released until the public has been provided an opportunity for a hearing.^{lviii}</p>
<p>Public Participation in Bonding</p>	<p>No specific provisions for public participation are provided with the exception for bond review as noted above.</p>
<p>Other Significant Features</p>	<p>Action for Damages to Water Supply^{lix} Abatement of Environmental Emergencies^{lix}</p>

3.3.4 Reclamation and Closure Bonding Case Studies

3.3.4.1 Golden Sunlight Mine

Introduction and Background

Golden Sunlight Mines, Inc. (GSM) mines and processes gold-bearing ore on public (BLM) and private lands about five miles northeast of Whitehall. The approval of an environmental impact statement (EIS) and operating permit in 1981 was followed by a major expansion that included the construction of the open pit, cyanide vat leaching mill and Tailing Impoundment No. 1. Ore production of approximately 5,000 tpd began in early 1983.

Since then, the operating permit has been revised and amended numerous times. In 1988, GSM applied to the Montana Department of State Lands (MDSL) (now the Montana Department of Environmental Quality (MDEQ)) and the BLM for Amendment 008 to its operating permit. The agencies prepared an environmental assessment (EA) to evaluate the impacts of the expansion and, in 1990, approved GSM's application. Following approval, the company expanded the pit and waste rock dumps and constructed Tailing Impoundment No. 2.

Several environmental organizations filed appeals against the BLM's approval of Amendment 008 with the U.S. Department of Interior Board of Land Appeals (IBLA) in 1990. In 1992, an appeal of MDSL's approval of Amendment of 008 was filed in Montana District Court. In 1994, the Montana District Court found that MDSL could not rely on any measures not evaluated in the EA, and that it was improper to approve amendment of the permit based on the 31 stipulations listed in the decision. The court also ordered preparation of an Environmental Impact Statement (EIS) for Amendment 008, although mining was allowed to continue within the permit area.

In mid-1994, ground movement at the mine caused GSM to cease operation for approximately six months. Subsequently, fifteen million tons of waste rock was moved to relieve pressure on the ground movement block and to buttress the block against further movement. The agencies granted GSM approval to continue operations under an "Interim Dump Plan" (Amendment 009) which allowed dumping of waste rock on alternative areas within the existing permit area.

In 1995, GSM applied to mine additional ore by enlarging and deepening the pit (Amendment 010). The proposal combined additional space for waste rock generated under Amendment 008 with waste rock that would be generated if the expansion were approved. A draft EIS was produced in 1997 followed by a final copy in 1998. The EIS examined impacts of Amendment 008 and Amendment 010.

In June of 1998, the MDEQ and BLM issued a Record of Decision (ROD)^{lxii} for proposed mine expansion, approving the company's proposal as modified by numerous stipulations. Most significantly, the decision requires that no pit lake be allowed to form after the end of mine life by means of partial backfilling. Also, a designated groundwater mixing zone with compliance points where groundwater standards can be measured must be established. Because of the significant potential for acid mine drainage (AMD) to cause metals from waste rock dumps and other sources to leach into groundwater, the permit stipulates additional reclamation measures. These measures limit the infiltration of precipitation into the waste rock dumps and require that GSM must provide for water treatment in perpetuity if necessary.

Environmental groups recently appealed the MDEQ's Record of Decision in Montana District Court. Key to their complaint is that the approved plan does not adequately provide for reclamation. By

allowing slopes greater than 3H:1V, they argue, a need for water treatment in perpetuity will arise. The plan also allows AMD generating rock to be left exposed in the unreclaimed pit walls, which these groups feel violates the Montana Mining Reclamation Act (MMRA). While a decision on the complaint is not expected until 1999 at the earliest, if the courts find for the plaintiffs, the bond amount will probably be significantly more than that considered by the agencies, discussed herein.

Reclamation Bonding

Figure 3.3.1, **Golden Sunlight Mine Reclamation Bond Change**, illustrates the original bond level and changes resulting from the permit amendments and mine expansion for 1983 to the present.

The original bond in 1975 and subsequent bonds through 1989 were based upon criteria of \$1000 per disturbed acre. As a result, the bond in 1989 was \$1,751,000 for a disturbance area of 1,751 acres. In 1989, the Montana Department of State Lands (MDSL, MDEQ's predecessor) informed the Golden Sunlight Mine that the bond was inadequate, and that any future bond evaluation would include estimates for the agency to conduct reclamation. In 1990 MDSL used construction estimate methods to calculate a new performance bond. The resulting bond of \$38,627,000, for a disturbance area of approximately 1,800 acres, included water treatment through the dewatering phase of the tailings impoundments, but did not account for perpetual treatment of long-term acid mine drainage (AMD) seepage from the pit, tailings and waste rock facilities.

The current bond^{lxii}, based on reclamation through the completion of the Amendment 010 expansion in 2008, is \$64,087,000. The bond amount totals approximately \$43,700,000 for surface reclamation, and an additional \$20,400,000 for water treatment in perpetuity. Table 3.3.3, **Reclamation and Closure Bond Estimate** provides a summary of the tasks, their descriptions and the resulting bond amounts. Additional information describing reclamation and the MDEQ's basis for the estimates used to determine the bond amount is provided in the following sections.

Cost Estimates and Assumptions

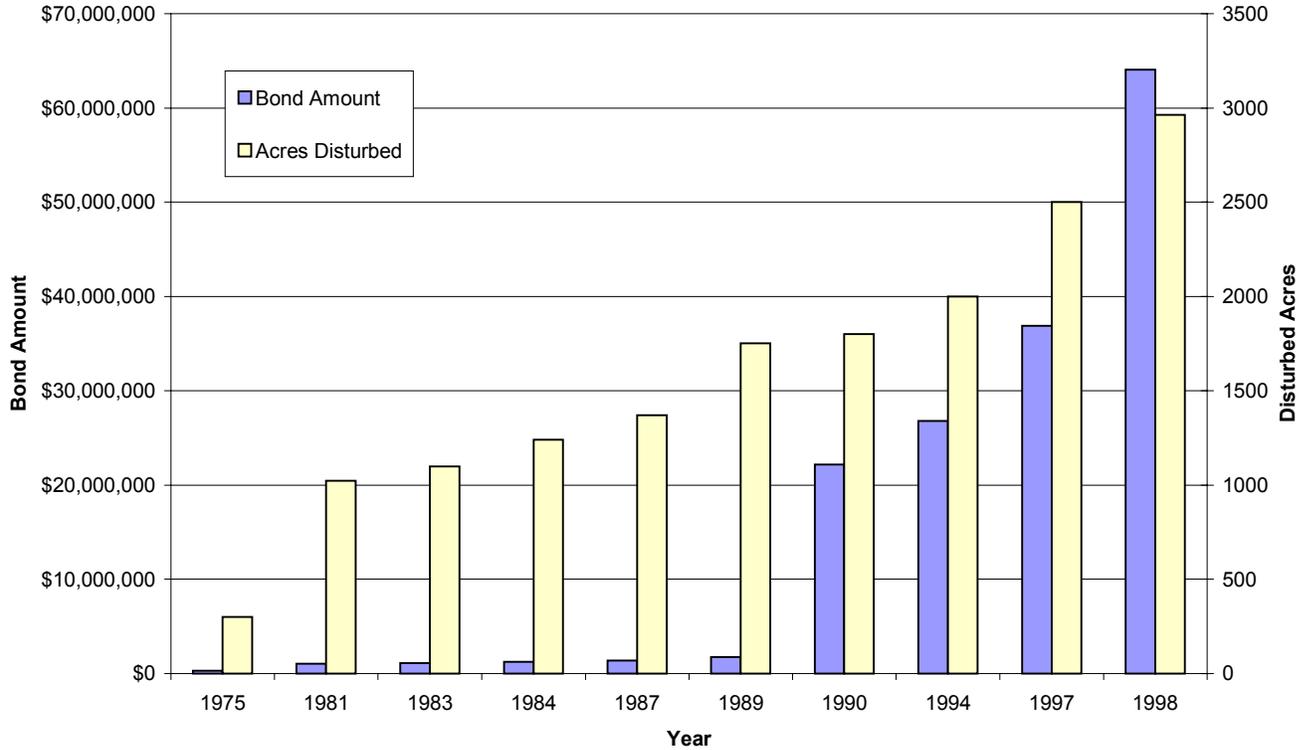
The source for information used in the bond calculation includes the EIS and memorandums, letters, maps and annual reports from GSM. Regrade, oxide, topsoil volumes, cycle times and productivity are based on GSM's experience and have been verified or otherwise revised by MDEQ. The MDEQ bases its estimate upon the use of various types of heavy equipment to perform the task. Costs are referenced from the Caterpillar Handbook (Edition 27), VEHSIM: Caterpillar PC Software Program, Dataquest Cost Reference Guide, Means Heavy Construction Cost Data (1997), and Montana State Prevailing—Davis Bacon Heavy Construction Wage Rates.

Waste Rock Dumps

The permit requires that all waste rock dumps be reclaimed by regrading the dumps at a slope of 2H:1V to 3H:1V, spreading a 24-inch oxide cover over the sulfide bearing dump surfaces (assumed to be 100 percent of the dump surfaces), spreading 19 to 24 inches of topsoil on the dump surfaces, as well as revegetation and weed control. In addition, costs have been added for the construction of drainage ditches placed every 100 vertical feet. A contingency of 10 percent of the estimated waste rock dump reclamation costs for block failure in the event of further ground movement in identified slide block areas has also been added.

The unit cost for reclamation of the waste rock dumps at the Golden Sunlight Mine is approximately \$20,000 per acre. Approximately 30 percent of the cost is related to regrading the waste rock slopes from an angle of repose to a grade of 2H:1V. The application of the oxide cap and topsoil is estimated

Figure 3.3.1
Golden Sunlight Mine
Reclamation Bond Change



to cost approximately \$9,600 per acre, or about 50 percent of the cost. Revegetation and weed control is estimated at \$750 per acre, or about 4 percent of the total cost.

Support Facilities

The permit requires that all structural buildings be demolished and disposed of, that the former building sites be reclaimed and that any utility lines (pipe, wells and power lines) be removed. Additional reclamation of support facilities (such as seepage ponds, fuel tanks, containment structures and roads) are also required, but have been included as with water treatment costs, as they will be used until such time as water treatment is no longer necessary. The bond amount assumes that all disturbed areas will be identified as sulfide bearing and require an oxide cover of 24 inches followed by a topsoil cover of an additional 24 inches.

The bond cost assumes a salvage value for any building, structure, equipment or other item. The guard house, warehouse/shop, and mill building are to remain for water treatment. Their cost for demolition is included under water treatment. Roads away from the facilities are assumed to be non-sulfide, and so require only six inches of topsoil after ripping and regrading.

Miscellaneous Disturbances

The permit requires that all miscellaneous disturbances be reclaimed. This includes various disturbances around the edges and toes of the waste rock dumps, pit, facilities, and buttress areas, as well as disturbances around the tailing impoundments and buffer zones.

The assumption is made that the disturbed areas will be non-sulfide, and so will require only ripping, regrading, six inches of topsoil, revegetation and weed control. Similar to other areas, the cost of revegetation and weed control is estimated at \$500 for flats and \$1200 for slopes.

Tailings Impoundments

The permit requires that the tailings impoundments be reclaimed by dewatering, the placement of a 24-inch cover of neutral material and 24 inches of topsoil, revegetation and weed control. A stipulation in the permit specifies that the tailings surface will be maintained in the event of differential settlement of the tailings. To bond for this maintenance it is assumed that approximately 3.4 feet of fill, in the form of alluvium located near the impoundment areas, will be placed over the entire settlement area.

It is assumed that as the tailing impoundments are being dewatered, any solution will be pumped to the process circuit or water treatment circuit. Costs for pumping and treatment of water produced during dewatering activities have been included in the Water Treatment and Interim Maintenance portions of the bond.

The unit cost for reclamation of the tailing impoundments at the Golden Sunlight Mine is approximately \$14,500 per acre. The costs for application of neutral capping material and topsoil are equivalent to that required for reclamation of waste rock dumps. Since there are no regrading costs, costs for drainage ditches or contingencies for block failure, the overall cost of reclaiming the tailings impoundments is about 25 percent less than that of reclaiming the waste rock dumps. Revegetation and weed control are estimated at \$500 per acre on the tailing impoundments. Those costs on the steeper waste rock dumps are \$750 per acre.

Construct and Maintain Storm Water Facilities

The permit requires that storm water features be reclaimed in some cases. In others, they are constructed and maintained. Reclamation of storm water diversions includes maintenance of vegetation and weed control and storm event repair, as well as construction of other diversions.

It is assumed that the reclamation and construction will take place in non-sulfide areas only, and require the replacement of soil to a depth of six inches.

Open Pit

The permit requires that the pit be backfilled to 4800 ft. in order to prevent the formation of a pit pond. An underground sump will be constructed at the bottom of the pit to collect ground and surface water. Sump construction, pump and piping installation and pumping costs are included in the Water Treatment portion of the bond. Backfill will be hauled from the waste rock dumps to the pit bottom.

Following backfill, 24 inches of oxide cover material will be placed over accessible (level) areas in the pit, followed by 24 inches of topsoil. Revegetation and weed control will also take place.

**Table 3.3.3 – Reclamation and Closure Bond Estimate
Golden Sunlight, MT Cost
Summary**

Item	Task	Description	Volume Cu. Yd.	Thickness Ft.	Acres	Unit	Unit Cost	Estimated Cost
1	Reclaim Waste Rock Dumps	Regrade waste rock slopes to 2H:1V	27,512,648			Cu. Yd.	\$0.26	\$7,070,000
		Haul and spread oxide cap on sulfide surfaces	3,841,700	2.00	1,191	Acre	\$5,313	\$6,326,000
		Haul and spread topsoil on disturbances	3,544,100	1.87	1,191	Acre	\$4,281	\$5,097,000
		Revegetate and weed control			1,191	Acre	\$749	\$892,000
		Construct drainage ditches						\$2,315,000
		Contingency for block failure						\$2,170,000
		Sub-total				1,191	Acre	\$20,049
2	Reclaim Support Facilities	Structural building demolition and disposal						\$785,000
		Reclaim former building sites			19	Acre	\$6,505	\$121,000
		Reclaim fuel tanks and containment structures						\$109,000
		Sub-total						\$1,015,000
3	Reclaim Miscellaneous Disturbances			960	Acre	\$940	\$902,000	
4	Reclaim Tailings Impoundments	Haul and spread neutral capping material	1,125,800	2.00	349	Acre	\$8,713	\$3,040,000
		Haul and spread topsoil on disturbances	1,125,800	2.00	349	Acre	\$5,337	\$1,862,000
		Revegetate and weed control			349	Acre	\$501	\$175,000
		Sub-total			349	Acre	\$14,547	\$5,077,000
5	Construct and Maintain Storm Water Facilities						\$625,000	
6	Reclaim Pits	Backfill pit (partial to prevent pit lake)	422,370			Cu. Yd.	\$1.24	\$525,000
		Haul and spread oxide cap on sulfide surfaces	193,600	2.00	60	Acre	\$5,167	\$310,000
		Haul and spread topsoil on disturbances	193,600	2.00	60	Acre	\$4,367	\$262,000
		Revegetate and weed control			60	Acre	\$500	\$30,000
		Construct wildlife habitat enhancement structures						\$100,000
		Sub-total				60	Acre	\$20,450
7	Monitoring						\$414,000	
8	Interim Maintenance						\$110,000	
	Sub-total Direct Costs						\$33,240,000	
9	Indirect Costs	Mobilization @1.0%						\$332,000
		Engineering and redesign @3.0%						\$997,000
		Reclamation management @2.5%						\$831,000
		Contingency @4.0%						\$1,330,000
		Administration @5.0%						\$1,662,000
		Inflation cost adjustment @3.0%, Yrs 1-5						\$5,295,000
		Sub-total						
10	Water Treatment	Capital cost – Treatment Plant Facilities						\$1,454,000
		Capital cost – Seepage Capture Systems						\$669,000
		Op. And Maint. – Treatment Plant Facilities						\$16,631,000
		Op. And Maint. – Seepage Capture Systems						\$1,646,000
		Remove or abandon utility lines						incl. in above
		Reclaim seepage ponds						incl. in above
		Reclaim roads away from facilities area						incl. in above
Sub-total							\$20,400,000	
Total Final Reclamation Bond								\$64,087,000

Wildlife enhancement structures listed in the existing reclamation plan will be constructed. These structures include construction of five large raptor cavities, five small raptor cavities, ledges and small cavities and two horizontal excavations for bats. A lump sum allocation was used for estimating the cost of wildlife enhancement structures.

The cost of backfilling the pit equals about \$20,450 per acre of pit backfilled or otherwise capped. This unit cost is included for general comparison purposes, however it should be cautioned that pit reclamation costs are highly objective and site-specific. Comparison with the costs applied for pit backfilling at other locations is not recommended.

Monitoring

The permit requires that groundwater and surface water monitoring be conducted, in addition to ground movement monitoring. Also, a hydrological investigation of the westside area must be conducted.

The sources for the estimate are based on personal communication with GSM staff. GSM currently monitors 120 hydrologic sites. The state assumes the company would monitor half of the hydrologic sites with a reduced parameter list and conduct the westside hydrological investigation. The cost estimate assumes ground and surface water monitoring, as well as ground movement monitoring, by the state for five years. A lump sum allocation was used for estimating the cost of the westside hydrological investigation by a third party consultant.

Interim Maintenance

The bond calculation assumes an interim maintenance and shutdown period of six months. The estimated costs include water collection, site storm water repairs and miscellaneous costs for operation and maintenance including vehicles and fuel, power, supervisory labor, computers and monitoring. The sources and basis for costs are similar to those previously cited.

Indirect Costs

As noted in Table 3.3.3, the estimated reclamation bond costs for the GSM mine includes indirect costs for mobilization (one percent), engineering and redesign (three percent), reclamation management (2.5 percent), contingency (four percent), administration (five percent) and an inflation cost adjustment (three percent for years one through five).

The total indirect costs, excluding that for inflation, applied to surface reclamation only, total about \$5,152,000. This equates to 18.5 percent of the direct costs, or approximately 12 percent of the total costs for surface reclamation.

Water Treatment

The permit requires the Golden Sunlight Mine to design and provide for water treatment in perpetuity. The assumption is made that all water with a surface water discharge must meet applicable water quality standards (Montana WQB-7 Water Quality Standards).

Seepage from various sources, including the pit, tailing impoundments and dumps, has been estimated in the EIS. The water treatment plant bond is based on the estimated seepage plus contingencies as

identified in the EIS, resulting in an estimated 449 gpm seepage for water treatment. The seepage capture system is as described in the EIS.

The water treatment program includes water capture, pumping to treatment plant and direct discharge. The capital costs of the water treatment plant are based on conversion of the existing GSM mill facility, GSM estimates and comparisons with other facilities. The operation and maintenance costs for capture systems and the treatment plant is based on a compilation of GSM estimates and operation and maintenance costs from other water treatment facilities. Environmental monitoring, sampling, and testing costs are based on 1997 GSM programs.

Capital, operating and maintenance costs are discounted over a 100 year period. For cash flow calculation purposes, reclamation of the facilities was assumed to occur in 100 years. Reclamation would include support facilities such as seepage ponds, fuel tanks, containment structures and reclamation of roads away from the facilities area.

The estimate includes various means of determining annual costs based on projected treatment scenarios. The result is costs that differ depending upon the nature and source of the wastewater to be treated. For example, it is assumed that waste rock dumps do not begin seeping for 25 years, therefore replacement costs do not begin until then.

Cash flow analysis over a 100-year period is performed based upon the projections contained in the permit. An inflation rate of 1.5 percent and a discount rate of six percent are used in the conceptual cash flow analysis to determine the bonding amount. MDEQ assumes that bonding for a period of 100 years in the present, with a review every five years, will be sufficient to provide for water treatment in perpetuity if necessary.

3.3.4.2 Zortman and Landusky Mine

Introduction and Background

The Zortman and Landusky mines are located in the Little Rocky Mountains of north central Montana. Mining on the Zortman mine began in the late 1970's using the first cyanide heap leach process in the state. In 1979, Montana prepared an EIS on the Zortman and Landusky operations, followed by approval of separate operating permits for the mines. The mines are located near each other on a mixture of private lands and public lands managed by the BLM. Following enactment of surface management regulations in 1981, the BLM approved plans of operation for the mines. The permits have expanded or modified operations 10 times since 1979.

In 1992, Zortman Mining, Inc. (ZMI), a subsidiary of Pegasus Gold Corporation (Pegasus), owner and operator of the Zortman and Landusky mines, filed application with the BLM and MDEQ to expand mining operations at the Zortman Mine. The expansion, which essentially involved further development of a more sulfide ore body, included a 150-acre expansion of the existing pits, a 60-million ton capacity waste rock disposal area, a 200-acre, 80 million ton capacity heap leach pad, a conveyor system, new process plant and ponds and the associated ancillary facilities.

MDEQ and the BLM initiated an EIS to evaluate ZMI's proposed operation expansion. At about the same time, acid mine drainage was identified as a potential problem at the Zortman and Landusky Mine sites. In early 1993, MDEQ and BLM required ZMI to modify its existing operating and reclamation plans at both mines in response to impacts to ground and surface water.

In mid-1993, Montana filed suit in State District Court against ZMI and Pegasus Gold Corporation, alleging violations of the Montana Water Quality Act, due to acid mine drainage (AMD) and repeated discharges of process solutions containing cyanide. In June 1995, the EPA filed suit in Federal District Court alleging discharges from the mines were in violation of the Clean Water Act. Similarly, Montana filed suit in Federal District Court. At the same time, Island Mountain Protectors, environmental organizations and the Fort Belknap Community Council, on behalf of the Fort Belknap Tribes, also filed citizen suits that included these same charges. All parties entered into negotiations and developed a Consent Decree that was lodged in Federal District Court in mid-1996, and which became effective in September 1996.

In 1994, the agencies combined the environmental analysis of the acid mine drainage corrective measures with the EIS process. ZMI submitted an additional proposal for expansion of the Landusky Mine. As a result, the scope of both the draft and final EIS was enlarged to include expanded mining at both mines along with the plans needed at both mines for control of AMD. In October 1996, the agencies issued a Record of Decision (ROD) which approved expanded mining and modified reclamation plans under Alternative 7 of the EIS.

Subsequent to the ROD, the Fort Belknap Tribal Council, Island Mountain Protectors and environmental groups appealed the MDEQ's decision in Montana District Court. Key to their complaint is that the approved plan does not adequately provide for reclamation. This inadequacy results in the need for water treatment in perpetuity and leaves AMD generating rock exposed in the unreclaimed pit walls—both violations of the Montana Mining Reclamation Act (MMRA). Similar appeals were filed concurrently with the U.S. Department of the Interior Board of Land Appeals (IBLA). The appeals allege that the BLM, in approving the expansion, failed to satisfy their trust obligation to protect the Fort Belknap Tribe's water, air and cultural resources, and to comply with the Religious Freedom Restoration Act and National Historic Preservation Act.

Subsequent to approval of the ROD in 1996, ZMI announced it was suspending plans for expansion due partly to low gold prices. In January 1998, ZMI and Pegasus Gold Corporation filed for reorganization under Chapter 11 of the Bankruptcy Code. In April 1998, Pegasus Gold announced that it was canceling all plans for future mining at the Zortman and Landusky Mines.

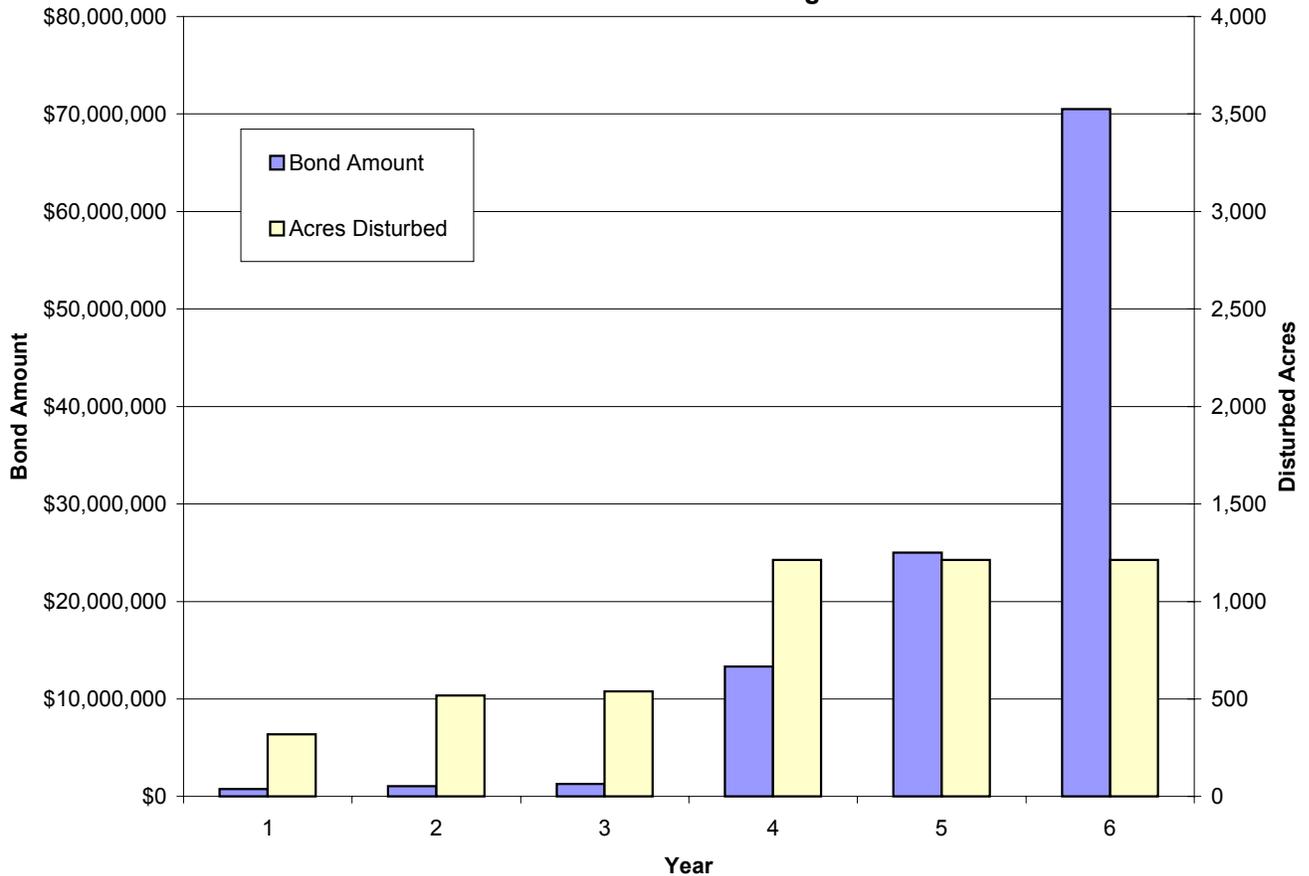
As a result of the cancellation, the agencies reissued the ROD^{lxiii} in June of 1998 to provide for reclamation of the mines without the proposed expansions. The decision was made to select Alternative 3 from the 1996 Final EIS. Alternative 3 does not approve mine expansion but it provides environmental protection measures (including partial pit backfilling, thicker soil covers, isolation of potentially acid-forming rock, erosion control, revegetation to enhance wildlife habitat and provisions for capture and treatment of seepage which may threaten water quality).

Reclamation Bonding

Figure 3.3.2, **Zortman and Landusky Mine Reclamation Bond Change**, illustrates the original bond level as well as any changes made to the bond. Changes are a result of permit amendments and mine expansion from 1982 to the present.

The bond in 1982, and subsequent bonds through 1989, was based on \$1,800 per disturbed acre and \$200 per undisturbed permitted acre. Using this criterion, the reclamation bond in 1985 was \$1,253,600 for a disturbance area of 538 acres. In 1990, the Montana Department of State Lands revised the bonds for the Zortman and Landusky Mines using new calculations that included itemized construction estimates for the agency to conduct reclamation. Subsequent to a proposed amendment to the operating bond, MDSL calculated a new performance bond using construction estimate

Figure 3.3.2
Zortman and Landusky Mines
Reclamation Bond Change



methods. The resulting bond of \$11,915,000 was for a disturbance area of approximately 1,500 acres. In 1993, following site visits by MDSL and the BLM (both of which determined the potential for AMD at the mines), an interim bond amount of \$25,000,000 was instituted for the approximate disturbance area at that time of 2,000 acres.

The 1996 Consent Decree resulted in the Zortman and Landusky Mines posting a bond for \$32,330,000 for water capture and treatment in perpetuity. The non-consent decree portion of the bond, estimated at the time of the FEIS issuance in 1996, was \$35,000,000, of which \$29,624,000 was posted with the MDEQ. The remaining \$5,376,000 was to be posted when ZMI commenced construction of the Goslin Flats leach pad expansion.

The current bond estimate^{lxiv}, based on reclamation according to the June 1998 ROD, is calculated at \$70,510,000. About \$38,180,000 of the bond is for surface reclamation; the additional \$32,330,000 is for water treatment in perpetuity. Table 3.3.4, **Reclamation and Closure Cost Estimate**, provides a summary of tasks, descriptions of those tasks and the resulting bond amounts. The MDEQ currently has a total of \$61,954,000 on file for reclamation and consent decree activities, which is about \$8,600,000 below the current estimate. The MDEQ and BLM have entered a claim with the bankruptcy court in an attempt to make up for this shortfall by tapping any of Pegasus and ZMI's

remaining assets. The Bankruptcy Court recently provided approximately \$1.5 million to settle the state's claim, leaving a shortfall of \$7.1 million.

Additional information describing the required reclamation and the MDEQ's basis for the costs calculated to determine the bond amount is provided below.

Cost Estimates and Assumptions

The sources for the information used in bond calculation include the June 1998 Record of Decision, 1995 FEIS, 1005 Revisions to Plans for the Landusky Mining Area, Letters and updated reclamation cover quantities and other information provided by ZMI. The MDEQ's estimate is based on information and cost estimates from Montana Abandoned Mine Land Reclamation Bureau Files, Dataquest's Cost Reference Guide, Caterpillar Performance Handbook (27th Ed.), VEHSIM: Caterpillar Software Program, OSM Handbook for Calculation of Reclamation Bond Amounts (1987), Means Heavy Construction Cost Data (1997), and Montana State Prevailing-Davis Bacon Heavy Construction Wage Rates.

Leach Pad

The ROD requires that all heap leach pads be reclaimed by regrading the spent heaped ore to a slope of no more than 3H:1V (except existing 2.5H:1V containment dikes). All surfaces will then be reclaimed with either a water barrier cover (slopes less than 4H:1V) or with a water balance cover (slopes less than 4H:1V). A water barrier cover consists of a GCL (geosynthetic clay liner) layer (a layer of bentonite sandwiched between two layers of geotextile), 36 inches of NAG (non-acid generating) material and 12 inches of topsoil. On steeper slopes, a water balance cover consisting of 12 inches of NAG, filter fabric, 24 inches of subsoil and 12 inches of topsoil, is employed. Revegetation and weed control follow installation of the water barrier or water balance cover.

The unit cost for reclamation of the heap leach pads at the Zortman and Landusky Mines is approximately \$37,000 per acre. Approximately 50 percent of the cost is related to the installation of the GCL component of the water barrier cover. The difference between using a water barrier cover and a water balance cover is approximately \$10,000 per acre. Revegetation and weed control is estimated at \$1,000 per acre, or about three percent of the total cost.

Waste Rock Dumps

The ROD requires that all waste rock dumps be reclaimed by regrading the waste rock to a slope of no more than 3H:1V. All surfaces are then reclaimed with either a water barrier cover (slopes less than 4H:1V) or a water balance cover (slopes greater than 4H:1V), followed by revegetation and weed control.

The unit cost for reclamation of the waste rock dumps at the Zortman and Landusky Mines is approximately \$19,000 per acre. The GCL component of the water barrier cover over potentially AMD-generating spent ore accounts for approximately 42 percent of the cost. The cost differential of using a water barrier cover versus a water balance cover is approximately \$1,500 per acre. Revegetation and weed control is estimated at \$1,000 per acre, or about five percent of the total cost. The waste dump water barrier and water balance covers are less costly than they are on the heap leach pads because of the actual footprints of the waste rock dumps that require reclamation. Approximately 50 percent of the dumps' volume will be used in pit backfilling. The figures in the table are based on acreage prior to backfilling, so the actual acreage being reclaimed is about half that shown. These new

figures result in per acre unit costs comparable to those incurred in reclaiming the heap leach pads. The relatively low cost of regrading the waste rock dumps can be explained in a similar manner.

Open Pits

The ROD requires that the pits be backfilled at the Zortman mine to allow free draining conditions. Water barrier covers are then installed over the backfilled pit bottoms, followed by revegetation and weed control. At the Landusky Mine, two smaller pits are to be backfilled to allow free draining conditions. Also, a drainage notch to the primary pit is to be combined with backfill to allow free draining conditions. Installation of water barrier covers, revegetation and weed control will follow. In both cases, the remaining accessible pit benches receive 12 inches of NAG and 12 inches of topsoil, followed by revegetation and weed control.

The cost for backfilling the pit is \$68,145 per acre of pit backfilled or otherwise capped with a water barrier or water balance cover. This unit cost is included for general comparison purposes. It should be cautioned however, that pit reclamation costs are highly objective and site-specific—comparison with the costs applied for pit backfilling at other locations is not recommended.

Facilities, Roads, Diversions and Other

The ROD requires that all facilities, haul roads and access roads be reclaimed. Following regrading, areas without the presence of sulfides are reclaimed with 12 inches of topsoil. Areas with sulfides are reclaimed with a water barrier cover, followed by revegetation and weed control.

The ROD requires that all surface water diversions be sized to the 100-year 24-hour storm event (6.33 inches), armored with adequate erosion control material and seepage retarding bedding material (GCL).

As noted in Table 3.3.4, the estimated reclamation bond costs for the Zortman and Landusky mines includes indirect costs for mobilization (one percent), engineering and redesign (3.6 percent), reclamation management (2.9 percent), contingency (four percent) and administration (five percent).

The total indirect costs applied to surface reclamation only and excluding inflation total about \$5,410,000. This equals 16.5 percent of the direct costs, or approximately 14 percent of the total costs for surface reclamation.

Water Treatment

The permit, which incorporates the consent decree by reference, requires the Zortman and Landusky Mines to design and provide for water treatment in perpetuity. The assumption is made that all water affected by surface water discharge must meet applicable water quality standards (Montana WQB-7 Water Quality Standards), and that the water treatment program must substantially comply with requirements in the plan.

Seepage from various sources, including the pit, tailing impoundments and waste rock dumps, has been estimated in the EIS. The water treatment plant bond is based on the estimated seepage plus contingencies as identified in the EIS, resulting in an estimated 350 gpm seepage for water treatment.

The water treatment program includes water capture, pumping to a treatment plant and discharge to land application areas. The water treatment plant capital costs are based on conversion of the existing Zortman and Landusky process facilities, Zortman and Landusky cost estimates and comparisons with

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other facilities. The operation and maintenance costs for capture systems and treatment plant is based on compilation of Zortman and Landusky cost estimates and operation and maintenance costs from other mining water treatment facilities. Environmental monitoring, sampling and testing costs are based on 1997 Zortman and Landusky programs.

Capital costs and operating and maintenance costs are discounted over a 100 year period. For cash flow calculation purposes, reclamation of the facilities was assumed to occur in 100 years.

The estimate includes various means of determining annual costs. Estimations are based on projected treatment scenarios and result in costs that differ depending on the nature and source of the wastewater to be treated. For example, it is assumed that water treatment does not become necessary for 20 years, therefore replacement and operating and maintenance costs do not begin until then.

Cash flow analysis over a 100 year period is based upon the projections contained in the permit. An inflation rate of three percent and a discount rate of six percent are used in the conceptual cash flow analysis to determine the bonding amount. MDEQ assumes that bonding for a period of 100 years in the present, with a review every 5 years, will be sufficient to provide for water treatment in perpetuity if necessary.

**Table 3.3.4 - Reclamation and Closure Bond Estimate
Zortman and Landusky, MT
Cost Summary**

Item	Task	Description	Volume Cu. Yd.	Thickness Ft.	Acres	Unit	Unit Cost	Estimated Cost
1	Leach Pad Reclamation	Regrade leach pad slopes to 3H:1V	6,686,349			Cu. Yd.	\$0.55	\$3,650,000
		Install GCL on leach pads			138	Acre	\$18,478	\$2,550,000
		Install Geotextile on leach pads			272	Acre	\$8,640	\$2,350,000
		Haul and spread NAG material on leach pads	1,117,281	1.7	410	Acre	\$7,195	\$2,950,000
		Haul and spread sub-soil on disturbances	958,993	1.4	410	Acre	\$5,976	\$2,450,000
		Haul and spread topsoil on disturbances	670,374	1.0	410	Acre	\$2,073	\$850,000
		Revegetate and weed control			410	Acre	\$976	\$400,000
		Sub-total			410	Acre	\$37,073	\$15,200,000
2	Waste Rock Dump Reclamation	Regrade waste rock dump slopes to 3H:1V	265,000			Cu. Yd.	\$1.13	\$300,000
		Install GCL on waste rock dump surfaces			50	Acre	\$8,000	\$400,000
		Install Geotextile on waste rock dump surfaces			55	Acre	\$6,364	\$350,000
		Haul and spread NAG material on surfaces	138,908	0.8	105	Acre	\$3,333	\$350,000
		Haul and spread sub-soil on disturbances	190,696	1.1	105	Acre	\$3,333	\$350,000
		Haul and spread topsoil on disturbances	129,249	0.8	105	Acre	\$1,429	\$150,000
		Revegetate and weed control			105	Acre	\$952	\$100,000
		Sub-total			105	Acre	\$19,048	\$2,000,000
3	Reclaim Pits	Drainage notch excavation	1,307,190			Cu. Yd.	\$1.30	\$1,700,000
		Backfill	3,641,827			Cu. Yd.	\$1.11	\$4,050,000
		Install GCL on backfilled pit surfaces			115	Acre	\$11,739	\$1,350,000
		Install Geotextile on backfilled pit surfaces			24	Acre	\$8,333	\$200,000
		Haul and spread NAG material on reclaimed surfaces	433,987	2.2	124	Acre	\$6,855	\$850,000
		Haul and spread topsoil on reclaimed disturbances	267,754	1.3	124	Acre	\$1,613	\$200,000
		Revegetate and weed control			124	Acre	\$806	\$100,000
		Sub-total			124	Acre	\$68,145	\$8,450,000
4	Facilities, Roads, Diversions and Other	Facilities Reclamation						\$750,000
		Haul and Access Roads			1,741	Acre	\$1,063	\$1,850,000
		Surface Water Diversion						\$1,350,000
		Cover, Wells, Diversion						\$3,170,000
		Sub-total						\$7,120,000
	Sub-total Direct Costs				2380			\$32,770,000
5	Indirect Costs	Mobilization @1.0%						\$330,000
		Engineering and redesign @3.6%						\$1,180,000
		Reclamation management @2.9%						\$950,000
		Contingency @4.0%						\$1,310,000
		Administration @5.0%						\$1,640,000
		Inflation cost adjustment						\$0
		Sub-total						
6	Water Treatment	Water capture and treatment						\$24,730,000
		Water treatment in perpetuity						\$7,600,000
		Sub-total						\$32,330,000
	Total Final Reclamation Bond							\$70,510,000

3.4 OREGON

Although Oregon has seen significant exploration for gold and silver mines as a result of the gold mining boom in the 1980's, potential properties such as the Grassy Mountain project and Quartz Mountain mine have not been developed. This lack of development is due partially to referendums that put a moratorium on cyanide use, and partially due to stringent state reclamation regulations. While the potential for polymetallic minerals deposits in the state is considered significant, no modern mines have been able to meet both economic and environmental considerations.

3.4.1 Major Mines with Existing Permits and Bonds

Currently there are no major hardrock metal mines permitted to operate in Oregon. Formosa's Silver Butte mine tailings impoundment was bonded at \$500,000 per acre (less than five acres disturbance) prior to reclamation. Oregon's only major mining operation, the Glenbrook nickel mine and smelter facility, pre-dated or has been otherwise considered exempt from modern state mine reclamation regulation.

3.4.2 Reclamation and Closure Bonding Regulatory Features

In 1971, Oregon was among the first states to establish a mined land reclamation Act. Rules for the Act were promulgated in 1982. After significant revisions to the Act, in 1991 rules were established specifically for chemical process mines.

Oregon optionally allows individual counties the principal responsibility for bonding and other mine permitting aspects. In order to take responsibility for mine permitting and bonding authority, the county must demonstrate that it is capable of the undertaking.

The Oregon Mined Land Reclamation Act contains specific, although not extensive, reclamation plan requirements to address key elements of surface reclamation, hydrology and surface and groundwater quality. Similarly, the Chemical Process Mine rules also contain reclamation plan requirements that specifically deal with geochemical considerations in addition to water quality and hydrology.

By far, Oregon has the most detailed bond cost estimate criteria of any state, ensuring that nearly every possible cost of reclamation that could be borne by the state is included. In addition, Oregon has unique provisions that allow a minimum of \$100,000 per acre to be bonded if the Department determines that a threat to ground or surface water is reasonably likely as a result of the permitted activity.

Additional information on Oregon's Mined Land Reclamation Act and associated rules are contained in Table 3.4.1, **Oregon Reclamation and Closure Bonding Features**.

Table 3.4.1 – Oregon Reclamation and Closure Bonding Features

<p>Statutes, Regulations and Guidelines</p>	<p>Oregon Mined Land Reclamation Act Chapter 517, Oregon Revised Statutes (ORS) [Enacted 1971]</p> <p>Oregon Mined Land Reclamation Act Applicable to Coal and Metal-Bearing Ores Operations Obtaining Permits After August 16, 1981 Title 632, Division 35, Oregon Administrative Rules (OAS) [Enacted 1982]</p> <p>Chemical Process Mining Title 632, Division 37, Oregon Administrative Rules (OAS) [Enacted 1991]</p>
<p>Authority</p> <p>Governing State Body and Lead State Agency</p> <p>Bonding Required By State And Relationship with Federal Agencies</p>	<p>The governing board of the State Department of Geology and Mineral Industries shall administer and enforce the provisions of ORS 517.702 to 517.989^{lxv}</p> <p>Surface mining on Federal Lands. Surface mining conducted on federal lands, is subject to ORS 517.750 – 517.990(3), (4) and (5) and these rules. The Department shall coordinate with agencies of the federal government to minimize conflict or duplication in operating, reclamation and security requirements. The Board may enter into formal agreements with federal agencies to establish the means by which these rules are carried out.^{lxvi}</p>
<p>Exemptions to Reclamation Bonding</p> <p>Activities Prior to Regulation</p> <p>Size Limitations</p>	<p>Nothing in ORS 517.702 to 517.989 applies to the reclamation of lands within the surfaces and contours of surface mines as of July 1, 1972, or to vertical extensions of those surfaces and contours. The surfaces and contours of surface mines shall not include those areas over which the mining operator merely leveled terrain or cleared vegetative cover.^{lxvii}</p> <p>(1) The following excavation, processing or grading activities are exempt from these rules and do not require the payment of fees, posting of bonds or submittal of reclamation plans: (b) Operations producing less than 5,000 cubic yards of material per year and disturbing less than one acre of land are exempt from these rules but may require a permit from DEQ and other government agencies.^{lxviii}</p>
<p>Reclamation Plan Requirements</p>	<p>"Reclamation" means the employment in surface mining of procedures reasonably designed to minimize as much as practicable the disruption from surface mining and to provide for the rehabilitation of any surface resources through the use of plant cover, soil stability techniques, and through the use of measures to protect the surface and subsurface water resources, including but not limited to domestic water use and agricultural water use, and other measures appropriate to the subsequent beneficial use of such mined and reclaimed lands.^{lxix}</p> <p>Reclamation Plan. The Department may require the following in a reclamation plan:</p> <p>(A) Provisions for recontouring, stabilization and/or topsoil replacement of all disturbed areas;</p> <p>(B) Provisions for the revegetation of all disturbed areas consistent with future use. This shall include seedbed preparation, mulching, fertilizing, species selection, plus seeding or planting rates and schedules. The Department shall, in most instances, consider revegetation successful if it is comparable in stability and utility to adjacent analogous areas. In arid or semi-arid regions,</p>

<p>Reclamation Plan Requirements (continued)</p>	<p>the Department may allow three years of growth prior to evaluation of revegetation. Otherwise revegetation will be evaluated after one growing season. Vegetation test plots and chemical/physical soil and subsoil analysis may be required to ensure establishment feasibility. If applicable the applicant must include a plan for the control of noxious weeds;</p> <p>(C) Provisions for protection of public health and safety;</p> <p>(D) Provisions specifying adequate setbacks;</p> <p>(E) Procedures for all stream channels and stream banks to be rehabilitated so as to minimize bank erosion, channel scour, and siltation. Disturbance within the beds and banks of streams may require a permit from the Division of State Lands;</p> <p>(F) The Department may require the applicant to provide for the prevention of stagnant water;</p> <p>(G) Final slopes shall be stable;</p> <p>(H) Reclaimed cutbanks shall not have slopes exceeding 1-1/2 horizontal to 1 vertical (1-1/2:1). The Department may grant exceptions for steeper slopes when the applicant can document that the slopes will be stable and if the steeper slopes: (i) Blend into adjacent terrain features; or (ii) Existed prior to mining; or (iii) Are consistent with approved subsequent beneficial use.</p> <p>(I) Fill slopes shall be 2:1 or flatter unless steeper slopes are approved by the Department. Technical data supporting steeper slope stability may be required by the Department;</p> <p>(J) Procedures for the salvage, storage and replacement of topsoil or acceptable substitute;</p> <p>(K) Provisions for the establishment of 3:1 in-water slopes to six feet below water level for permanent water impoundments. Reasonable alternatives may be approved by the Department when they are consistent with the reclamation plan. For example, safety benches no more than two feet below low water level and five feet wide may be substituted for the slope requirement where the Department determines that sloping is not practical;</p> <p>(L) Visual screening of the proposed operation may be required, if economically practical, when the operating area is visible from a public highway or residential area. Techniques for visual screening include, but are not limited to, vegetation, fencing or berms;</p> <p>(M) Procedures for the removal or disposal of all equipment, refuse, structures and foundations from the permit area. Permanent structures may remain if they are part of an approved reclamation plan;</p> <p>(N) Provisions to maintain access to utilities when a utility company right-of-way exists;</p> <p>(O) Procedures or information for decommissioning mine facilities including but not limited to: Procedures for ore storage sites to meet decommissioning performance standards for protection of surface and ground water quality and living resources and to achieve revegetation requirements; (ii) Procedures for tailing disposal facility to meet decommissioning performance standards for long-term stability, protection of surface and ground water quality and living resources and provide for attainment of site land use objectives; (iii) Procedures for solutions to meet decommissioning performance standards for discharge, containment and evaporation, or other ultimate disposal methods; (iv) Removal of all process chemicals; (v) Appropriate isolation or removal of waste material; (vi) Monitoring system by which the success of the proposed reclamation can be measured for bond release; (vii) Performance standards for spent ore leachate shall be established by DEQ unless the applicant can demonstrate to DEQ the limits cannot be achieved practicably. Demonstration can be laboratory trials or field evaluations.^{lxx}</p>
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<p>Bond Calculation (continued)</p>	<p>(H) The Department shall consider the following factors in determining the amount of security required for the Chemical Processing Bond: (i) The estimated cost of detoxification or disposal of ore processing solutions and solution contaminated ore so as to meet the performance standards for reclamation approved for the operation in the Operating Permit issued by the Department; (ii) The estimated cost of restoration of contaminated soil, surface and ground water or living resources within the performance standards should an accident occur at the site; (iii) The estimated cost of removal and/or disposal of chemicals used on site; (iv) The operator's credible accident contingency plan; (v) Estimated agency contracted service expenses including but not limited to supervision, mobilization, labor and equipment needs of the agency for decontamination and restoration should the agency be required to perform such restoration.</p> <p>(I) The amount of bond or other security may be reduced upon completion of ore processing and decontamination, provided documentation substantiates the reduction of risk to the environment. Some amount of the bond or other security, not less than \$25,000, shall be maintained through any post closure monitoring which may be required;</p> <p>(J) Chemical Processing Bond or Other Approved Security release standards and schedules for any specific site shall be established in consultation with the DEQ prior to operation;</p> <p>(K) The applicant may be required to submit reclamation/decommissioning cost estimates and/or estimated costs for mitigation, reclamation and/or disposal associated with a credible accident for consideration by the Department;</p> <p>(L) No permit shall be issued or renewed until all financial security for a surface mining site is on file with the Department permit bonds or other securities must be maintained until operations have ceased, reclamation has been completed, and all decommissioning performance standards have been met. The permit bonds, security deposit assignments, letters of credit or other security as authorized by ORS 517.810. Permit bonds must be U.S. Treasury listed, provided by surety companies authorized to do business in Oregon and acceptable to the department. A security submitted for multiple surface mining sites under the provisions of ORS 517.810(4) must be accompanied by a list showing the permits covered by the security, the amount of the bond applicable to each surface mining site, and the number of acres bonded at each site.^{lxxii}</p> <p>(1) Notwithstanding ORS 517.810, for the purposes of ORS 517.905 to 517.951 the bond or security deposit required shall not exceed \$10,000 per acre of land to be surface mined under the terms of the operating permit.</p> <p>(2) The State Department of Geology and Mineral Industries may increase the amount of the bond or security required under subsection (1) of this section to an amount not to exceed the lower of actual cost of reclamation or \$100,000 per acre of land to be mined under the terms of the operating permit if the operating permit applies to extraction, processing or beneficiation techniques the result of which: (a) Will increase the concentration of naturally occurring hazardous or toxic metals and minerals identified by the governing board of the State Department of Geology and Mineral Industries under ORS 517.840 to a significantly higher level than that occurring naturally within the permit area; and (b) Is reasonably likely to present a threat to public health, safety or the environment.</p> <p>(3) The increased bond or security deposit under subsection (2) of this section may be required only when the department determines that a threat to surface or subsurface waters is reasonably likely to exist as a result of the permitted activity.^{lxxiii}</p>
<p>Phased Bonding</p>	<p>No specific provisions.</p>
<p>Type of Bond Allowed</p>	<p>(1) In lieu of a bond, the applicant may deposit with the department cash or other security in a form satisfactory to the department.</p> <p>(3) In lieu of the bond or other security required of the applicant in subsection (1) of this section,</p>

Type of Bond (continued)	<p>the department may accept a similar security from the landowner, equal to the estimated cost of reclamation as determined by the department in consultation with the operator or explorer. In the event of disagreement regarding the estimated cost of reclamation, the State Geologist may review the disagreement to resolve the conflict. The State Geologist's decision may be appealed to the board as provided in ORS 183.310 to 183.550.</p> <p>(4) In lieu of the bond required by subsection (1) of this section, the department may accept a blanket bond covering two or more surface mining sites or exploration projects operated by a single company or owned by a single landowner, or operated by all members of an established trade association, in an amount, established by the department, not to exceed the amount of the bonds that would be required for separate sites.^{lxxiv}</p>
<p>Reclamation and Bonding Oversight</p> <p>Reclamation Monitoring and Compliance</p> <p>Bond Review</p> <p>Bond Forfeiture</p> <p>Bond Release</p>	<p>Inspections. As provided by ORS 517.850 the Department may, after reasonable notice, inspect any surface mining site to determine status or compliance. The Department will report the results of these inspections to the permittee in writing.^{lxxv}</p> <p>No specific provisions.</p> <p>(2) The department may issue an order requiring compliance with the operating permit, reclamation plan, this chapter or the rules of the department, or the department may recover against the bond or alternative form of financial security and reclaim the area affected by surface mining if the department determines that: (a) A permittee has failed to comply with a department notice issued under subsection (1) of this section; (b) A permittee fails to complete reclamation in conformance with the reclamation plan within three years after surface mining on any segment of the permit area has terminated; or (c) A permittee fails to complete reclamation in conformance with the reclamation plan and the department determines that abandonment of surface mining has occurred on any segment of the permit area.</p> <p>(3) The surety on the bond or holder of the other security deposit shall pay the amount of the bond or other security deposit required for such completion to the department upon the department's demand under subsection (2) of this section. The department may reclaim the surface-mined land in a manner determined by the department including by public or private contractor. If the amount specified in the demand is not paid within 30 days following such demand the Attorney General, upon request of the department, shall institute proceedings to recover the amount specified in the demand.^{lxxvi}</p> <p>Obtaining Bond Release (1) The permittee shall notify the Department when the reclamation has been completed. (2) The Department shall inspect the reclaimed site. If the permittee has fulfilled the requirements of the approved reclamation plan or decommissioning performance standards, the bonds or other securities shall be released. The Department may authorize bond or other security reduction if the reclamation or decommissioning is partially completed.^{lxxvii}</p>
Public Participation in Bonding	No specific provisions for public participation in bonding, although inferred in coordinated permitting public notice provisions.
Other Significant Features	County Authority – OAR § 632-035-0015 (3) Chemical Process Mining – OAR § 632-037

3.4.2.1 County Authority – OAR § 632-035-0015 (3)

(a) The Department shall recognize permits issued under county ordinances in lieu of permits required by these rules if such county ordinances have been approved by the Board before July 1, 1984. The Board may approve a county ordinance provided the ordinance meets the administrative and reclamation standards contained in ORS 517.750 - 517.955 and 517.990(3), (4), (5) and (6), and these

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rules, and provision is made for the reclamation to be secured by an adequate reclamation bond or alternate security. Examination for approval of proposed county ordinances shall include, but is not limited to, the following criteria:

- (A) Fully qualified professional personnel to administer the ordinance;
 - (B) Circulation for review of all applications and supporting documents to all appropriate natural resource public agencies, including the Department;
 - (C) Provision for completed processing and issuance of permits in the same or less time as the state;
 - (D) Provision for annual field inspections and for preparation and maintenance of permanent records and reports;
 - (E) Provision for prior mined (grandfathered) sites as provided in state law;
 - (F) Provision for regulation of expansion (as defined in OAR 632-035-0010(5)) of grandfathered sites;
 - (G) Adoption of criteria regarding final slopes and water depths contained in these rules and regulations;
 - (H) Provision for bonding or adequate alternate security;
 - (I) Provision for confidentiality of information as provided for in state law;
 - (J) A statement of penalties;
 - (K) A complete mined land reclamation document which does not require reference to other documents for compliance and which is free standing and not merely a part of a zoning ordinance;
 - (L) Provision to assume administration of all surface mining within the local agency's jurisdiction except municipalities within the county unless the city consents thereto as provided in ORS 517.780(2). Sites for which authority is not assumed, such as those on federal land, should be clearly exempted and left in state jurisdiction within the language of the ordinance. On those lands for which the county proposes to assume authority, the county must provide for reclamation of all categories of surface mining regulated under state law;
 - (M) Provision for incorporation of future changes of the state law into the local ordinance;
 - (N) Provision for review by the Board of future proposed changes in the local ordinance;
 - (O) Description of transition mechanism for transfer from state to county or city authority shall be provided for either in the ordinance or in a memorandum of understanding.
- (b) The Board may rescind approval of a county ordinance if the county does not enforce its ordinance as approved by the Board or at the request of the county. When the Board recognizes county authority to issue surface mining permits in lieu of the permit required by these rules, the county will provide the Department with copies of all such applications, permits, denials, reclamation plans, and inspection reports. The Department may inspect those sites after giving reasonable notice to the operator and appropriate county authority;

(c) Umatilla and Clackamas counties may continue to operate their own reclamation programs as long as they maintain the standards specified in their approved ordinances. Changes to the reclamation ordinances in those counties must be approved by the Board. Changes to the reclamation ordinances must be consistent with state law and must be submitted to the Board for approval. Routine audits of the county programs shall be conducted by the Department to ensure compliance with state laws, rules, and county ordinances. Any deficiencies noted during the audit will be given in writing to the county along with a reasonable date to reach compliance. Authorization will be withdrawn by the Board if a county fails to maintain an adequate reclamation program.

3.4.2.2 Chemical Process Mining

OAR § 632-037-0005 Purpose

(1) The purpose of these rules is to implement the provisions of Chapter 735, 1991 Oregon Laws. These rules prescribe the consolidated application process for obtaining the permits necessary to operate a chemical process mine and for complying with other requirements of Chapter 735, 1991 Oregon Laws, including: (a) Implementation of a state consolidated application process for chemical process mines; (b) Coordination of federal and state permitting processes as they relate to the consolidated application process; and (c) Opportunities for public participation and comment throughout the state consolidated application process.

OAR § 632-037-0015 State and Federal Agency Coordination

(1) When a chemical process mine is proposed on federal land, the Department shall, when agreed to by the federal agency, enter into a memorandum of agreement with the federal agency that is designated as the lead agency for the proposed mine under the National Environmental Policy Act. The purpose of a Memorandum of Agreement shall be to coordinate the state consolidated application process established in Chapter 735, 1991 Oregon Laws with the federal application process to the fullest extent possible. (2) The Memorandum of Agreement may: (d) Ensure that the state and federal financial security requirements are coordinated to the fullest extent possible.

OAR § 632-037-0130 Reclamation and Mine Closure Standards

The Department shall require a chemical process mine to comply with reclamation and mine closure standards utilizing the best available, practicable and necessary technology to assure compliance with environmental standards. The reclamation and mine closure standards shall include but not be limited to the following:

(1) Surface reclamation shall assure environmental protection and the protection of human health and safety, as well as livestock, fish and wildlife.

(2) Surface reclamation of a chemical process mine shall require certification by the Department of Fish and Wildlife and the Department of Agriculture that a self-sustaining ecosystem, comparable to undamaged ecosystems in the area, has been established in satisfaction of the permittee's habitat restoration obligations.

(3) Post-closure monitoring shall be required by the Department to insure compliance with decommissioning performance standards.

(4) Revegetation shall be considered successful if it is consistent with the establishment of a self-sustaining ecosystem, comparable to undamaged ecosystems in the area of the mine. Vegetation test

plots and chemical/physical soil and subsoil analysis may be required to insure establishment feasibility.

(5) Native species shall be established unless the use of non-native species is justified and approved by the Technical Review Team.

(6) Seedmixes, fertilizer rates and other requirements will be derived from departmental experience and advice from such sources as the Oregon Department of Agriculture, U.S. Soil Conservation Service, Oregon State University Extension Service, the Oregon Department of Transportation, the Bureau of Land Management, the Forest Service, local soil conservation districts and private sector experts.

(7) All final slopes shall be stable, blend into adjacent terrain and be compatible with the establishment of a self-sustaining ecosystem, comparable to undamaged ecosystems in the area of the mine.

(8) Reclaimed highwalls shall not have slopes exceeding 1-1/2 horizontal to 1 vertical (1-1/2:1). The Department may grant exceptions for steeper slopes when the applicant can document that the slopes will be stable and if the steeper slopes: (a) Blend into the adjacent terrain features; (b) Existed prior to mining; or (c) Are consistent with the establishment of a self-sustaining ecosystem, comparable to undamaged ecosystems in the area of the mine.

(9) Fill slopes shall be 2:1 or flatter unless steeper slopes are approved by the Department. Technical data supporting steeper slope stability may be required by the Department.

(10) In-water slopes to six feet below water level for permanent water impoundments when necessary shall be 3:1. Reasonable alternatives may be approved by the Department when they are consistent with the reclamation plan. For example, safety benches no more than two feet below water level and five feet wide may be substituted for the slope requirement where the Department determines that sloping is not practical.

(11) Permanent structures may remain if they are part of the approved reclamation plan.

(12) Any standards adopted by rule by a permitting or cooperating agency related to reclamation or closure of a chemical process mine.

(13) Backfilling or partial backfilling of pits shall be required if the Department determines that: (a) Backfilling is necessary to achieve the reclamation objectives set forth in ORS Chapter 517 or Chapter 735, 1991 Oregon Laws; (b) Reclamation objectives, including but not limited to compliance with environmental standards, cannot be achieved through mitigation or other reclamation technologies; and (c) Backfilling is the best available, practicable and necessary technology to assure compliance with environmental standards.

OAR § 632-037-0135 Financial Security

(1) A reclamation bond or alternative security acceptable to the Department shall be posted before the start of any mining operations. "Alternative security" shall include certificates of deposit or irrevocable letters of credit issued by a federally-insured bank. The purpose of the financial security shall be to allow the Department to meet the requirements of the reclamation and closure plan and to provide protection of surface and subsurface resources. The amount of the financial security shall be

calculated on the basis of the estimated actual cost of reclamation and closure and shall not be limited. The calculation shall also consider environmental protection costs based on the credible accident analysis and the factors listed in section (6) of this rule.

(2) The Department shall assess annually the overall cost of reclamation. If changes in the operation or modifications to a permit cause the cost of reclamation to exceed the amount of the financial security currently held by the state, the permittee shall post an additional security for the difference. All reclamation calculations shall be approved by the Department.

(3) The Department shall provide for incremental surety increases, with the level of surety required being consistent with the degree and forms of surface disturbance anticipated within a time period specified by the Department. When the actual surface area to be disturbed approaches the level expected by the Department, the permittee shall notify the Department sufficiently in advance of reaching the acreage limit specified to allow for a review of the surety requirements and posting of additional surety by the permittee prior to exceeding the acreage limit set by the Department.

(4) If reclamation costs will exceed the posted financial security and the operator does not increase the amount of the financial security, the department and other permitting agencies shall suspend all permits until the permittee posts the additional financial security.

(5) The Department may seek a lien against the assets of the permittee to cover the cost of reclamation if the financial security posted is insufficient. The amount of the lien shall be the amount of the costs incurred by the Department to complete reclamation. All current operating permits of the permittee shall be suspended and the Department shall deny immediately all pending applications of the permittee to conduct mining operations.

(6) The factors the Department shall consider in determining the amount of the security may include but are not limited to the following:

- (a) The reclamation estimate submitted by the applicant as part of the consolidated application;
- (b) The impact analysis, including the credible accident analysis;
- (c) Supervision;
- (d) Mobilization;
- (e) Costs of equipment;
- (f) Costs of labor;
- (g) Removal or disposition of debris, junk, equipment, structures, foundations and unwanted chemicals;
- (h) Reduction or stabilization of hazards such as in-water slopes, highwalls, and landslides or other mass failure;
- (i) Disposition of oversize, rejects, scalpings and overburden;
- (j) Backfilling, contouring or regrading and topsoil replacement;
- (k) Draining, establishment of drainage and erosion control;
- (l) Soil tests;
- (m) Seedbed preparation, seeding, mulching, fertilizing, netting, tackifiers or other stabilizing agents;
- (n) Tree and shrub planting;
- (o) Fencing;
- (p) Liability insurance;
- (q) Long-term stabilization, control, containment or disposition of waste solids and liquids;
- (r) Final engineering design;
- (s) Costs of remedial measure identified to clean up releases of contaminants associated with mining, processing or beneficiation that are reasonably likely to cause a threat to public health, safety or the environment;

- (t) The estimated cost of detoxification or disposal of ore processing solutions and solution contaminated ore so as to meet the standards for reclamation approved for the operation in the operating permit issued by the Department and the standards established in Chapter 735, 1991 Oregon Laws and these rules;
- (u) The estimated cost of restoration of contaminated soil, surface and ground water or living resources within the standards established in Chapter 735, 1991 Oregon Laws and these rules should an accident occur at the site;
- (v) The estimated cost of removal and/or disposal of chemicals used on site;
- (w) The spill prevention plan;
- (x) Estimated department contracted service expenses including but not limited to supervision, mobilization, labor and equipment needs of the department for decontamination and restoration should the department be required to perform such restoration.

(7) Cost estimate information shall be derived from sources such as: (a) Comparable costs from similar projects; (b) Catalog prices; (c) Guides and cost estimates obtained from appropriate government, public and private sources; (d) Site test and monitoring data; (e) Operator estimates; and (f) Equipment handbooks.

(8) Using the reclamation estimate submitted in the consolidated application and the impact analysis as a guide, the Department shall distribute an initial determination of the amount of financial security necessary to implement the reclamation and closure plans and to protect human health and the environment to all permitting and cooperating agencies for review and comment. After considering the comments of such agencies, the Department shall set the amount of financial security and notify the applicant.

(9) The financial security acceptable to the Department shall be posted before the start of mining operations. No permit shall be issued or renewed until all financial security for a chemical process mine is on file with the Department. Bonds or other securities shall be maintained until operations have ceased, reclamation has been completed and all decommissioning performance standards have been met. Bonds shall be United States Treasury listed, provided by surety companies licensed to operate in Oregon and acceptable to the Department. A mining operation may not satisfy the financial security requirements through self-insurance.

(10) The Department may require financial security or an annuity for post-reclamation monitoring and care.

OAR § 632-037-0140 Obtaining Financial Security Release

(1) Upon completion of full reclamation, the permittee shall submit to the Department a written request for the release of its financial security.

(2) If a permittee has conducted concurrent reclamation or partial reclamation following the cessation of mine operations, the request for release of financial security shall include an estimate of the percentage of reclamation done to date and the corresponding percentage of reclamation funds that the permittee believes should be released. A bond release or reduction request shall state in unambiguous terms all measures taken to reclaim the site and any problems or potential problems that may inhibit reclamation in accordance with permit requirements. The Department shall consider any such problems in determining the appropriate level of financial security to be maintained.

(3) Upon receipt of a request to release financial security, the Department shall: (a) Issue a public notice in accordance with OAR 632-037-0030; and (b) Distribute the request to each permitting and

cooperating agency, members of the public who participated in any hearing or written comment period under these rules, and to any person who requests such notification.

(4) No sooner than 60 days after taking the actions required under section (3) of this rule, the Department shall conduct an informal public hearing to determine whether to allow the release or reduction of the financial security.

(5) The Department may require security or an annuity for post-reclamation monitoring and care to be paid before final release of the financial security. The Department shall determine the amount of the security or annuity and distribute the proposal to all permitting and cooperating agencies. After considering the comments of such agencies, the Department shall set the amount of the security or annuity and notify the permittee.

3.5 SOUTH DAKOTA

3.5.1 Introduction

South Dakota's Black Hills gold rush of the 1870's was followed by a long period during which the Homestake underground lode mine was the only major metallic operation in the state. It wasn't until the 1980's that new discoveries of near-surface gold deposits were made. These deposits, amenable to heap leaching, led to a renewed gold boom in the Black Hills region of the state.

Mining for gold and silver in the Black Hills region accounts for all of South Dakota's metallic hardrock mining production. Six medium-sized gold and silver mines are currently permitted in the state. Two mines (Homestake and Wharf) are in operation, operations are temporarily suspended at two mines (Gilt Edge and Golden Reward), one mine is closed and undergoing final reclamation (Richmond Hill) and one new mine is permitted but has not been developed.

Reclamation bonding has been a standard process in the state in a substantive form since the early 1970's. With the exception of the historic Homestake underground mine, all of the major hardrock mines in the state have been permitted since that time and have had reclamation plans and bonds since their inception.

3.5.2 Major Mines with Existing Permits and Bonds

South Dakota's six permitted gold and silver mines are listed in Table 3.5.1, **South Dakota Major Hardrock Mines, Mines with Existing Permits and Bonds**. All of South Dakota's gold and silver mines are medium-sized, ranging from 263 to 655 acres disturbed, with a total disturbance area of 2,186 acres.

South Dakota's total bond amount of approximately \$26,500,000 equals approximately \$14,158 per acre disturbed. This value is at the top of the mid-range bonding values in the western United States.

The historic Homestake mine has been in production nearly 125 years, and has produced over 38 million ounces of gold, making it one of the richest mines in the world.⁴ The underground mine and surface mill and tailings impoundment facilities were in operation prior to 1978, and so do not require a permit. However, the company has provided a corporate guarantee of \$10 million for reclamation of the grandfathered facilities. Reclamation is in progress on parts of the site. The Homestake Open Cut surface mine was permitted in 1982 (disturbed acres and the most current bond are shown in Table 3.5.1). Mining has recently been completed in the Open Cut and, according to the South Dakota Department of Environment and Natural Resources, a pit lake with uncertain water quality may eventually form if Homestake discontinues the dewatering of its 8,000-foot deep underground mine.

During the 1980's, four major gold and silver mines utilizing open pit mining and cyanide heap leaching methods were developed in the Black Hills Region. The Wharf mine, originally permitted in 1982, recently completed permitting a new pit area that will allow it to continue to operate through 2007. The adjoining Golden Reward mine temporarily ceased operation in 1996 due to low precious metals prices. The property, which uses an on/off heap leach pad loading system, is approximately 50

⁴ T. Durkin, R. Townsend and M. Cepak, *South Dakota Gold Mining: Regulations, Compliance, and Environmental History*, South Dakota Department of Environment and Natural Resources, Minerals and Mining Program, 1998.

percent reclaimed according to the Department of Environment and Natural Resources. The period of temporary cessation is in effect until 2001, and can be extended another five years.

The nearby Richmond Hill mine was permitted in 1988, with an original reclamation bond of \$1.2 million. Following the discovery of significant acid mine drainage potential in the waste repository and open pit in 1992, the reclamation and closure plan was modified and the bond was increased to \$10.7 million. Final reclamation of the open pit, waste rock dump and heap leach pads has been completed, and the property is currently undergoing remaining reclamation and closure.

The Gilt Edge mine, operated by Brohm Mining, a subsidiary of Dakota Mining, opened in 1988 and has been in interim operation since 1995. The mine received a permit to expand its existing operations in 1996, but expansion onto Forest Service land was delayed. The expansion permit involves mining into the ore body adjacent to the present mine pits—both oxide and sulfide ore will be mined. The expansion has been the subject of appeals by environmental and conservation groups, delaying Forest Service approval. In 1998, Dakota Mining Corp., the owner of the Gilt Edge mine, announced that it would abandon the mine site. South Dakota's governor went to the Eighth Circuit Court and obtained a temporary restraining order and preliminary injunction to prevent Dakota Mining from abandoning the mine. To date, the company has complied with the restraining order and injunction. Dakota Mining declared bankruptcy in 1999. Additional information on the Gilt Edge and Richmond Hill mines are included as case studies in this section.

The acreage figure and bond amount shown for the proposed and permitted Johnson Gulch mine is to be provided by the company prior to starting operations. Future development of the property is most likely dependent upon an increase in precious metals prices and county approval.

**Table 3.5.1 – South Dakota Major Hardrock Mines
Mines with Existing Permits and Bonds**

Mine Name	Ownership	Commodity	Type	Status	Disturbed Acres¹	Bond Amount⁵
Gilt Edge	Brohm Mining Corp.	Gold, Silver	Open Pit, Heap Leach	Operations Suspended	263	\$12,850,000
Golden Reward	Golden Reward Mining Co.	Gold, Silver	Open Pit, Heap Leach	Operations Suspended	397	\$1,549,000
Homestake	Homestake Mining Co.	Gold, Silver	Open Pit and Underground, Gravity and Vat Leach	Operating	550	\$1,737,000
Johnson Gulch	Naneco Minerals Inc.	Gold Silver	Open Pit, Heap Leach	Proposed	0	\$0
Richmond Hill	Lac Minerals Inc.	Gold, Silver	Open Pit, Heap Leach	Closed – Reclamation	321	\$10,700,000
Wharf	Wharf Resources	Gold, Silver	Open Pit, Heap Leach	Operating	655	\$4,113,000
Total					2,186	\$30,949,000

⁵ Data from South Dakota Department of Environment and Natural Resources, December 31, 1998.

3.5.3 Reclamation and Closure Bonding Regulatory Features

In 1971, South Dakota was among the first states to enact a mined land reclamation Act. The Act was subsequently revised in 1982. In 1986, following the rapid permitting of the Homestake, Wharf and Brohm mines in the Black Hills, the state legislature conducted a study of the social and economic impacts of surface mining and oil and gas development in the state. As a result of the study, new laws—which included requirements for socioeconomic impact studies for new mines, clarification of local controls over mining, revisions to reclamation and bonding requirements and specification of plan development requirements—were passed by the legislature. In 1987, a six-month moratorium on the issuance of new mining permits was declared by the governor to allow the Board of Minerals and Environment time to draft new rules in response to the new laws.

In response to the proliferation of mines in the Black Hills region, a series of events began. In 1988 and 1990 the state initiated several statewide measures to put restrictions on mining, but the proposals failed. In 1989, the state legislature passed the Centennial Environmental Protection Act. The Act contained several sections on mining, including a requirement that a cumulative environmental evaluation of large-scale surface mining in the Black Hills be conducted. A moratorium on new mine permits during the study period was also included, as were provisions for bonding up to \$500,000 for accidental release of cyanide and the establishment of a Groundwater Research and Education Fund. The industry-sponsored Cumulative Environmental Evaluation was completed in 1990, and resulted in final recommendations to the Board.

The recommendations, which were passed by the legislature in 1991, included a 6,000 acre limit on land affected by large scale gold mining at any one time, a requirement that at least 500 acres of disturbed land be reclaimed by September 1, 1997, a requirement that an evaluation of the reclamation standards be conducted to determine necessary revisions, requirements for post-closure care and bonding for reclaimed mines, the requirement to post bond for potential cyanide spills and the establishment of annual reporting requirements for large scale surface gold mining operations. The mining companies reclaimed more than 500 acres of land disturbed by surface mining prior to the September 1997 deadline, and the Board found the reclamation standards to be adequate. In addition, a statewide initiative which limits the size of new large-scale surface mines to a maximum of 320 acres and the expansion of existing mines to 200 acres, passed the same year.

The South Dakota Mined Land Reclamation Act and its rules contain extensive “minimum reclamation standards” as reclamation plan requirements. These standards address key elements of surface reclamation, surface and stormwater diversions, revegetation and hydrologic balance. In addition, post-closure monitoring and bonding are also provided for in the statutes. Additional information on South Dakota’s Act and associated rules are contained in Table 3.5.2, **South Dakota Reclamation and Closure Bonding Features**.

Table 3.5.2 – South Dakota Reclamation and Closure Bonding Features

<p>Statutes, Regulations and Guidelines</p>	<p>Mined Land Reclamation Act Title 45, Chapter 06B, South Dakota Codified Law (SDCL) [1971, revised 1982]</p> <p>Mined Land Reclamation Title 74, Chapter 29, South Dakota Administrative Rules (SDAR) [1988]</p> <p>BONDCALC – Reclamation Bond Calculation Program Minerals and Mining Program, South Dakota Department of Environmental and Natural Resources</p>
<p>Authority</p> <p>Governing State Body</p> <p>And</p> <p>Lead State Agency</p> <p>Bonding Required By State</p> <p>And</p> <p>Relationship with Federal Agencies</p>	<p>Jurisdiction and authority of board – Employment of personnel -- Legal services provided by attorney general. The board of minerals and environment shall carry out and administer the provisions of this chapter. The board has jurisdiction and authority over all persons and property, public and private, necessary to enforce the provisions of this chapter. The department of environment and natural resources may employ agents, employees and consultants, permanent and temporary, as it may require and shall determine their qualifications, duties and compensation. The board may call upon the attorney general of the state for such legal services as it may require.^{lxxviii}</p> <p>No specific statutes provided.</p> <p>No specific statutes provided. State has MOU with U.S. Forest Service.</p>
<p>Exemptions to Reclamation Bonding</p> <p>Activities Prior to Regulation</p> <p>Size Limitations</p>	<p>Previously mined land – Reclamation not required for surface mining. Any new or existing surface mining operation being conducted on previously mined land with existing unreclaimed land disturbance may not be required to reclaim such existing unreclaimed land disturbance which was incurred prior to July 1, 1971.^{lxxix}</p> <p>Previously mined land – Reclamation not required for underground mining. Any new or existing underground mining operation being conducted on previously mined land with existing unreclaimed land disturbance may not be required to reclaim such existing unreclaimed land disturbance which was incurred prior to July 1, 1980.^{lxxx}</p> <p>Small-scale operation -- Special permit laws applicable. Any mining operation, other than an in situ mining operation or a mining operation that employs a cyanide leaching or other chemical or biological leaching process to extract minerals from ore, which affects less than ten acres, excluding access roads, and extracts less than twenty-five thousand tons of ore or overburden per calendar year shall be subject to the provisions of § 45-6B-54 to 45-6B-63, inclusive, and are not required to comply with the provisions of § 45-6B-5 to 45-6B-7, inclusive, § 45-6B-10, 45-6B-14 or 45-6B-36.^{lxxxi}</p>

Reclamation Plan Requirements	<p>"Reclamation," the employment during and after a mining operation of procedures reasonably designed to minimize as much as practicable the disruption from the mining operation and to provide for the rehabilitation of affected land through the rehabilitation of plant cover, soil stability, water resources, or other measures appropriate to the subsequent beneficial use of such mined and reclaimed lands.^{lxxxii}</p> <p>Postclosure plan -- Postclosure care -- Financial assurance – Certification of completed postclosure activities -- Liability of operator. The operator shall prepare a detailed postclosure plan for a mining operation. The plan shall include, at a minimum, a description of the activities, methods, procedures and processes necessary to ensure the continued effectiveness of reclamation measures and compliance with applicable performance standards including, as necessary:</p> <ol style="list-style-type: none">(1) Treatment of tailings to ensure continued neutralization or immobilization of any parameters of concern;(2) Operation of monitoring systems;(3) Inspection and maintenance activities to ensure compliance with all applicable reclamation, design and operating criteria; and(4) Procedures for maintaining the final cover and controlling erosion and fugitive dust. <p>For each mining operation requiring a postclosure plan, the operator shall begin postclosure care immediately following the release of reclamation surety and continue postclosure care for thirty years. The board may modify the permit to reduce the length of the postclosure care period at any time after reclamation surety release if a reduced period ensures compliance with all applicable performance standards. The board may modify the permit to extend the period beyond thirty years if necessary to ensure compliance with all applicable performance standards or design and operating criteria.</p> <p>For each mining operation requiring a postclosure plan, the operator shall post with the board financial assurance to guarantee the costs of postclosure care and maintenance over the postclosure period.</p> <p>After completion of postclosure care of the mine area, the operator shall submit to the department a statement certifying that postclosure activities have been completed in accordance with the postclosure plan. The department shall conduct an on-site inspection of the affected mine area, and provide public notice of its findings, at least thirty days prior to approving the certification of completion of postclosure care.</p> <p>Liability of an operator for the affected mine area under this chapter shall continue until the certification of completion of postclosure care is approved by the board.^{lxxxiii}</p> <p>Minimum Reclamation Standards^{lxxxiv}</p> <p>01. General requirements for all reclamation types.</p> <p>All mining operations must comply with the general requirements in §§ 74:29:07:02 to 74:29:07:17, inclusive, and with the following requirements: (1) Reclamation must rehabilitate the affected land to a condition that meets the selected postmining land use; (2) All reclamation activities are subject to the concurrent, interim, and final reclamation requirements of chapter 74:29:08; and (3) All reclamation required by the approved reclamation plan must be completed prior to final and full bond release.</p> <p>02. Minimizing of adverse impacts.</p> <p>To minimize the adverse impacts of a mining operation, the following must be considered during the mine planning process: (1) Design of mine operation facilities to minimize surface disturbances; (2) Construction of mine facilities so that affected lands are cleared in small sections or increments to match the needs of mine production; (3) Visual screening of affected lands, including pits, dumps, impoundments, process facilities, buildings, and equipment;</p>
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<p>Reclamation Plan Requirements (continued)</p>	<p>(4) Design, construction, and location of mine facilities to minimize impacts to surface water and groundwater; (5) Control of access; (6) Preventive measures to minimize harmful impacts to wildlife; (7) Location of waste dumps, spoil piles, and topsoil stockpiles to facilitate implementation of reclamation and to minimize environmental impacts; (8) Minimizing the production of mine waste and spoil; (9) Design and location of facilities so they are compatible with surrounding land uses; and (10) Integration of mine operations planning with the reclamation plan.</p> <p>03. Grading and backfilling – Necessity.</p> <p>Grading, backfilling, and other topographic reconstruction methods must be included in the reclamation plan to achieve visually and functionally compatible contours. Backfilling is not required if the applicant can demonstrate that it is economically or physically infeasible. In determining if backfilling is required or the extent to which it is required, the board shall consider the following factors: (1) Public safety and welfare; (2) Technical and economic feasibility; (3) Surface and mineral ownership; (4) Land use requirements; (5) Pollution potential; and (6) Mineral resource values.^{lxxxv}</p> <p>04. Grading and backfilling – Criteria.</p> <p>The following general criteria apply to all grading, backfilling, or other topographic reconstruction methods: (1) All reclaimed slopes and slope combinations must meet the following requirements: (a) Be visually and functionally compatible with the configuration of the surrounding area; (b) Be suitable for the postmining land use; (c) Be structurally stable; and (d) For fill slopes or other slopes composed of unconsolidated material, not exceed the angle of repose; (2) All grading, backfilling, and topographic reconstruction must control erosion and sedimentation, protect areas outside the affected land from slides or other damage, and minimize the need for long-term maintenance. Erosion control measures must be implemented during all phases of construction, operation, reclamation, and closure. Detailed plans indicating dimensions, location, spacing, and design of erosion control techniques are required; (3) All grading, backfilling, and topographic reconstruction must be completed as soon as feasible after mining ceases. The operator shall establish reasonable timetables consistent with good mining and reclamation practices; (4) Depressions for the accumulation of water are not allowed unless they are consistent with the approved postmining land use; (5) Original drainage must be preserved as much as possible. Alternative drainage may be approved by the board if it is functionally compatible with and complements the prevailing hydrologic balance of the surrounding area; (6) When highwall reduction or elimination is not proposed, the applicant must provide justification demonstrating that such reduction or elimination is impossible, impractical, or aesthetically undesirable. If they are not eliminated, all highwalls must be stabilized; and (7) Landforms created as the result of grading, backfilling, or topographic reconstruction of the affected land must blend in with and complement the visual continuity of the surrounding area. Mitigation techniques such as land shaping, rock sculpting, or visual screening may be used to minimize negative visual impacts.</p> <p>05. Disposal of refuse.</p> <p>All refuse from the mining operation, including garbage and rubbish, must be disposed of in an approved landfill or may be disposed of on-site if disposal complies with the South Dakota solid waste regulations in article 74:27. Acid-forming or toxin-producing materials that have been mined must be handled and disposed of in a manner that will control unsightliness and protect the hydrologic system from pollution. All hazardous wastes must be handled in accordance with South Dakota hazardous waste regulations in article 74:28.^{lxxxvi}</p>
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<p>Reclamation Plan Requirements (continued)</p>	<p>06. Revegetation.</p> <p>Revegetation must meet the following general requirements: (1) Vegetative species and composition must be appropriate for the postmining land use. The species of vegetation to be used must be described in the reclamation plan, indicating the composition of seed mixtures and plant types and the seeding and planting rates per acre. Vegetative species and composition must be selected in consultation with the local conservation district, the landowner, and the department of game, fish, and parks if wildlife habitat is included as a postmining land use. Introduced, naturalized, or nonnative plant species may be used only if they are suitable for the postmining land use and are approved by the board; (2) The applicant must develop methods and procedures for revegetation which incorporate reference areas, baseline data comparisons, or other procedures to determine postreclamation revegetation success; (3) A reference area may serve as a basis for comparatively measuring reclamation success. Reference areas must meet the following requirements: (a) Be large enough to make comparisons; (b) Be located in areas where they will not be affected by future mining while serving their designated use; (c) Be managed in a way that will not cause significant changes in the cover, productivity, species diversity, and composition of the vegetation; and (d) Be representative of the postmining land use; and (4) Seeding and planting must be done in accordance with accepted agricultural practices. Affected lands shall be seeded during the first normal period of favorable planting conditions after final topsoil preparation, unless an alternative plan is approved. Any rills or gullies that would preclude successful establishment of vegetation or achievement of the postmining land use must be removed or stabilized.^{lxxxvii}</p> <p>07. Topsoil management.</p> <p>In addition to the requirements of SDCL 45-6B-40, topsoil must be managed as follows: (1) All salvageable topsoil or other suitable material must be removed from the areas of affected land before the land is disturbed. The board may authorize topsoil to remain on areas where minor disturbances associated with construction and installation activities will occur, such as light-use roads, signs, utility lines, fences, and monitoring stations, provided that the minor disturbances will not adversely affect the soil resource; (2) Where long-term disturbances will occur, the board may authorize the temporary distribution of a portion of stockpiled topsoil or other suitable material to enhance stabilization of affected lands during periods of interim reclamation and temporary cessation of operations under the following conditions: (a) The topsoil or subsoil capacity and productive capabilities are not diminished by the distribution or can be restored; (b) The topsoil is protected from erosion; and (c) The topsoil will be available for final reclamation; (3) The board may require topsoil or other suitable material to be analyzed by the operator prior to replacement to determine if fertilizer or other soil amendments are necessary to establish and sustain the required vegetation; (4) Topsoil stockpiles must be marked with legible signs containing letters not less than six inches high in sufficient locations to clearly identify stockpiles. Such signs must be in place from the time stockpiling begins; (5) Topsoil or other suitable material shall be distributed as necessary to establish and sustain the required vegetation. The reclamation plan must contain an estimate of topsoil necessary to complete reclamation; (6) If excess topsoil is present, the board may approve the use of the excess for reclamation purposes elsewhere; (7) Trees, large rocks, and other waste material which may hinder redistribution of topsoil must be separated from the topsoil before stockpiling; (8) If the amount of topsoil necessary for reclamation does not exist on the affected land, other suitable material such as subsoil may be used as a topsoil substitute if it can be demonstrated that the material is capable of establishing and sustaining the required vegetation. If other suitable materials are used in lieu of topsoil, they must be managed in accordance with all topsoil requirements in this section and with the following: (a) Topsoil substitute stockpiles must be segregated from topsoil stockpiles and signed as substitute topsoil stockpiles; and (b) In addition to soil analyses, the board may require test plots to determine the suitability of topsoil substitutes as a plant-growing medium.^{lxxxviii}</p>
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<p>Reclamation Plan Requirements (continued)</p>	<p>08. Hydrologic balance -- Water quality.</p> <p>To minimize disturbances to the prevailing hydrologic balance of the affected land and adverse effects on the quality and quantity of surface water and groundwater, both during and after the mining operation and during reclamation, the following requirements must be met: (1) South Dakota water rights laws and regulations must be complied with; (2) South Dakota water quality laws and regulations must be complied with; (3) Dredge and fill laws in sections 401 and 404 of the Federal Clean Water Act as they existed on February 1, 1987, must be complied with; (4) Temporary or large sedimentation, erosion, or drainage control structures must be removed after affected lands have been vegetated and stabilized, if required by the reclamation plan; (5) Permanent diversion structures must be designed not to erode during the passage of the approved design precipitation event; and (6) Unchannelized surface water must be diverted around the operation as necessary to minimize pollution and erosion and to protect the operation and downstream water users who have prior water rights.^{lxxxix}</p> <p>09. Surface runoff diversions.</p> <p>Surface runoff diversions must meet the following general requirements: (1) In soils or other unconsolidated material, the sides of diversion ditches may be no steeper than two horizontal to one vertical. The sides and, in ditches carrying intermittent discharges, the bottom must be stabilized by seeding with grasses or other methods specified in the reclamation plan as soon as practicable; (2) In rock, the sides of diversion ditches must be stable; (3) Rock riprap, concrete, geosynthetic liners, geosynthetic filter media, soil cement, or other methods must be used where necessary to prevent erosion; (4) Culverts or bridges must be installed where necessary to allow access; (5) Diversion ditches must be constructed to minimize hazards to humans, wildlife, or livestock; (6) Surface runoff diversions around milling or processing facilities using potentially toxic chemicals or materials must be capable of carrying the flow from the six-hour probable maximum precipitation event without causing erosion; (7) All other surface water diversions must be capable of carrying a minimum of the two-year six-hour precipitation event without causing erosion; and (8) Diversion ditches may not discharge on topsoil storage areas, spoil, or other unconsolidated material such as newly reclaimed affected lands.</p> <p>10. Diversions of intermittent and perennial streams.</p> <p>Permanent or temporary diversions of intermittent and perennial streams on affected lands must meet the following general requirements: (1) Spoil, topsoil, or other unconsolidated materials may not be pushed into or placed within 10 feet of the banks of a perennial or intermittent stream or in a location which may subject them to bankfull flooding except during the construction of the diversion as approved in the permit; (2) The banks of a diverted perennial or intermittent stream must be stabilized and vegetated with approved species as soon as practicable; (3) The banks and channel of a diverted perennial or intermittent stream must be protected where necessary by rock, geosynthetic liners, geosynthetic filter media, riprap, or similar measures to minimize erosion and degradation of water quality. Permanent diversions must be designed and constructed to prevent erosion and to carry flow consistent with the flow produced by stream's original width, depth, shape, and gradient; (4) The board may not permit mining on the flood plain of a perennial or intermittent stream if it would cause the uncontrolled diversion of the stream during bankfull periods; (5) Channel and flood plain diversions must be designed to prevent erosion during the passage of the approved design precipitation event. Cross-sections and other hydrologic data for the existing stream above, below, and within the diversion area must be used to determine the flow capacities, channel configuration, and shape of the diversion. Such design information must be included in the reclamation plan; and (6) The water quality of a diverted intermittent or perennial stream must meet surface water quality standards in chapter 74:51:01.</p>
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<p>Reclamation Plan Requirements (continued)</p>	<p>11. Impoundments.</p> <p>For permanent surface impoundments, the criteria in § 74:29:07:27 apply. Tailings impoundments on all affected land must meet the criteria set forth in chapter 74:29:05.</p> <p>12. Roads and railroad spurs.</p> <p>Constructed or upgraded roads and railroad spurs are affected land from the location where they provide exclusive service to the mining operation and must be covered by the reclamation bond. They must meet the following general requirements: (1) When feasible, roads and railroad spurs must not be constructed within riparian zones; (2) Roads within riparian zones must be constructed so that negative effects on streams are minimized; (3) Roads or railroad spurs within the riparian zone of a coldwater permanent fishery designated pursuant to chapter 74:51:02 or 74:51:03 may be subject to the requirements of §§ 74:29:07:29 to 74:29:07:32, inclusive. (4) Streams must be crossed at or near right angles unless contouring down to the stream bed will result in less potential stream bank erosion. Ford entrances and exits must be constructed to minimize erosion and prevent water from flowing down the roadway; (5) Drainage control structures must be used as necessary to control runoff and to minimize erosion, sedimentation and flooding. When used, drainage control structures must be installed as road construction progresses; (6) Culverts must be installed at prominent drainage ways. Culverts must be protected from erosion by rock, concrete, riprap, or other approved means. Culverts and drainage pipes must be constructed and maintained to avoid plugging, collapsing, or erosion at inlets and outlets; (7) Trees and vegetation may be cleared only to the width necessary to maintain slope stability and to serve traffic needs; (8) Access and haul road drainage structures must be routinely maintained; (9) Other transport facilities and utilities must be constructed and maintained to control degradation of water quality and quantity; and (10) An applicant may request in writing to the board that a road or railroad spur be permitted to remain unreclaimed if the surface landowner or a local, state, or federal agency has requested that the road or spur remain unreclaimed and agrees to be responsible for future maintenance. The operator must furnish proof of such a request. No surety is required for reclamation of such a road or spur and reclamation of the road or spur is not required if the request is approved by the board.</p> <p>13. Buildings and structures.</p> <p>All buildings and structures constructed, used, or improved by the operator must be dismantled and removed unless it can be demonstrated to the board's satisfaction that they will be consistent with the approved postmining land use.</p> <p>14. Spoil.</p> <p>Spoil on all affected land must meet the following general requirements: (1) Except where diversions are approved by the board, all spoil must be located to avoid blocking intermittent or perennial drainages. Ephemeral drainages may be blocked if the engineering and environmental methods used for dealing with runoff control and sedimentation are approved by the board; (2) If permanent spoil dumps are approved by the board, the board may require the operator to demonstrate the long-term stability of the dumps through geotechnical stability analyses conducted by a registered professional engineer competent in the field of geotechnical analysis; (3) The board may require the operator to analyze spoil material to determine if it will be a source of water pollution. If the spoil material may be such a source the operator must describe proposed procedures for mitigating the condition; and (4) All spoil material that is determined to be toxic or acid-forming or that will prevent reestablishment of vegetation on the reclaimed land surface must be properly disposed of during the mining operation unless such materials occur naturally on the land surface.^{xc}</p>
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<p>Reclamation Plan Requirements (continued)</p>	<p>15. Noxious weeds.</p> <p>The applicant, in consultation with the county weed board, local conservation district, or other appropriate agency, must develop and implement a noxious weed control plan. The plan must be included as part of the reclamation plan.</p> <p>16. Subsidence.</p> <p>The operator must prevent or minimize subsidence that may result from mining activities. Where subsidence cannot be prevented, measures must be taken to minimize damage to and loss of value of property and to minimize hazards to livestock, wildlife, and humans.^{xci}</p> <p>17. Underground mines.</p> <p>All underground mine openings and workings or previously existing underground mine workings intercepted by surface mining activities must be sealed during reclamation.</p> <p>18. Requirements for specific types of reclamation.</p> <p>The requirements in §§ 74:29:07:19 to 74:29:07:27, inclusive, apply to the specific type or types of reclamation selected pursuant to SDCL 45-6B-45. These requirements are to be used to develop, when practicable, a multiple-use reclamation plan. The individual who develops the reclamation plan must be competent in the management and planning of the specific type or types of reclamation selected.</p> <p>19. Forest planting.</p> <p>The following requirements apply to forest planting as an approved postmining land use: (1) Trees, shrubs, and other understory vegetation physiologically suited to the site shall be used to revegetate disturbed areas. Woody species shall be planted at rates which can reasonably be expected to yield mature timber stand density appropriate to the species; (2) No slope may exceed the maximum for typical forest usage in the surrounding area; (3) Reclamation is complete when the following conditions are met; (a) Sufficient woody species to achieve the expected stand density are viable and vigorous growth can be demonstrated by the operator; (b) The understory vegetative cover is adequate to control erosion; (c) The surviving vegetative species composition is appropriate for the postmining land use; and (d) If an approved reference area is used, the reclaimed tree stand density must achieve at least 70 percent of that of the reference area five years after planting.^{xcii}</p> <p>20. Rangeland.</p> <p>The following requirements apply to rangeland as an approved postmining land use: (1) Affected land must have the capability to support a livestock carrying capacity that is equivalent to that of the surrounding area or to that of the reference area, if used; (2) Slopes may not exceed three to one unless the board approves steeper slopes; (3) Fencing newly seeded areas is required if it is necessary to preclude livestock or wildlife from impairing establishment of the required vegetation; and (4) Reclamation is complete when the reclaimed range is capable of withstanding proper stocking rates for two consecutive years prior to bond release.^{xciii}</p> <p>21. Agricultural or horticultural crops.</p> <p>The following requirements apply to agricultural or horticultural crops as an approved postmining land use: (1) The reclaimed land must have the capability of meeting or exceeding the premining crop production of the affected land or of the reference area, if used. If crop production did not occur on the affected land prior to mining, the reclaimed land must be capable of producing crops consistent with similar crop production areas in the surrounding</p>
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<p>Reclamation Plan Requirements (continued)</p>	<p>region. The applicant must document the targeted crop production potential based on premining, reference area, or regional productive capabilities; and (2) Reclamation is complete when productive capability is equivalent to or exceeds, for two consecutive crop years, that of the premining condition, the reference area, or similar crop production areas in the surrounding region.^{xciV}</p> <p>22. Wildlife habitat.</p> <p>The following requirements apply to wildlife habitat as an approved postmining land use: (1) Reclamation shall be directed toward optimizing habitat diversity for game and nongame species. The surrounding unaffected land must be considered in determining habitat diversity goals; (2) The applicant must identify the wildlife species to benefit from the proposed reclamation; (3) The affected land must be revegetated with native trees, shrubs, forbs, grasses, or other approved alternative vegetation. Revegetation composition, spacing, and arrangement must be based on consultation with the department of game, fish and parks or on an approved reference area. Woody species and understory vegetation shall be planted at rates which can reasonably be expected to yield densities appropriate for the designated wildlife species; (4) Alternative wildlife habitat reclamation objectives shall be developed in consultation with the department of game, fish and parks and approved by the board; (5) Sites to be reclaimed for recreational fisheries must provide suitable habitat for the selected fish species; (6) Surface impoundments to be reclaimed for recreational fisheries must have at least 25 percent of the bottom at a minimum depth of 20 feet to ensure sufficient water during drought, limit growth of undesirable weeds, and reduce the potential for winterkill; (7) Streams to be reclaimed for recreational fisheries must have a baseline study prepared by an individual who is competent in the field of fisheries management which addresses faunal, floral, and channel characteristics and is approved by the department of game, fish, and parks. Streams to be reclaimed for recreational fisheries must be reconstructed so that they provide suitable habitat for the selected fish species. Reclamation must achieve to the extent possible the premining pool to riffle ratio, width-to-depth ratio, and stream bed particle sizing and sorting ratio, unless modifications to enhance the stream habitat are approved by the department of game, fish and parks and the department. Reclamation techniques such as stream bank stabilization and revegetation, construction of wing deflectors, k-dams, or other management techniques may be incorporated into the reclamation plan and must have the approval of the department, the department of game, fish and parks, and the board; (8) Sites to be reclaimed for recreational fisheries must have safe bank access; and (9) Reclamation is complete when the following conditions are met: (a) The surviving vegetation species composition is capable of supporting the wildlife species identified as those to benefit from the proposed reclamation; (b) The understory cover is adequate to control erosion; (c) Stream fisheries approximate or exceed the baseline condition of the stream or that of the approved reference area; and (6) Surface impoundment fisheries meet the postmining land use as described in the approved reclamation plan.^{xcv}</p> <p>23. Recreation.</p> <p>The following requirements apply to recreation as an approved postmining land use: (1) The applicant must identify the proposed type of recreation which the reclamation will provide and must demonstrate the following to the satisfaction of the board: (a) The affected land will support the proposed type of recreation. This may be accomplished by identifying reference areas having physiographic and ecological characteristics similar to the affected lands. Reference areas, when used, must be determined in consultation with the department of game, fish and parks, the local conservation district, and a panel of three experts, recognized as such by the department, in the type of recreation being proposed; and (b) A public demand exists for the proposed type of recreation. This may be done with data showing numbers of licenses or permits sold in the area, participant surveys, or sales from area equipment stores; and (2) Reclamation is complete when it is demonstrated that the type of recreation has been established and all other requirements of the reclamation plan have been met.</p>
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<p>Reclamation Plan Requirements (continued)</p>	<p>24. Industrial use.</p> <p>The following requirements apply to industrial use as an approved postmining land use: (1) The applicant must identify the type of industry which will be located at the site and must demonstrate or address the following to the satisfaction of the board: (a) The existence of a market or need for the proposed type of industry; (b) The availability of electricity, water, phone services, sewage and waste disposal, and other support services necessary for the establishment of the proposed type of industry; (c) Access to the site, maintenance of access, and traffic control; (d) The source, suitability, and quantity of water available for industrial and potable uses; (e) The industry's legal right to inhabit the land; (f) The geotechnical feasibility of establishing an industrial site; and (g) The prior approval of the city or county planning and zoning commissions or other city or county authorities. The board may not allow industrial sites as a type of reclamation without prior local approval; (2) The reclamation plan must provide for an alternative postmining land use in the event that the proposed type of industry is not feasible; (3) A vegetative cover sufficient to control erosion must be established as soon as practicable following cessation of operations on affected land designated for industrial reclamation if the development and associated earth work will not begin within one year following cessation of operations. If the affected land is not developed within three years, the operator must implement the alternative postmining land use reclamation plan unless the board approves a time extension; and (4) Reclamation is complete when a vegetative cover sufficient to control erosion has been established over all affected land not being developed for industrial use and the incoming industry has firmly established itself at the site. If the alternative postmining land use reclamation plan is implemented, surety release criteria appropriate to that type of reclamation apply.</p> <p>25. Homesites.</p> <p>The following requirements apply to homesites as an approved postmining land use: (1) The applicant must demonstrate or address the following to the satisfaction of the board: (a) The suitability to the affected land for residences being established; (b) The availability of electricity, water, phone service, sewage and waste disposal, and other support services necessary for permanent occupancy; (c) Access to the site, maintenance of access, and traffic control; (d) The source, suitability, and quantity of water available for domestic use; (e) The geotechnical feasibility of establishing homesites; (f) The prior approval of city or county planning and zoning commissions or other city or county authorities. The board may not allow homesites as a type of reclamation without prior local approval; and (g) The potential effect on the health and well-being of the occupants of areas formerly used for disposal of tailings, hazardous or toxic wastes, sewage, rubbish, or other potentially harmful materials; (2) The reclamation plan must provide for an alternative postmining land use in the event that the proposed homesites are not feasible; (3) A vegetative cover sufficient to control erosion must be established as soon as possible following suspension of operations on affected land designated for homesite reclamation if the development and associated earth work will not begin within one year following cessation of operations. If the affected land is not developed within three years, the operator must implement the alternative postmining land use reclamation plan unless the board approves a time extension. On affected lands designated for homesite reclamation, slopes may not exceed those considered by the board to be practical for housing development; and (4) Reclamation is complete when a vegetative cover sufficient to control erosion has been established over all affected land not presently being developed for homesites and at least 25 percent of the land designated for homesite development is developed or in the process of being developed for homesites. If the alternative postmining land use reclamation plan is implemented, surety release criteria appropriate to that type of reclamation apply.</p> <p>26. Future mineral exploration or development.</p> <p>The following requirements apply to future mineral exploration or development as an approved postmining land use: (1) The applicant must identify the following: (a) Plans for the future</p>
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<p>Reclamation Plan Requirements (continued)</p>	<p>mineral exploration and mineral development being proposed, including the information required by § 74:29:06:03; and (b) Affected lands which must remain in an unreclaimed state to provide access to or development of the potential reserve; (2) Final reclamation of affected lands not required for the future mineral exploration and development being proposed must be conducted; (3) The reclamation plan must provide for an alternative postmining land use in the event that the future mineral exploration and development proposed does not occur within the time limits specified in this section; (4) Interim reclamation consistent with the requirements of § 74:29:08:02 must be conducted on all affected land designated for future mineral exploration and development if mining will not begin within one year following cessation of mining operations. In addition, the following measures must be taken: (a) Shafts, portals, adits, or other underground mine entrances must be covered or secured and all trenches and small excavations must be backfilled or covered to minimize safety hazards; and (b) Access must be limited by maintaining site security, establishing locked gates, and other measures; (5) If the affected land designated for future mineral exploration and development is not developed within three years following the cessation of mining, the operator must implement the alternative postmining land use reclamation plan. The board may extend this time period if justification is provided by the operator; and (6) Reclamation is complete when affected land to be used for future mineral exploration and development is re-permitted and covered by a reclamation surety or, if the alternative postmining land use reclamation plan is implemented, reclamation is completed in accordance with criteria appropriate to that reclamation type.</p> <p>27. Permanent surface impoundment.</p> <p>The following requirements apply to a permanent surface impoundment as an approved postmining land use: (1) Dams must be designed to contain and, if necessary, pass the design precipitation event. All dam designs must be reviewed and approved by the division of water rights; (2) If necessary to prevent failure, dams must contain an overflow notch and spillway. Overflow notches and spillways must be riprapped with rock, concrete, or other suitable materials to prevent erosion; (3) Slopes around surface impoundments, unless otherwise approved by the board, may not exceed two to one, except from five to ten feet below the expected water line where slopes may not exceed three to one. If a swimming area is proposed, the slope, unless otherwise approved by the board, may be no steeper than five to one throughout the area proposed for swimming. All slopes around surface impoundments must be graded and contoured to minimize hazards to humans, livestock, and wildlife; (4) The board may require the operator to determine if sources of water contamination within the impoundment exist. Such sources must be treated to prevent contamination of the impounded water; (5) Surface impoundments intended for use as recreational fisheries or recreation areas must meet the applicable requirements of § 74:29:07:23; and (6) Reclamation is complete when the intended use of the surface impoundment has been attained and all other requirements of the reclamation plan have been met.</p>
<p>Bonding Requirements</p>	<p>Inspection of site prior to issuance of permit -- Surety for reclamation costs required. Prior to the issuance of a mining permit the board of minerals and environment shall cause an inspection to be made of the proposed mine site. Based upon this inspection, the criteria established in § 45-6B-21, and the submitted reclamation plan, the board shall set the level of the surety necessary to guarantee the costs of reclamation of affected public and private lands. The surety shall be filed or deposited with the board before the issuance of the mining permit in such form as required by the board.^{xvii}</p> <p>Board may require additional proof of financial assurance from certain operators -- Content and amount -- Factors for consideration. The board may require any operator whose mining operation employs cyanide leaching or any other chemical or biological leaching process to extract minerals from ore, in addition to the surety required by § 45-6B-20, to file or deposit an additional proof of financial assurance with the board before the issuance of the mining permit in such form as required by the board. Such financial assurance may consist of insurance, cash, company net worth or such other form of security as the board deems adequate to protect the interests of the public. The board shall set the amount of such financial assurance based on the</p>

Bond Forfeiture	Violation -- Forfeiture of surety -- Proceedings by attorney general. The attorney general, upon request of the board of minerals and environment, shall institute proceedings to have the surety of the operator forfeited for violation by the operator of an order entered pursuant to § 45-6B-49. Before making such request of the attorney general, the board shall notify the operator in writing of the alleged violation of or noncompliance with such order and shall afford the operator the right to appear before the board at a hearing to be held not less than thirty days after the receipt of such notice by the operator. At the hearing the operator may present for the consideration of the board statements, documents and other information with respect to the alleged violation. After the conclusion of the hearings, the board shall either withdraw the notice of violation or shall request the attorney general to institute proceedings to have the surety of the operator forfeited as to the land involved. A corporate surety shall have the option to reclaim the lands in question or forfeit the bond penalty. ^{civ}
Bond Release	Surety liability continues until released. Liability of an operator under surety provisions shall continue until such time as released in part or in its entirety by the board of minerals and environment. The surety may not be held more than twelve months after completion of reclamation. ^{cv}
Public Participation in Bonding	No specific provisions for Public Participation in bonding are provided.
Other Significant Features	Statutes specific to the Black Hills Region – SDS § 45-6B-82, 83, 89 and 90

3.5.3.1 Statutes Specific to the Black Hills Region

SDS § 45-6B-82. Evaluation of cumulative impacts of large-scale surface mining in Black Hills -- Contents -- Challenge as to adequacy. To evaluate the cumulative impacts of large-scale surface mining in the Black Hills, when the total amount of affected land under permit and proposed for permit for large-scale surface gold or silver mines reaches two thousand five hundred fifty-three acres, a cumulative environmental evaluation shall be conducted and, after a hearing conducted to receive comments from interested members of the public, the results shall be reported to the board as soon as possible but not later than December 1, 1990. The environmental evaluation shall include, but not be limited to, the following:

- (1) An assessment of the existing environmental and socioeconomic status of the Black Hills to include overall land use patterns and those factors related to the unique quality of life and recreational characteristics associated with the Black Hills;
- (2) An assessment of the cumulative impacts of the existing large-scale surface gold and silver mining industry in the Black Hills;
- (3) An assessment of the reasonably anticipated future large-scale gold and silver mining development in the Black Hills;
- (4) An assessment of the costs associated with the amelioration of the possible unplanned discharge of process solutions from a credible incident at a large-scale surface gold and silver mining development;
- (5) An assessment of options for mitigating possible negative cumulative impacts of large-scale surface gold or silver mining development;
- (6) An assessment of the potential and feasibility of further reclamation in conjunction with existing and future mine permits; and
- (7) An assessment of the need for, and the appropriate factors to be considered in, correlating the timing of permits for future mine expansion with reclamation of previously affected lands where negative cumulative impacts cannot be mitigated.

For the purposes of this chapter, the Black Hills is defined as Lawrence County south of Interstate Highway 90, Meade County west and south of Interstate 90, and Pennington and Custer Counties west of South Dakota Highway 79. The environmental evaluation shall be prepared by an independent

qualified contractor selected by and under the direction of the board. The board may use the South Dakota school of mines and technology and other qualified subcontractors to prepare and complete the environmental evaluation. No court action may be commenced to challenge the adequacy of a cumulative environmental evaluation. Any issue concerning the adequacy an evaluation shall be presented to the board at a hearing held by the board.

(The 500-acre surface mining reclamation requirement was met and the board determined that current reclamation standards are adequate.)

SDS § 45-6B-83. Use of evaluation in acting on proposed operation or permit application. The board may use the environmental evaluation required by §45-6B-82 in determining the environmental consequences of a proposed operation and in acting on a permit application, including specifying appropriate mitigative measures that may be required for any future site-specific permit or amendment application. However, no new large-scale gold and silver surface mining permit may be issued for new surface mines in the Black Hills prior to January 1, 1992. The board shall continue to act on any new permit application or amendment application involving not more than two hundred acres of affected land during this moratorium if the applicant qualifies under § 45-6B-83.1. During this moratorium, the department may not make a recommendation and the board may not issue a permit for a new surface mine or for any surface mine of more than two hundred acres in the Black Hills. The department shall accept all applications and use information in the applications to assist in the environmental evaluation and the work of the review committee. On July 1, 1991, the department shall begin the processing of all new surface mine permit applications. The board may initiate an update of the environmental evaluation once every five years, with costs to be paid by the state subject to appropriation by the Legislature.

SDS § 45-6B-89. Large-scale surface gold or silver mines in Black Hills -- Legislative findings. Pursuant to § 45-6B-82, a cumulative evaluation of the impacts of large-scale surface gold or silver mines in the Black Hills has been conducted and reviewed by a committee of citizens representing a cross section of interests attentive to issues relating to mining in the Black Hills. The study and the committee have recommended that certain controls be placed on the number of acres affected by large-scale mining in the Black Hills. The study and committee have further recommended that more extensive requirements are necessary for closure and postclosure, reclamation assurances, yearly activity and compliance reporting, critical resources and financial assurances for remediating accidental releases.

The Legislature finds it to be in the public interest and the public policy of the State of South Dakota that the findings of the study and committee be implemented in law.

SDS § 45-6B-90. Restrictions on issuance of new permits for large-scale gold or silver surface mining in Black Hills -- Review of reclamation standards. The board may issue no new permit nor any amendment for an existing permit for a large-scale gold or silver surface mining operation in the Black Hills that would cause the total amount of affected land ascribable to large-scale gold or silver surface mining in the Black Hills to exceed six thousand acres. If five hundred acres of surface mining disturbed land ascribable to large-scale gold or silver surface mining in the Black Hills have not undergone final reclamation by September 1, 1997, the board may issue no new permits nor any amendments to existing permits for any large-scale gold or silver surface mining operations in the Black Hills. When five hundred acres of surface mining disturbed land ascribable to large-scale gold or silver surface mining in the Black Hills have undergone final reclamation, the board shall cause a review of the reclamation standards contained in this chapter and any rules promulgated thereunder to be conducted.

The review shall address the following issues:

- (1) The effectiveness of existing reclamation standards in achieving the approved postmining land use at existing large-scale gold and silver surface mining operations;
- (2) The method of selecting the postmining land use for large-scale gold or silver surface mining operations;
- (3) The effectiveness of existing reclamation standards in achieving an aesthetically acceptable condition at existing large-scale gold or silver surface mining operations; and
- (4) An evaluation of alternative reclamation standards if the effectiveness of existing reclamation standards is found to be deficient.

If the board finds, after the review has been completed, that existing reclamation standards are effective, the board may issue new permits and amendments to existing permits for large-scale gold or silver surface mining operations in the Black Hills that would cause the total amount of affected land ascribable to large-scale gold or silver surface mining in the Black Hills to exceed six thousand acres.

The following apply for purposes of this section only:

- (1) The surface of lands affected by underground mining operations do not constitute affected land;
- (2) Lands that have undergone final reclamation do not constitute affected land; and
- (3) Final reclamation has been conducted when the operator completes required grading, topsoil replacement, erosion and drainage control, landscaping and any required planting or seeding, all of which the department finds will result in meeting the requirements of the reclamation plan and achieving the approved postmining land use.

SDS § 45-6B-95. Permits for new large-scale operations -- Limitations. The board may not issue a permit for a new large-scale gold or silver surface mining operation if the proposed surface mining disturbed lands under that permit shall exceed 320 acres. Nor may the board issue new permits or amendments to existing permits for new large-scale gold or silver surface mining operations for expanded acres of surface mining disturbed lands until reclamation has been performed in accord with § 45-6B-97.

SDS § 45-6B-96. Permits for presently operating surface mines -- Limitation -- Exception. The board may not issue new permits to or amendments to existing permits for presently operating large-scale gold or silver surface mining operations for expanded acres of surface mining disturbed lands until reclamation has been performed in accord with § 45-6B-97, except that presently operating large-scale gold or silver surface mining operations shall not be subject to this provision until the permitted acres of surface mining disturbed lands shall total 200 acres more per each individual permit than its permitted surface mining disturbed land total acreage as of January 1, 1992.

SDS § 45-6B-97. Reclamation -- Qualifications for credit -- Assignment. New permits or amendments to existing permits for expanded acres of surface mining disturbed land for operations referred to in § § 45-6B-95 and 45-6B-96 may be issued only if the applicant has performed reclamation on an equal number of acres of permitted affected land, or has agreed not to disturb an equal acreage of permitted affected land, or, with consent of the board, has performed or agrees to perform reclamation concurrently with disturbance of an equal number of acres of previously mined land inside or outside a permit area boundary. For purpose of § § 45-6B-94 to 45-6B-99, inclusive only, reclamation is performed when the operator completes required grading, topsoil replacement, erosion and drainage control and any required planting and seeding that the department finds meets the requirements of the approved reclamation plan. To qualify for reclamation credit, reclamation activities shall have been conducted after the operator was granted the original large-scale gold or silver surface mining permit and surety for the reclaimed acres of affected land shall not have been

released prior to November 19, 1992. With consent of the board, a large-scale gold or silver surface mining operator may assign reclamation credit acreage to another large-scale gold or silver surface mining operator.

3.5.4 Reclamation and Closure Bonding Case Studies

3.5.4.1 Gilt Edge Mine

Introduction and Background

In 1988, Brohm Mining Corp. (formerly Gilt Edge, Inc.) began production at the Gilt Edge mine in the Black Hills of South Dakota. The medium-sized project is an open pit crushed and run-of-mine ore heap leach operation that produces gold and silver. The project was originally permitted to disturb approximately 400 acres, but has since been expanded to 564 acres.

The ore and waste rock was tested for potential to form acid mine drainage. Results in the initial permitting did not indicate that acid mine drainage (AMD) was likely to occur. In 1993, however, acid mine drainage was found discharging from the waste rock depository, and Brohm was ordered to submit a mitigation plan addressing the AMD discharge. The mine proposed and installed advanced wastewater treatment (reverse osmosis and chemical co-precipitation) to treat excess wastewater flow from the mine. In addition, the company completed relocation and reclamation of historic tailings located in Strawberry Creek.

In 1996, the Bard granted Brohm Mining Corp. a permit to mine the Anchor Hill project located adjacent to the existing Gilt Edge Mine. The Anchor Hill project involves mining a deposit that contains a mixed oxide/sulfide orebody. The project has sparked controversy among environmental and conservation organizations with respect to the management of the risk of acid generation from the sulfide wastes. Anchor Hill was touted by the state for providing superior reclamation materials to improve upon AMD reclamation at the Gilt Edge site. According to the Department of Environment and Natural Resources, the project would also provide the cash flow for the company to reclaim the mine site and increase the cash portion of the bond so that the demand note would eventually be replaced with a cash bond.

Although the mine received permission from the state to begin mining at Anchor Hill in 1997, in September, operations were temporarily suspended until the EIS process for the Forest Service portion of the project was completed. While the EIS process was completed in 1998, Brohm Mining Corporation's parent company, Dakota Mining Corporation, had since encountered financial difficulties. In 1998, Dakota Mining Corp., the owner of the Gilt Edge mine, announced that it would abandon the mine site. South Dakota's Governor went to the Eighth Circuit Court and obtained a temporary restraining order and preliminary injunction to prevent Dakota Mining from abandoning the mine. To date, the company has complied with the restraining order and injunction. The company is currently conducting interim operation of the mine. Dakota Mining recently declared bankruptcy, leaving their ability to properly reclaim and close the mine in question.

Reclamation Bonding

The mine was originally permitted in 1988 under the presumption there was no potential for acid mine drainage generation. The reclamation and closure bond was set at \$1.2 million. Following the incidence of acid mine drainage from the waste rock dump, the reclamation costs increased about tenfold. Because the company did not have the cash to increase the reclamation bond, the state placed conditions on the Anchor Hill pit which were designed to increase the cash portion of the reclamation

bond. The company is to provide an additional cash bond of \$5 million prior to starting mining at Anchor Hill.

As of December 31, 1998, the state held \$12,850,000 in surety for the mine. Reclamation surety to cover basic site reclamation costs in the amount of \$4.1 million is held in the form of a certificate of deposit. Environmental surety, in the amount of \$8.7 million to cover the cost of the acid rock mitigation plan is held in the form of a \$1.9 million certificate of deposit and a \$6.7 million demand note based on net worth. Because the company is having financial difficulties, the liquidity of the demand note is in jeopardy—the funds may not be available in the event the state is required to perform reclamation. While South Dakota is still struggling with the legal and financial hurdles of resuming mining in the Anchor Hill pit, the state is applying interest from the CD toward the cash portion of the environmental surety. The amount of the demand note will decrease over time as the cash portion of the environmental bond increases (provided interest exceeds inflation of reclamation costs).

The Department of Environment and Natural Resources' most recent cost estimate for reclamation and closure at the site is \$12.6 million^{cv}, representing a shortfall of nearly \$7 million in the available bond. In addition, water treatment to deal with acid mine drainage generation at the site may continue to be necessary after closure, and water treatment costs in the bond calculation only cover a five-year period. This could potentially leave the state liable for a significant bonding shortfall. It is the state's goal to have the company become able to complete its reclamation and closure responsibilities and to replace the demand note with a cash bond. However, with the continued depression of gold prices, the financial viability of the mine and its parent company is in question, and the risk of unfunded reclamation and closure bonding liability is high.

Table 3.5.3, **Reclamation and Closure Bond Estimate, Gilt Edge, SD, Cost Summary** provides a summary of costs as currently estimated by the state. Additional information describing the required reclamation and the basis for the estimated costs is provided in the following sections.

Cost Estimate Sources and Assumptions

The estimate uses hourly rates from Butler Machinery in Rapid City and other sources and operator costs estimated at \$22 per hour. In addition, \$5 per hour are added to equipment costs to account for supervisory labor.

Heap Leach Pads

The pad neutralization and pond solution treatment costs for the Gilt Edge pad and plant were calculated on the basis of 3.2 million tons of spent ore on pad at \$0.20/ton and 7.737 million gallons in ponds at \$5 per 1000 gallons.

The neutralized pad area will be graded, receive a four to six inch topsoil cover, and then be revegetated.

Waste Rock Dumps

The existing material in the Ruby Waste Rock Repository will be regraded to create 3H:1V slopes. Following regrading, a cap consisting of the following layers (from bottom to top) will be placed over the Ruby Waste Rock Repository: an 18-inch low permeability soil layer or geosynthetic clay layer (GCL), a 12-inch drainage layer, a 36-inch spent ore protective cover and a four to 6 inch topsoil

**Table 3.5.3 - Reclamation and Closure Bond Cost Estimate
Gilt Edge SD Cost Summary**

Item	Task	Description	Volume Cu. Yd.	Thickness Ft.	Acres	Unit	Unit Cost	Estimated Cost
1	Leach Pad Reclamation	Detoxification/Neutralization			71	Acre	\$9,700	\$688,685
		Regrading/Contouring			71	Acre	\$875	\$62,143
		Topsoil or Growth Medium			71	Acre	\$157	\$11,136
		Revegetation/Stabilization			71	Acre	\$652	\$46,265
		Sub-total			71	Acre	\$11,384	\$808,229
2	Waste Rock Dump Reclamation	Regrading/Contouring			62	Acre	\$5,405	\$335,087
		Install Engineered Cover			62	Acre	\$43,940	\$2,724,299
		Topsoil or Growth Medium			62	Acre	\$465	\$28,839
		Revegetation			62	Acre	\$615	\$38,110
		Stormwater Diver., Drain Pipe and Sludge Disp.			62	Acre	\$5,690	\$352,795
	Sub-total				62	Acre	\$56,115	\$3,479,129
3	Open Pit	Regrading/Contouring	1,872,027		36	Acre	\$55,422	\$1,995,194
		Install Engineered Cover			36	Acre	\$34,522	\$1,242,774
		Topsoil or Growth Medium			36	Acre	\$613	\$22,053
		Revegetation/Stabilization			36	Acre	\$1,916	\$68,963
		Sub-total			36	Acre	\$92,472	\$3,328,984
4	Facilities, Roads, Diversions and Other	Facilities Demolition, Mob-Demob and Monitoring						\$577,897
		Install Engineered Cover			2	Acre	\$26,258	\$52,515
		Regrading/Contouring			27	Acre	\$1,859	\$50,180
		Topsoil or Growth Medium			27	Acre	\$318	\$8,574
		Revegetation			27	Acre	\$1,070	\$28,881
		Stormwater Ponds			8	Acre	\$35,454	\$283,635
	Sub-total				35	Acre	\$28,619	\$1,001,682
	Sub-total Direct Costs							\$8,618,024
5	Indirect Costs	Mob/Demob @ 2.0%						\$195,193
		Contract Administration @13.0%						\$1,268,756
		State Tax @2.0%						\$195,193
		Contingency @ 10%						\$975,966
		Sub-total						
6	Water Treatment	Pit Water and Closure Period Treatment						\$1,323,640
	Total Reclamation Cost				204	Acre		\$12,576,772

cover. The low permeability soil layer cover will be used on slopes, and GCL used on flat areas. The reclaimed area will then be revegetated.

The cost estimate includes capital cost items for the repository, such as stormwater ponds, diversion ditches and a sludge disposal facility.

Open Pit

The Anchor Hill, Sunday and Dakota Maid pits will be partially backfilled. Limestone will be placed on acid generating benches and on spent ore used in backfilling that has high acid-generating potential.

A cap consisting of the following layers (from bottom to top) will be placed over the backfilled sections of the Anchor Hill Pit, Sunday Pit, and Dakota Maid Pit: an 18-inch low permeable soil layer or geosynthetic clay layer (GCL), a 12-inch drainage layer, a 36-inch spent ore protective cover and a four to six-inch topsoil cover. The low permeability soil layer cover will be used on slopes, and GCL used on flat areas. The reclaimed area will then be revegetated.

Facilities, Roads, Diversions and Other

The cash value of salvaged facilities may be claimed by creditors to satisfy any outstanding debts. Therefore, the assumption in the original bond calculation that salvage value can be traded off with demolition cost cannot be used. Demolition costs have been added to the bond calculation.

Portions of the crusher area will be backfilled prior to capping. Costs are also included for construction of the upper Strawberry Creek channel below the new surge and storm ponds.

Indirect Costs

As noted in Table 3.4.3, the estimated reclamation bond costs for the Gilt Edge mine include indirect costs for mobilization/demobilization (two percent), contract administration and engineering (13 percent), State Tax (two percent) and contingency (10 percent).

The indirect costs total about \$2,635,000. This equals 27 percent of the direct costs, or approximately 21 percent of the total cost of reclamation.

Additional Water Treatment Costs

Additional water treatment costs were calculated by the Department to treat about 64,000,000 gallons of water remaining in the pits prior to backfill. The costs are based on an average treatment cost of \$8 per 1000 gallons. Water treatment was assumed to continue for two years at 50 million gallons per year inflow to the pits, followed by three years at a reduced flow of five million gallons per year. Costs for continued water treatment were based on \$7 per 1000 gallons. Perpetual treatment is not included in the environmental bond.

3.5.4.2 Richmond Hill Mine

Introduction and Background

In 1988, LAC Minerals USA (formerly St. Joe Gold Corp.) began production at the Richmond Hill mine in the Black Hills of South Dakota. The medium-sized project is an open pit heap leach

operation that produces gold and silver. The project was originally permitted to disturb approximately 400 acres.

Preliminary indications during mine permitting suggested that a small amount of sulfide rock might be encountered during mining. However, a significantly larger amount than was anticipated was mined. Methods of addressing AMD potential in the permit did not reveal the problem to the responsible agencies until the existence of significant sulfide rock was discovered during an inspection of the mine in 1992.

Further inspection by the Department of Environment and Natural Resources found that AMD was actively discharging and was impacting the trout fishery in Squaw Creek. LAC was ordered to pay a \$489,000 penalty, eliminate the discharge and submit a mitigation plan addressing the discharge of AMD from the mine.

From 1992 to 1994, an environmental assessment was performed that revealed approximately 2.7 million tons of rock in the waste depository to be acid-generating. Some of the spent ore and disturbed facilities areas were also found to have AMD potential. In addition, most of the exposed pit floor and highwalls were found to be acid generating and contributing to groundwater contamination.

A mitigation/reclamation and closure plan was approved by the state in 1994. The plan called for backfilling the open pit with the reactive waste and installing a low-permeability engineered cover over the material, essentially creating a waste repository. In addition, the plan called for construction of low-permeability engineered covers over the spent heap leach pads and ancillary areas.

In 1995, Richmond Hill completed backfilling the pit repository with all the waste rock and installed an engineered cap to provide long-term closure of acid generating rock. In 1997, Richmond Hill completed construction of an engineered cap over its spent leach pads. Results from monitoring have thus far been encouraging.⁶

Reclamation Bonding

The original bond amount included with the 1988 permit was approximately \$1.2 million—an average of about \$3,000 per acre disturbed. As a result of the 1994 modifications to the plan, the Department re-estimated cost of reclamation and closure at \$10.7 million.^{cvi}

When reclamation is completed, the company is required to submit a post-closure maintenance and monitoring plan to the state. The post-closure period begins at the time of reclamation surety release (mine closure) and lasts for 30 years, unless the Board of Minerals and Environment determines that a different period of time is necessary to determine compliance with post-closure standards. In 1994, a post-closure bond of \$1.7 million to cover estimated post-closure care was calculated. That estimate has recently been revised to reflect \$11 million for a 30-year post-closure period.

Table 3.5.4, **Reclamation and Closure Bond Estimate, Richmond Hill, SD, Cost Summary** provides a summary of costs as estimated by the state following discovery of AMD. Additional information describing the required reclamation and the basis for the estimated costs is provided in the following sections.

⁶ Footnote or add to references: T. Durkin, *Acid Mine Drainage: Reclamation at the Richmond Hill and Gilt Edge Mines, South Dakota*, South Dakota Department of Environment and Natural Resources, Minerals and Mining Program, 1994.

Cost Estimate Sources and Assumptions

The estimate uses hourly equipment rates from a local contractor and other sources. Operator costs are estimated at \$17.00 per hour.

Heap Leach Pads

The spent ore on the heap leach pads will be amended with limestone to provide a neutralizing potential of 3:1 of the acid potential. The slopes of the pads will be reduced to 3H:1V. The estimate includes the application of four to six inches of topsoil and revegetation. The estimate does not include any costs for capping the heap leach piles (the company revised the original plan and received approval from the state to place a cap over the leach pads and they were capped in 1997).

Waste Rock Dumps

The AMD generating waste rock will be removed from Spruce Gulch and backfilled in three-foot compacted lifts in the pit impoundment. Regrading/recontouring costs shown in the estimate summary are for the costs of hauling and backfilling the waste rock material. Following removal of the waste rock material, four to six inches of topsoil will be applied and the area will be revegetated. LAC decided to remove the entire waste rock dump (3.5 million tons), using a portion of the non-reactive waste rock in the construction of the pit impoundment cap. Reclamation of the waste rock dumps was completed in 1995.

Open Pit

After backfilling of the open pit with waste rock is complete, the waste rock and acid-generating pit surfaces will be graded to slopes of 3H:1V or less and capped with an engineered multi-media cover consisting of (from bottom to top) six inches of onsite crushed limestone, 18 inches of low-permeability manufactured soil and 4.5 feet of nonreactive crushed waste material for thermal/frost/root protection of the low-permeability layer. Four to six inches of topsoil will then be applied and the area will be revegetated. The 18-inch low permeability layer is constructed in two, nine-inch lifts and consists of nonreactive waste rock crushed to .5 inch and blended with 13 percent bentonite to meet a field permeability criteria of 1×10^{-7} cm/sec. Reclamation of the open pit was completed in 1995.

Facilities, Roads, Diversions and Other

Buildings are removed and facilities, roads and other areas are graded and four to six inches of topsoil are applied and the area revegetated. Reclamation of these areas is still pending.

Indirect Costs

As noted in Table 3.4.4, the estimated reclamation bond costs for the Richmond Hill mine include indirect costs for mobilization/demobilization (three percent), contract administration and engineering (10 percent), state tax (two percent), and contingency (four percent).

The indirect costs total about \$1,703,546. This equates to 29 percent of the direct costs or approximately 16 percent of the total cost of reclamation.

**Table 3.5.4 - Reclamation and Closure Bond Cost Estimate
Richmond Hill, SD
Cost Summary**

Item	Task	Description	Volume Cu. Yd.	Thickness Ft.	Acres	Unit	Unit Cost	Estimated Cost
1	Leach Pad Reclamation	Detoxification/Neutralization			61	Acre	\$69,189	\$4,220,500
		Regrading/Contouring			61	Acre	\$14,656	\$894,001
		Topsoil or Growth Medium			61	Acre	\$1,344	\$81,962
		Revegetation/Stabilization			61	Acre	\$706	\$43,084
		Sub-total			61	Acre	\$85,894	\$5,239,547
2	Waste Rock Dump Reclamation	Regrading/Contouring			101	Acre	\$24,958	\$2,520,791
		Install Engineered Cover			101	Acre	\$0	\$0
		Topsoil or Growth Medium			101	Acre	\$744	\$75,113
		Revegetation			101	Acre	\$744	\$75,113
		Sub-total			101	Acre	\$26,446	\$2,671,017
3	Open Pit	Regrading/Contouring			35	Acre	\$0	\$0
		Install Engineered Cover			35	Acre	\$18,646	\$652,625
		Topsoil or Growth Medium			35	Acre	\$1,337	\$46,803
		Revegetation/Stabilization			35	Acre	\$514	\$17,998
		Sub-total			35	Acre	\$20,498	\$717,426
4	Facilities, Roads, Diversions and Other	Facilities Demolition, Mob-Demob and Monitoring						\$181,735
		Install Engineered Cover			0	Acre	\$0	\$0
		Regrading/Contouring			65	Acre	\$539	\$35,059
		Topsoil or Growth Medium			65	Acre	\$487	\$31,663
		Revegetation			65	Acre	\$1,378	\$89,582
	Sub-total				65	Acre	\$5,201	\$338,039
	Sub-total Direct Costs							\$8,966,029
5	Indirect Costs	Mob/Demob @ 3.0%						\$268,981
		Contract Administration @10.0%						\$896,603
		State Tax @2.0%						\$179,321
		Contingency @ 4%						\$358,641
		Sub-total						
6	Water Treatment	Pit Water and Closure Period Treatment						\$0
	Total Reclamation Cost				262	Acre		\$10,669,575

3.6 WASHINGTON

Washington's major hardrock metals mining industry was historically based on the Republic Unit mine, adjacent to the Coeur-Wallace mining district in Idaho. As a part of the western U.S. gold mining boom in the 1980's, the Cannon and Kettle River mines were permitted. Mining is completed at the Cannon mine and the site is being reclaimed. With addition of the Lamefoot and K2 mines (which use the original Kettle River milling complex), the life of the Kettle River mine was extended.

The Crown Jewel gold and silver mine was proposed in 1990. The Environmental Impact Statement process was completed in 1997 and the Washington State agencies have issued their permits for the mine, pending appeal. The Washington Departments of Natural Resources and Ecology have determined most of their bonds in accordance with the most current state statutes and regulations, which are discussed in this section.

3.6.1 Major Mines with Existing Permits and Bonds

Washington's four permitted mines are listed in Table 3.6.1, **Washington Major Hardrock Mines, Mines with Existing Permits and Bonds**. Complete information on Washington's reclamation and closure bond amounts was not obtained from the various regional divisions of the agencies.

3.6.2 Reclamation and Closure Bonding Regulatory Features

In 1970, Washington was one of the first states to enact a mined land reclamation act. In 1993, the act was subsequently amended with significant revisions and additions. In 1994, the Metal Mining and Milling Act was passed, providing additional authority to promulgate rules and regulate water quality and associated aspects of mining operations.

The Washington Surface Mining and Metal Mining and Milling Acts contain extensive, detailed performance standards as reclamation plan requirements. These requirements address key elements of surface reclamation, hydrology and revegetation. Together with the existing water quality regulations under the authority of the Washington Department of Ecology, regulators have broad discretion to require bonding for nearly every potential impact to the environment.

Additional information on Washington's Surface Mining Act and associated rules as they pertain to reclamation and closure bonding is contained in Table 3.6.2, **Washington Reclamation and Closure Bonding Features**.

**Table 3.6.1 – Washington Major Hardrock Mines
Mines with Existing Permits and Bonds**

Mine Name	Ownership	Commodity	Type	Status	Disturbed Acres	Bond Amount
Cannon	Asamera Minerals Inc.	Gold, Silver	Underground, Flotation Mill	Closed – Reclamation		\$500,000
Kettle River Key East/West	Echo Bay Mines Ltd.	Gold, Silver	Open Pit and Underground, Vat Leach	Operating Mill, Reclamation	41	\$832,666
Kettle River – Lamefoot/K2 Expansion	Echo Bay Mines Ltd.	Gold, Silver	Underground, Vat Leach	Operating		\$8,300,000
Republic	Hecla Mining Co.	Gold Silver	Underground, Flotation and Vat Leach	Operating	38	\$2,513,785
Total					79	\$3,346,451⁷

⁷ Total does not include Cannon or Lamefoot/K2 Mine (no acreage available).

Table 3.6.2 – Washington Reclamation and Closure Bonding Features

Statutes, Regulations and Guidelines	<p>Surface Mining Act Title 78, Chapter 44 Revised Codes of Washington (RCW) [Enacted 1970, revised 1993]</p> <p>Metal Mining and Milling Act Title 78, Chapter 56 RCW [Enacted 1994]</p>
Authority	
Governing State Body	
Lead State Agency	The department of natural resources is charged with the administration of reclamation under this chapter. In order to implement and enforce this chapter, the department, under the administrative procedure act (chapter 34.05 RCW), may from time to time adopt those rules necessary to carry out the purposes of this chapter. ^{cviii}
Bonding Required By State	(7) Only one agency may require a performance security to satisfy the deposit requirements of RCW 78.44.087, and only one agency may require a performance security to satisfy the deposit requirements of this section. However, a single performance security, when acceptable to both the department of ecology and the department of natural resources, may be utilized by both agencies to satisfy the requirements of this section and RCW 78.44.087. ^{cxix}
And	
Relationship with Federal Agencies	<p>(8) No other state agency or local government other than the department shall require performance security for the purposes of surface mine reclamation. The department may enter into written agreements with federal agencies in order to avoid redundant bonding of surface mines straddling boundaries between federally controlled and other lands within Washington state.^{cx}</p> <p>The department may cooperate with other governmental and private agencies and agencies of the federal government, and may reasonably reimburse them for any services the department requests that they provide. The department may also receive any federal funds, state funds and any other funds and expend them for reclamation of land affected by surface mining and for purposes enumerated in RCW 78.44.060.^{cxii}</p>
Exemptions to Reclamation Bonding	
Activities Prior to Regulation	Miners and permit holders shall not be required to reclaim any segment where all surface mining was completed prior to January 1, 1971. However, the department shall make an effort to reclaim previously abandoned or completed surface mining segments. ^{cxiii}
Size Limitations	(17)(a) "Surface mine" means any area or areas in close proximity to each other, as determined by the department, where extraction of minerals from the surface results in: (i) More than three acres of disturbed area; (ii) Mined slopes greater than thirty feet high and steeper than 1.0 foot horizontal to 1.0 foot vertical; or (iii) More than one acre of disturbed area within an eight acre area, when the disturbed area results from mineral prospecting or exploration activities. (b) Surface mines include areas where mineral extraction from the surface occurs by the auger method or by reworking mine refuse or tailings, when these activities exceed the size or height thresholds listed in (a) of this subsection. ^{cxiii}

<p>Reclamation Plan Requirements</p>	<p>The need for, and the practicability of, reclamation shall control the type and degree of reclamation in any specific instance. However, the basic objective of reclamation is to reestablish on a continuing basis the vegetative cover, slope stability, water conditions, and safety conditions suitable to the proposed subsequent use consistent with local land use plans for the surface mine site.</p> <p>Each permit holder shall comply with the minimum reclamation standards in effect on the date the permit was issued and any additional reclamation standards set forth in the approved reclamation plan. The department may modify, on a site specific basis, the minimum reclamation standards for metals mining and milling operations regulated under chapter 232, Laws of 1994 in order to achieve the reclamation and closure objectives of that chapter. The basic objective of reclamation for these operations is the reestablishment on a continuing basis of vegetative cover, slope stability, water conditions, and safety conditions.</p> <p>Reclamation activities, particularly those relating to control of erosion and mitigation of impacts of mining to adjacent areas, shall, to the extent feasible, be conducted simultaneously with surface mining, and in any case shall be initiated at the earliest possible time after completion of surface mining on any segment of the permit area.</p> <p>All reclamation activities shall be completed not more than two years after completion or abandonment of surface mining on each segment of the area for which a reclamation permit is in force.^{cxiv}</p> <p>Reclamation of surface mines permitted after June 30, 1993, and reclamation of surface mine segments addressed by reclamation plans modified after June 30, 1994, shall meet the following minimum standards except as waived in writing by the department.</p> <p>(1) Prior to surface mining, permit holders shall carefully stockpile all topsoil on the site for use in reclamation, or immediately move topsoil to reclaim adjacent segments, except when the approved subsequent use does not require replacing the topsoil. Topsoil needed for reclamation shall not be sold as a mineral nor mixed with sterile soils. Stockpiled materials used as screening shall not be used for reclamation until such time as the appropriate county or municipal government has given its approval.</p> <p>(2) The department may require that clearly visible, permanent monuments delineating the permit boundaries and maximum extent of the disturbed area be set at appropriate places around the minesite. The permit holder shall maintain the monuments until termination of the reclamation permit.</p> <p>(3) All minimum reclamation standards may be waived in writing by the department in order to accommodate unique and beneficial reclamation schemes such as parks, swimming facilities, buildings, and wildlife reserves. Such waivers shall be granted only after written approval by the department of a reclamation plan describing the variances to the minimum reclamation standards, receipt of documentation of SEPA compliance, and written approvals from the landowner and by the local land use authority.</p> <p>(4) All surface-mined slopes shall be reclaimed to the following minimum standards:</p> <p>(a) In surface mines in soil, sand, gravel, and other unconsolidated materials, all reclaimed slopes shall: (i) Have varied steepness; (ii) Have a sinuous appearance in both profile and plan view (iii) Have no large rectilinear topographic elements; (iv) Generally have slopes of between 2.0 and 3.0 feet horizontal to 1.0 foot vertical or flatter except in limited areas where steeper slopes are necessary in order to create sinuous topography and to control drainage; (v) Not exceed 1.5 feet horizontal to 1.0 foot vertical except as necessary to blend with adjacent natural slopes; (vi) Be compacted if significant backfilling is required to produce the final reclaimed slopes and if the department determines that compaction is necessary.</p> <p>(b) Slopes in consolidated materials shall have no prescribed slope angle or height, but where a</p>
<p>Reclamation Plan</p>	

Requirements (continued)	<p>severely hazardous condition is created by mining and that is not indigenous to the immediate area, the slopes shall not exceed 2.0 feet horizontal to 1.0 foot vertical. Steeper slopes shall be acceptable in areas where evidence is submitted that demonstrates that the geologic or topographic characteristics of the site preclude reclamation of slopes to such angle or height or that such slopes constitute an acceptable subsequent use under local land use regulations.</p> <p>(c) Surface mines in which the seasonal or permanent water tables have been penetrated, thereby creating swamps, ponds, or lakes useful for recreational, wildlife habitat, water quality control, or other beneficial wetland purposes shall be reclaimed in the following manner: (i) For slopes that are below the permanent water table in soil, sand, gravel, and other unconsolidated materials, the slope angle shall be no steeper than 1.5 feet horizontal to 1.0 foot vertical; (ii) Generally, solid rock banks shall be shaped so that a person can escape from the water, however steeper slopes and lack of water egress shall be acceptable in rural, forest, or mountainous areas or where evidence is provided that such slopes would constitute an acceptable subsequent use under local land use regulations; (iii) Both standpipes and armored spillways or other measures to prevent undesirable overflow or seepage shall be provided to stabilize all such water bodies within the disturbed area; and (iv) Where lakes, ponds, or swamps are created, the permit holder shall provide measures to establish a beneficial wetland by developing natural wildlife habitat and incorporating such measures as irregular shoreline configurations, sinuous bathymetry and shorelines, varied water depths, peninsulas, islands, and subaqueous areas less than 1.5 foot deep during summer low-water levels. Clay-bearing material placed below water level may be required to avoid creating sterile wetlands.</p> <p>(d) Final topography shall generally comprise sinuous contours, chutes and buttresses, spurs, and rolling mounds and hills, all of which shall blend with adjacent topography to a reasonable extent. Straight planar slopes and right angles should be avoided.</p> <p>(e) The floors of mines shall generally grade gently into postmining drainages to preclude sheet wash erosion during intense precipitation, except where backgrading is appropriate for drainage control, to establish wetlands, or to trap sediment.</p> <p>(f) Topsoil shall be restored as necessary to promote effective revegetation and to stabilize slopes and mine floors. Where limited topsoil is available, topsoil shall be placed and revegetated in such a way as to ensure that little topsoil is lost to erosion.</p> <p>(g) Where surface mining has exposed natural materials that may create polluting conditions, including but not limited to acid-forming coals and metalliferous rock or soil, such conditions shall be addressed according to a method approved by the department. The final ground surface shall be graded so that surface water drains away from these materials.</p> <p>(h) All grading and backfilling shall be made with nonnoxious, noncombustible, and relatively incompactible solids unless the permit holder provides: (i) Written approval from all appropriate solid waste regulatory agencies; and (ii) Any and all revisions to such written approval during the entire time the reclamation permit is in force.</p> <p>(i) Final reclaimed slopes should be left roughly graded, preserving equipment tracks, depressions, and small mounds to trap clay-bearing soil and promote natural revegetation. Where reasonable, final equipment tracks should be oriented in order to trap soil and seeds and to inhibit erosion.</p> <p>(j) Pit floors should be bulldozed or ripped to foster revegetation.</p> <p>(5) Drainages shall be graded and contain adequate energy dissipation devices so that essentially natural conditions of water velocity, volume, and turbidity are reestablished within six months of reclamation of each segment of the mine. Ditches and other artificial drainages shall be constructed on each reclaimed segment to control surface water, erosion, and siltation and to direct runoff to a safe outlet. Diversion ditches including but not limited to channels, flumes,</p>
Reclamation Plan Requirements	

<p>(continued)</p>	<p>completing reclamation according to the approved reclamation plan or minimum standards and related administrative overhead for the area to be surface mined during (a) the next twelve-month period, (b) the following twenty-four months, and (c) any previously disturbed areas on which the reclamation has not been satisfactorily completed and approved.^{cxix}</p> <p>(2) The performance security shall be conditioned on the faithful performance of the applicant or operator in meeting the following obligations:</p> <p>(a) Compliance with the environmental protection laws of the state of Washington administered by the department of ecology, or permit conditions administered by the department of ecology, associated with the construction, operation, and closure pertaining to metals mining and milling operations, and with the related environmental protection ordinances and permit conditions established by local government when requested by local government;</p> <p>(b) Reclamation of metals mining and milling operations that do not meet the threshold of surface mining as defined by RCW 78.44.031(17);</p> <p>(c) Postclosure environmental monitoring as determined by the department of ecology; and</p> <p>(d) Provision of sufficient funding as determined by the department of ecology for cleanup of potential problems revealed during or after closure.</p> <p>(3) The department of ecology may, if it deems appropriate, adopt rules for determining the amount of the performance security, requirements for the performance security, requirements for the issuer of the performance security, and any other requirements necessary for the implementation of this section.^{cxx}</p>
<p>Phased Bonding</p>	<p>The permit holder shall reclaim each segment of the mine within two years of completion of surface mining on that segment except as provided in a segmental reclamation agreement approved in writing by the department. The primary objective of a segmental reclamation agreement should be to enhance final reclamation.^{cxxi}</p>
<p>Type of Bond Allowed</p>	<p>(2) This performance security may be: (a) Bank letters of credit acceptable to the department; (b) A cash deposit; (c) Negotiable securities acceptable to the department; (d) An assignment of a savings account; (e) A savings certificate in a Washington bank on an assignment form prescribed by the department; (f) Assignments of interests in real property within the state of Washington; or (g) A corporate surety bond executed in favor of the department by a corporation authorized to do business in the state of Washington under Title 48 RCW and authorized by the department.^{cxvii,cxviii}</p>
<p>Reclamation and Bonding Oversight</p> <p>Reclamation Monitoring and Compliance</p>	<p>The department may order at any time an inspection of the disturbed area to determine if the miner or permit holder has complied with the reclamation permit, rules, and this chapter. The department shall have special inspection requirements for metals mining and milling operations regulated under chapter 232, Laws of 1994. The department shall inspect these mining operations at least quarterly, unless prevented by inclement weather conditions, in order to ensure that the permit holder is in compliance with the reclamation permit, rules, and this chapter. The department shall conduct additional inspections as needed during the construction phase of these mining operations in order to ensure compliance with the reclamation permit, rules, and this chapter.^{cxviii}</p> <p>(1) State agencies with the responsibility for inspecting metals mining and milling operations regulated under this chapter shall conduct such inspections at least quarterly: PROVIDED, That the inspections are not prevented by inclement weather conditions.^{cxv}</p>

<p>Bond Review</p>	<p>(5) The department may increase or decrease the amount of the performance security at any time to compensate for a change in the disturbed area, the depth of excavation, a modification of the reclamation plan, or any other alteration in the conditions of the mine that affects the cost of reclamation. The department may, for any reason, refuse any performance security not deemed adequate.^{cxxvi}</p> <p>(4) The department of ecology may increase or decrease the amount of the performance security at any time to compensate for any alteration in the operation that affects meeting the obligations in subsection (2) of this section. At a minimum, the department shall review the adequacy of the performance security every two years.^{cxxvii}</p>
<p>Bond Forfeiture</p>	<p>The department of ecology may, with staff, equipment, and material under its control, or by contract with others, remediate or mitigate any impact of a metals mining and milling operation when it finds that the operator or permit holder has failed to comply with relevant statutes, rules, or permits, and the operator or permit holder has failed to take adequate or timely action to rectify these impacts. If the department intends to remediate or mitigate such impacts, the department shall issue an order to submit performance security requiring the permit holder or surety to submit to the department the amount of moneys posted pursuant to RCW 78.56.110. If the amount specified in the order to submit performance security is not paid within twenty days after issuance of the notice, the attorney general upon request of the department shall bring an action on behalf of the state in a superior court to recover the amount specified and associated legal fees. The department may proceed at any time after issuing the order to submit performance security to remediate or mitigate adverse impacts. The department shall keep a record of all expenses incurred in carrying out any remediation or mitigation activities authorized under this section, including: (1) Remediation or mitigation; (2) A reasonable charge for the services performed by the state's personnel and the state's equipment and materials utilized; and (3) Administrative and legal expenses related to remediation or mitigation. The department shall refund to the surety or permit holder all amounts received in excess of the amount of expenses incurred. If the amount received is less than the expenses incurred, the attorney general, upon request of the department of ecology, may bring an action against the permit holder on behalf of the state in the superior court to recover the remaining costs listed in this section.^{cxxviii,cxxix}</p>
<p>Bond Release</p>	<p>(6) Liability under the performance security shall be maintained until reclamation is completed according to the approved reclamation plan to the satisfaction of the department unless released as hereinafter provided. Liability under the performance security may be released only upon written notification by the department. Notification shall be given upon completion of compliance or acceptance by the department of a substitute performance security. The liability of the surety shall not exceed the amount of security required by this section and the department's reasonable legal fees to recover the security. (7) Any interest or appreciation on the performance security shall be held by the department until reclamation is completed to its satisfaction. At such time, the interest shall be remitted to the permit holder; except that such interest or appreciation may be used by the department to effect reclamation in the event that the permit holder fails to comply with the provisions of this chapter and the costs of reclamation exceed the face value of the performance security.^{cxxx}</p> <p>(5) Liability under the performance security shall be maintained until the obligations in subsection (2) of this section are met to the satisfaction of the department of ecology. Liability under the performance security may be released only upon written notification by the department of ecology. (6) Any interest or appreciation on the performance security shall be held by the department of ecology until the obligations in subsection (2) of this section have been met to the satisfaction of the department of ecology. At such time, the interest shall be remitted to the applicant or operator. However, if the applicant or operator fails to comply with the obligations of subsection (2) of this section, the interest or appreciation may be used by the department of ecology to comply with the obligations.^{cxxxii}</p>
<p>Public Participation in Bonding</p>	<p>No specific provisions for Public Participation in bonding are provided other than Citizen Action Suits.^{cxxxii}</p>

Other Significant Features	(2) Metals mining using the process of in situ extraction is permanently prohibited in the state of Washington. ^{cxxxiii} Metal Mining and Milling Act
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3.6.3 Reclamation and Closure Bonding Case Studies

3.6.3.1 Crown Jewel Mine

Introduction and Background

Battle Mountain Gold Co.’s proposed Crown Jewel mine project is located in northeast Washington. The proposal is to develop an open pit and cyanide milling gold and silver mine. The Final Environmental Impact Statement(EIS) has been completed and the state agencies have issued permits for much of the project. However, the Department of Agriculture and Department of the Interior recently denied the mine permits based on legal/technical issues related to ratios of millsite to mine site claim—issues which surround the antiquated 1872 Mining Law. Senator Gorton of Washington then attached a rider to a Kosovo relief-fund bill that would allow the mine to proceed. The rider passed in 1999. Other avenues of appeal are still available to environmental groups opposed to the mine.

Although the status of the Crown Jewel Mine remains unclear, the approach taken by the Washington State Department of Ecology and Department of Natural Resources is worthy of examination. Based on the available information, the reclamation and closure bond for the Crown Jewel mine appears to employ the most comprehensive and conservative methodology yet taken by any agency, state or federal.

The proposed project would disturb a total of 787 acres. Over half of the mine site (59 percent) is on land administered by the Forest Service, while 24 percent is on BLM lands, 15 percent is on private lands and two percent is on state lands.

Reclamation Bonding

As the lead agencies responsible for permitting and bonding, the Washington Department of Ecology and Department of Natural Resources have issued, or have proposed to issue, the following permits:

Permit	Bond Amount
<i>Reclamation (DNR)</i>	\$11,191,089
<i>Construction Air Quality Permit (DOE)</i>	\$818,844
<i>Construction Stormwater General Permit (DOE)</i>	\$231,635
<i>Dam Safety Permits (DOE)</i>	\$3,487,850
<i>Water Rights Permits (DOE)</i>	\$3,923,672
<i>Wildlife Mitigation (DOE)</i>	\$1,549,251
<i>Post-Reclamation Water Quality Treatment (DOE)</i>	\$31,000,000
<i>Post-Reclamation O&M and Monitoring (DOE)</i>	\$5,000,000
Total Reclamation and Closure Bond Amount	\$57,202,341

The Washington Department of Ecology provided a detailed reclamation surety cost estimate for only the reclamation bond amount shown above.^{cxxxiv} Table 3.6.3, **Reclamation and Closure Bond**

Estimate, Crown Jewel, WA, Cost Summary provides a summary of costs as contained in the estimate. Additional information describing the required reclamation and the basis for the estimated costs is provided in the following sections. The entire reclamation plan and basis for cost estimate was not made available, so additional information contained in this section is limited.

Cost Estimate Sources and Assumptions

The available information did not include cost estimate sources and assumptions.

Tailings Impoundment

Costs for detoxification, neutralization and dewatering of the tailings impoundment were not included in the cost estimate. Those costs are included as additional reclamation and closure costs in the Dam Safety Permit bond amount (\$3,487,850).

The tailings impoundment area will be recontoured, three feet of clay/till capping material will be applied, subsoil will be applied and the area will be graded and ripped. One foot of topsoil will be applied, followed by grading. Revegetation/stabilization will consist of seeding, mulch and fertilization, dozer gouging and erosion control netting. Also, trees and shrubs will be planted.

Waste Rock Dumps

The waste rock dumps will be recontoured at an average slope of 3H:1V with sinuous contours, subsoil will be applied and the area will be graded and ripped. One foot of topsoil will be applied, followed by grading. Revegetation/stabilization will consist of seeding, mulch and fertilization, dozer gouging and erosion control netting. Trees and shrubs will be planted.

Open Pit

The reclamation plan proposes partial backfill of the pit, together with blasting to eliminate highwall benches, to create riparian zones and wetlands.

Facilities, Roads, Diversions and Other

Demolition costs are included for major and ancillary buildings as well as removal of other facilities and debris. Some post-reclamation monitoring costs are also included in the removal costs (\$630,000).

The facilities and roads will be recontoured, subsoil will be applied and the area will be graded and ripped. One foot of topsoil will be applied, followed by grading. Revegetation/stabilization will consist of seeding, mulch and fertilization, dozer gouging and erosion control netting. Trees and shrubs will be planted

Indirect Costs

As noted in Table 3.6.3, the estimated reclamation bond costs for the proposed Crown Jewel mine include indirect costs for mobilization (three percent), engineering design (4.29 percent), contract administration (3.34 percent), profit and overhead (16.09 percent), sales and use tax (6.3 percent) and contingency (four percent). The indirect costs total about \$2.98 million. This equals 36 percent of the direct costs, or 27 percent of the total costs for reclamation.

**Table 3.6.3 - Reclamation and
Closure Bond Cost Estimate
Crown Jewel, WA
Cost Summary**

Item	Task	Description	Volume Cu. Yd.	Thickness Ft.	Acres	Unit	Unit Cost	Estimated Cost
1	Tailings Impoundment Reclamation	Detoxification/Neutralization			101	Acre	\$0	\$0
		Regrading/Contouring			101	Acre	\$0	\$0
		Subsoil			101	Acre	\$3,636	\$367,281
		Topsoil or Growth Medium			101	Acre	\$1,041	\$105,155
		Revegetation/Stabilization			101	Acre	\$2,180	\$220,182
		Sub-total			101	Acre	\$6,858	\$692,618
2	Waste Rock Dumps	Subsoil			288	Acre	\$6,346	\$1,827,626
		Topsoil or Growth Medium			288	Acre	\$760	\$218,858
		Revegetation/Stabilization			288	Acre	\$1,510	\$434,802
		Sub-total			288	Acre	\$8,616	\$2,481,286
3	Open Pit	Subsoil			138	Acre	\$271	\$37,439
		Topsoil or Growth Medium			138	Acre	\$271	\$37,421
		Revegetation/Stabilization			138	Acre	\$509	\$70,263
		Sub-total			138	Acre	\$1,052	\$145,123
4	Facilities, Roads, Diversions and Other	Facilities Demolition						\$3,334,140
		Subsoil			260	Acre	\$2,767	\$719,355
		Topsoil or Growth Medium			260	Acre	\$1,143	\$297,279
		Revegetation/Stabilization			260	Acre	\$2,033	\$528,590
		Sub-total			260	Acre		\$4,879,364
Sub-total Direct Costs								\$8,198,391
5	Indirect Costs	Mobilization @ 3.0%						\$245,952
		Engineering Design @ 4.29%						\$351,711
		Contract Management @3.34%						\$273,826
		Profit and Overhead @16.09%						\$1,319,121
		Sales and Use Tax @6.3%						\$464,000
		Contingency @ 4%						\$327,936
		Sub-total						
Total Reclamation Cost					787	Acre		\$11,180,937

3.7 WYOMING

Although Wyoming is well known for its oil and gas industry and its industrial coal and uranium mines, there are currently no major metalliferous hardrock mines in the state. No major economic precious or base metals deposits have been discovered in the modern mining era and no major metals mines are active in the state today.

3.7.1 Major Mines with Existing Permits and Bonds

Currently there are no major hardrock metal mines permitted to operate in Wyoming.

3.7.2 Reclamation and Closure Bonding Regulatory Features

Wyoming’s hardrock mine reclamation and closure standards are, for the most part, taken from its standards for coal and uranium fuel mines. Although these standards are fairly comprehensive in terms of reclamation performance, they are relatively non-descript in terms of cost estimating. For the most part, the state relies upon the operator’s estimates.

Additional information on Wyoming’s Mined Land Reclamation Act and associated rules as they pertain to reclamation and closure bonding are contained in Table 3.7.1, **Wyoming Reclamation and Closure Bonding Features**.

Table 3.7.1 – Wyoming Reclamation and Closure Bonding Features

<p>Statutes, Regulations and Guidelines</p>	<p>Wyoming Environmental Quality Act Title 35, Chapter 11 Wyoming Statutes (WS) [Revised 1995]</p> <p>Land Quality Division - Non-Coal Rules Chapter 1 – 13 (§521525, 528-533m 1717-1718) Wyoming Rules (WR) [Enacted 1992]</p>
<p>Authority</p> <p>Governing State Body And Lead State Agency</p> <p>Bonding Required By State And Relationship with Federal Agencies</p>	<p>Environmental Quality Council^{cxxxv}</p> <p>Department of Environmental Quality^{cxxxvi}</p> <p>No specific provisions.</p> <p>No specific provisions.</p>
<p>Exemptions to Reclamation Bonding</p> <p>Activities Prior to Regulation</p>	<p>Compliance generally; exceptions. (a) No mining operation or operation by which solid minerals are intended to be extracted from the earth shall be commenced after the effective date of the act, except in accordance with its requirements. It is recognized these measures are performed in the public interest and constitute an expense to the operator, and while this act</p>

<p>Activities Prior to Regulation (continued)</p> <p>Size Limitations</p>	<p>applies to all mining operations, no operator shall be compelled to perform at his own expense measures required under this act with respect to operations that were completed or substantially completed prior to the effective date of this act.^{cxxxvii}</p> <p>(e) The provisions of this article shall not apply to any of the following activities: (vi) Surface mining operations, whether commercial or noncommercial, for the removal of sand, gravel, scoria, limestone, dolomite, shale, ballast or feldspar from an area of ten (10) acres or less of affected land if the operator has written permission for the operation from the owner and lessee, if any, of the surface; provided that the operator shall notify the land quality division of the department of environmental quality of the location of the land to be mined before commencing operations.^{cxxxviii} (Also applied to hardrock operations 10 acres or less).</p>
<p>Reclamation Plan Requirements</p>	<p>"Reclamation" means the process of reclaiming an area of land affected by mining to use for grazing, agricultural, recreational, wildlife purposes, or any other purpose of equal or greater value. The process may require contouring, terracing, grading, resoiling, revegetation, compaction and stabilization, settling ponds, water impoundments, diversion ditches, and other water treatment facilities in order to eliminate water diminution to the extent that existing water sources are adversely affected, pollution, soil and wind erosion, or flooding resulting from mining or any other activity to accomplish the reclamation of the land affected to a useful purpose.^{cxxxix}</p> <p>ENVIRONMENTAL PROTECTION PERFORMANCE STANDARDS^{cxl}</p> <p>Section 1. General.</p> <p>This Chapter sets forth the environmental protection performance standards applicable to all mining operations. No mining operation shall be conducted except in compliance with the requirements hereof.</p> <p>Section 2. General environmental protection performance standards.</p> <p>(a) Land uses.</p> <p>(i) Reclamation shall restore the land to a condition equal to or greater than the "highest previous use." The land, after reclamation, must be suitable for the previous use which was of the greatest economic or social value to the community area, or must have a use which is of more economic or social value than all of the other previous uses. (ii) Operators are required to restore wildlife habitat, whenever the Administrator determines that this restoration is possible, on affected land in a manner commensurate with or superior to habitat conditions which existed before the land became affected, unless the land is private and the proposed use is for a residential or agricultural purpose which may preclude its use as wildlife habitat. (iii) Water impoundments used for recreational purposes shall be constructed in accordance with the statutes and (g) of this section. Recreational lands, other than water impoundments, represent changes in the land which may or may not be suitable for wildlife habitat.</p> <p>(b) Backfilling, grading and contouring.</p> <p>(i) Backfilling, grading, and contouring of affected land shall be accomplished by one or more of the following as detailed in the approved reclamation plan: (A) Reestablishment of the contour of the land in a manner consistent with the proposed future use of the land. (B) Reestablishment of adequate through drainage if such a provision is necessary to prevent pollution or diminution of the quantity and quality of the surface water and groundwater. (C) Contouring of affected land to blend in with the topography of the surrounding terrain unless so doing would create an erosion problem or a hazard to man or beast. (D) Creation of water impoundments for a use certified in an approved plan in accordance with the statutes and (g) of this section.</p>

<p>Reclamation Plan Requirements (continued)</p>	<p>(iii) Hard rock surface mining. (A) If the reclamation plan does not provide for a permanent water impoundment, all disturbed areas shall be returned to a condition suitable for the use specified in the approved plan. The final pit area shall be backfilled, graded, and contoured as much as possible considering the physical characteristics of the land and rock materials. Whenever possible, pitwalls shall be reduced, graded, and contoured to blend in with the topography of the surrounding terrain. Where it is not possible to reduce pitwalls, based on the character of the rock encountered or economic considerations, the pitwalls must be stabilized by terracing or other acceptable engineering techniques. Plans for pitwall stabilization shall be submitted in compliance with procedures specified. The base of the pits which will be partially surrounded by highwalls must be graded, contoured and prepared for topsoil placement. Graded and contoured access to the base of such pits must be provided. (B) If the reclamation plan provides for a permanent water impoundment and this use has been approved, all sources of possible water contamination within the pit must be covered with overburden or stabilized in such a manner so as not to contaminate the water in the resulting impoundment. Where possible, based on the characteristics of the rock, nature and extent of the mining operation, pitwalls extending above the projected water level within the pit area must be reduced, graded and contoured so as to blend in with the topography of the surrounding terrain. Where it is not possible to reduce pitwalls, based on the character of the rock involved or economic feasibility of reducing the highwalls, the highwalls must be stabilized by terracing or other acceptable engineering techniques. Plans for pitwall stabilization must be submitted III.2.,(b),(ii),(C) following the procedure as indicated in this Chapter. Graded and contoured access to the impoundment must be provided. Backfilling, grading and contouring of affected areas above the projected high water line that is not occupied by stabilized highwalls will be required when the physical land characteristics are such that this activity is possible.</p> <p>(c) Topsoil, subsoil, overburden, and refuse.</p> <p>(i) Topsoil. (A) All topsoil or approved surface material shall be removed from all areas to be affected in the permit area prior to these areas being affected unless otherwise authorized by the Administrator. The topsoil may be mixed with the subsoil but shall be segregated so as not to become mixed with spoil or waste material, stockpiled in the most advantageous manner and saved for reclamation purposes. The Administrator may authorize topsoil to remain on areas where minor disturbance will occur associated with construction and installation activities including but not limited to light-use roads, signs, utility lines, fences, monitoring stations and drilling provided that the minor disturbance will not destroy the protective vegetative cover, increase erosion, nor adversely affect the soil resource. (B) When topsoil is not promptly redistributed, the topsoil or approved surface material shall be stockpiled on stable areas within the permit area in such a manner so as to minimize wind and water erosion and unnecessary compaction. In order to accomplish this, the operator shall establish, through planting or other acceptable means, a quick growing cover of vegetation on the topsoil stockpiles. The topsoil shall also be protected from acid or toxic materials, and shall be preserved in a usable condition for sustaining vegetation when placed over affected land. Provided however, where long-term disturbance will occur, the Administrator may authorize the temporary distribution of topsoil to enhance stabilization of affected lands within the permit area. Where this is authorized, the Administrator shall find that the topsoil or subsoil capacity and productive capabilities are not diminished, that the topsoil is protected from erosion, and will be available for reclamation. (C) Reclamation shall follow mining as soon as is feasible so as to minimize the amount of time topsoil must be stockpiled. Where topsoil has been stockpiled for more than one year, the operator may be required to conduct nutrient analyses to determine if soil amendments are necessary. (D) Topsoil stockpiles shall be marked with a legible sign containing letters not less than six inches high on all approach roads to such stockpiles. Said signs shall contain the word "Topsoil" and shall be placed not more than 150 feet from any and all stockpiles of topsoil. Such signs must be in place at the time stockpiling is begun. (E) Topsoil, or an approved substitute, shall be distributed at an approximate uniform depth on the surface of all lands affected consistent with the approved permit and the post-mining land use. (F) If abundant topsoil is present, and it is not all needed to accomplish the reclamation required in the approved</p>
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<p>Reclamation Plan Requirements (continued)</p>	<p>reclamation plan, the Administrator may approve of use of this topsoil by this or another operator in another area for reclamation purposes. (G) Trees, large rocks and other waste material which may hinder redistribution of topsoil shall be separated from the topsoil before stockpiling.</p> <p>(ii) Subsoil. (A) Except as provided in (B), all subsoil determined by field methods or chemical analysis to be suitable as a plant-growth medium shall be removed from all areas to be affected and handled in accordance with the topsoil requirements of this section. (B) Upon an adequate demonstration by the operator that all or a portion of the subsoil material is not needed to meet the revegetation and land-use requirements of these regulations, the Administrator may authorize all or a portion of the subsoil to not be used for reclamation. The unused subsoil may then be regarded as overburden material and handled in accordance with the requirements of this section.</p> <p>(iii) Topsoil and subsoil substitutes. (A) If insufficient suitable topsoil or subsoil is available for salvage or redistribution, then an operator may use selected overburden as a topsoil substitute. The operator shall demonstrate by analysis or test plots that the substitute material is suitable as an alternative material. (B) Topsoil substitute stockpiles shall be segregated from topsoil and overburden piles and shall be identified as substitute material. Identification signs shall be placed not more than 150 feet from all stockpiles of substitute material. Such signs shall be in place at the time stockpiling is begun. (C) If overburden is to be used in reclamation as a substitute for topsoil, all large rocks and other waste material which may hinder redistribution shall be separated before stockpiling.</p> <p>(iv) Overburden, spoil and refuse. (A) All overburden, spoil material and refuse shall be segregated from the topsoil and subsoil and stockpiled in such a manner to facilitate the earliest reclamation consistent with the approved reclamation plan. (B) Except where diversions are authorized by these regulations, all overburden, spoil material, and refuse piles must be located to avoid blocking intermittent or perennial drainages and flood plains in order to minimize loss and spread of material due to water erosion. Ephemeral drainages may be blocked if environmentally sound methods for dealing with runoff control and sedimentation are approved by the Administrator. (I) For temporary stockpiles, material should be replaced in pits as soon as possible consistent with the approved reclamation plan to minimize the amount of time material is stockpiled. (II) If permanent overburden, spoil, or refuse piles have been approved by the Administrator, they shall be designed, graded and contoured so as to blend in with the topography of the surrounding terrain. Spoil material shall not be deposited on slopes that exceed 20 degrees, unless the operator demonstrates to the satisfaction of the Administrator that this material will be stable and can be revegetated as required by this section. The slopes of all spoil areas must be designed so that they will be stabilized against wind and water erosion. After the grading and contouring of these stockpiles, topsoil or approved subsoil must be distributed over them in preparation for the revegetation procedure. Revegetation must be completed in accordance with requirements of this chapter. A permanent drainage system must be established consistent with these regulations. (C) All topsoil shall be removed from areas to be used for piling spoil material prior to the beginning of piling this material. (D) The operator may be required to have analyses made of spoil material in order to determine if it will be a source of water pollution through reaction with leaching by surface water. If it is determined that this condition may exist, the operator shall describe proposed procedures for eliminating this condition. (E) All overburden and spoil material that is determined to be toxic, acid-forming or will prevent adequate reestablishment of vegetation on the reclaimed land surface, unless such materials occur naturally on the land surface, must be properly disposed of during the mining operation.</p> <p>(v) Management and final burial on the permit area of all industrial solid wastes generated by the operation (such as, but not limited to grease, lubricants, paints, flammable liquids, garbage, trash, discarded mining machinery, lumber and other combustible materials) shall be in accordance with this section and with provisions of the Solid Waste Management Rules and Regulations deemed appropriate by the Administrator.</p> <p>(d) Revegetation.</p> <p>(i) Revegetation of all affected lands shall be accomplished in a manner consistent with the</p>
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<p>Reclamation Plan Requirements (continued)</p>	<p>approved reclamation plan and the proposed future use of the land.</p> <p>(ii) Land which did not support vegetation prior to becoming affected land because of natural soil conditions need not be revegetated unless subsoil from such affected land will support vegetation. The operator shall demonstrate to the Administrator's satisfaction that revegetation or reforestation is not possible if he seeks to proceed under the provisions of the subsection.</p> <p>(iii) After backfilling, grading, and contouring and the replacement of topsoil, and/or approved substitutes, revegetation shall be commenced in such a manner so as to most efficiently accommodate the retention of moisture and control erosion on all affected lands to be revegetated. In addition, any fertilizer requirements as determined on the basis of previous analysis must be fulfilled.</p> <p>(iv) Seeding which is accomplished by mechanical drilling shall be on the topographic contour, unless for safety reasons it is not practicable, or perpendicular to the prevailing wind on flat areas. Seeding of affected lands shall be conducted during the first normal period for favorable planting conditions after final preparation unless an alternative plan is approved. Any rills or gullies that would preclude successful establishment of vegetation or achievement of post-mining land use shall be removed or stabilized. The species of vegetation to be used in revegetation efforts shall be described in the reclamation plan indicating the composition of seed mixtures and the amount of seed to be distributed on the area on a per acre basis. Seed types will depend on the climatic and soil conditions prevailing in the permit area and the proposed use of the land after reclamation. Species to be planted as permanent cover shall be self-renewing. Seeding rates will depend on seed types, climatic and soil conditions and the techniques to be used in seeding.</p> <p>(v) Introduced, naturalized or non-indigenous native plant species, may be included in the approved seed mixture if they support the approved post-mining land uses. The operator shall document, unless otherwise authorized by the Administrator, the suitability of these species using data from published literature, from experimental test plots, from on-site experience, or from other information sources.</p> <p>(vi) The Administrator shall not release the entire bond of any operator until such time as revegetation is completed, if revegetation is the method of reclamation as specified in the operator's approved reclamation plan. Revegetation shall be deemed to be complete when: (1) the vegetation cover of the affected land is shown to be capable of renewing itself under natural conditions prevailing at the site, and the vegetative cover and total ground cover are at least equal to the cover on the area before mining, (2) the productivity is at least equal to the productivity on the area before mining, (3) the species diversity and composition are suitable for the approved post-mining land use and the revegetated area is capable of withstanding grazing pressure at least comparable to that which the land could have sustained prior to mining, unless Federal, State or local regulations prohibit grazing on such lands, and (4) the requirements in (1), (2) and (3) are met for the last 2 consecutive years of the bonding period. The Administrator shall specify quantitative methods and procedures for determining whether equal cover and productivity has been established including, where applicable, procedures for evaluating post-mining species diversity and composition. The following options or an alternative success standard approved by the Administrator are available: (A) The method utilizing control areas may be selected. If selected, the control areas shall be sampled for cover, productivity, species diversity and composition in the same season that the area to be affected is sampled for baseline data. Quantitative premining and post-mining vegetation data from the control areas shall be used to mathematically adjust premining affected area data for climatic change. Premining affected area cover and productivity data will be directly compared by statistical procedures to data from the reclaimed vegetation type when evaluating revegetation success for final bond release. Species diversity and composition data will be qualitatively or quantitatively evaluated as determined by the Administrator. (B) The method utilizing reference areas may be selected. If selected, the representativeness of the reference area is verified by a statistical comparison to the plant community that it typifies. Post-mining cover and productivity data from the reference area are directly compared by standard statistical procedures to data from the reclaimed area when evaluating revegetation success for final bond release. Species diversity and composition data will be qualitatively or quantitatively evaluated as determined by the Administrator. (C) Where</p>
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<p>Reclamation Plan Requirements (continued)</p>	<p>the premining cover, productivity, species diversity and composition data cannot be collected, or where the area to be affected is small and incidental to the operation, comparison areas may be selected. For purposes of this method, post-mining qualitative and quantitative data from the comparison area are directly compared by procedures acceptable to the Administrator to data from the reclaimed lands when evaluating success of revegetation for final bond release.</p> <p>(D) Without regard to the type of method selected, control, reference or comparison areas should be at least two acres in size, located in areas where they will not be affected by future mining, while serving their designated use, managed in a fashion which will not cause significant changes in the vegetation parameters of cover, productivity, species diversity and composition and be representative of the post-mining land use. (E) If reforestation for commercial harvest is the method of revegetation, reforestation shall be deemed to be complete when a reasonable population density as established in the reclamation plan has been achieved, the trees have shown themselves capable of continued growth for a minimum period of five (5) years following planting, and the understory vegetation is adequate to control erosion and is appropriate for the land-use goal. Quality and quantity, vegetation cover, productivity, and species diversity shall be determined in accordance with scientifically acceptable sampling procedures approved by the Administrator. (F) When the approved reclamation plan is to return to cropland, reclamation shall be deemed to be complete when productive capability is equivalent, for at least two consecutive crop years, to the premining conditions or approved reference areas. The premining production data for the reclaimed site shall be considered in judging completeness of reclamation whenever said data are available.</p> <p>(vii) Any plans for irrigation must be explained.</p> <p>(viii) The operator must protect young vegetative growth from being destroyed by livestock by fencing or other approved techniques for a period of at least two (2) years, or until the vegetation is capable of renewing itself with properly managed grazing and without supplemental irrigation or fertilization. The Administrator, permittee and the landowner or land managing agency shall determine when the revegetated area is ready for livestock grazing.</p> <p>(ix) In those areas where there were no or very few noxious weeds prior to being affected by mining, the operator must control and minimize the introduction of noxious weeds into the revegetated areas for a period of at least five years after the initial seeding.</p> <p>(e) Diversion systems – Unchannelized surface water and ephemeral streams.</p> <p>(i) Surface water shall be diverted around the operation for the following purposes: (A) To control water pollution. (B) To control unnecessary erosion. (C) To protect the on-going operation. (D) To protect the water rights of down-stream users.</p> <p>(ii) Temporary diversion of surface runoff or diversions used for erosion control shall meet the following standards: (A) In soils or other unconsolidated material, the sides of diversion ditches shall be no steeper than one and one-half to one (1-1/2:1). (B) In rock, the sides of diversion ditches shall not overhang. (C) In soils or unconsolidated materials, the sides and, in ditches carrying intermittent discharges, the bottom shall be seeded with approved grasses so as to take advantage of the next growing season. (D) Rock riprap, concrete, soil cement or other methods shall be used where necessary to prevent unnecessary erosion. (E) Culverts or bridges shall be installed where necessary to allow access by the surface owner for fire control and other purposes. (F) Diversion ditches shall in a nonerosive manner pass the peak runoff from a two-year six-hour precipitation event, or a storm duration that produces the largest peak flow, as specified by the Administrator.</p> <p>(iii) In no case shall diversion ditches discharge upon topsoil storage areas, spoil or other unconsolidated material such as newly reclaimed areas.</p> <p>(iv) Permanent diversion structures shall be designed to be erosionally stable during the passage of the peak runoff from a 100-year, six-hour precipitation event, or a storm duration that produces the largest peak flow, as specified by the Administrator.</p> <p>(f) Diversion of intermittent and perennial streams.</p>
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<p>Reclamation Plan Requirements (continued)</p>	<p>(i) In no case shall spoil, topsoil, or other unconsolidated material be pushed into, or placed below the flood level of a perennial or intermittent stream except during the approved construction of the diversion of said stream.</p> <p>(ii) The Wyoming Game and Fish Department shall be consulted prior to the approval of a diversion of a perennial or intermittent stream.</p> <p>(iii) The banks of a diverted perennial or intermittent stream shall be protected by vegetation by planting approved species to take advantage of the next growing season.</p> <p>(iv) The banks and channel of a diverted perennial or intermittent stream shall be protected where necessary by rock, riprap or similar measures to minimize erosion and degradation of water quality. Permanent diversions shall be designed and constructed to be erosionally stable. The design of the permanent diversion shall also be consistent with the role of the fluvial system.</p> <p>(v) Mining on the flood plain of a perennial or intermittent stream shall not be permitted if it would cause the uncontrolled diversion of the stream during periods of high water.</p> <p>(vi) Waters flowing through or by the mining operation shall meet the standards set by the U.S. Environmental Protection Agency and the Wyoming Water Quality Division in regard to the effect of the operation upon such waters.</p> <p>(vii) Channel and flood plain shall be designed to pass, in a nonerosive manner, the 10-year, six-hour precipitation event, if temporary, or the 100-year, six-hour precipitation event, if permanent, or a duration having a greater peak flow, as specified by the Administrator. Cross-sections of the existing stream above, below and within the disturbed area may be used to determine the flow capacities, channel configuration and shape.</p> <p>(g) Permanent water impoundments. Permanent water impoundments shall be constructed in accordance with the following requirements:</p> <p>(i) Dams must contain an overflow notch and spillway so as to prevent failure by overfilling and washing. Overflow notches and spillways must be riprapped with rock or concrete to prevent erosion.</p> <p>(ii) The slopes around all water impoundments must be gentle enough so as not to present a safety hazard to humans or livestock and so as to accommodate revegetation. Variations from this procedure may be approved by the Administrator based on the conditions present at the individual locality.</p> <p>(iii) Mineral seams and other sources of possible water contamination within the impoundment area must be covered with overburden or stabilized in such a manner to prevent contamination of the impounded water.</p> <p>(iv) Bentonite or other mire-producing material within the impoundment basin shall be removed or covered with materials which will prevent hazards to man or beast.</p> <p>(h) Tailings impoundments excluding uranium mill tailings impoundments.</p> <p>(i) Impoundments to contain mill tailings or slurry tailings shall be constructed in accordance with established engineering principles and shall be approved by the Wyoming State Engineer's Office. A copy of the State Engineer's approval shall be attached to the application.</p> <p>(ii) Reclamation of tailings impoundments shall be accomplished by removal and storage of all topsoil present within the tailings basin. After termination of operations, the topsoil shall be replaced and revegetated in accordance with these rules and regulations. If other methods of reclamation and stabilization against wind and water erosion are found to be necessary because of natural conditions, this must be stated and described subject to the Administrator's approval.</p> <p>(i) Roads and railroads. Constructed or upgraded roads and railroad spurs shall be included within the permit area from that point that they provide exclusive service and shall be covered by a reclamation bond.</p> <p>(i) Roads shall not be constructed up a stream channel or so close that the material shall spill into the channel, unless specifically approved by the Administrator.</p>
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<p>Reclamation Plan Requirements (continued)</p>	<p>(ii) Streams shall be crossed at or near right angles unless contouring down to the stream bed will result in less potential stream bank erosion. Structure of ford entrances and exits must be constructed to prevent water from flowing down the roadway.</p> <p>(iii) Drainage control structures shall be used as necessary to control runoff and to minimize erosion, sedimentation and flooding. Drainage facilities shall be installed as road construction progresses.</p> <p>(iv) Culverts shall be installed at prominent drainageways, or as required by the Administrator. Where necessary, culverts must be protected from erosion by adequate rock, concrete or riprap. Culverts and drainage pipes shall be constructed to avoid plugging, collapsing, or erosion at inlets and outlets.</p> <p>(v) Trees and vegetation may be cleared only for the essential width necessary to maintain slope stability and to serve traffic needs.</p> <p>(vi) Access, haul roads and drainage structures shall be routinely maintained.</p> <p>(vii) Other transport facilities and utilities shall be constructed and maintained to control diminution of degradation of water quality and quantity and to the extent possible prevent additional contributions of suspended solids to streamflow outside the permit area.</p> <p>(viii) Exemptions concerning roads. (A) If approval is obtained from the surface landowner to leave a road unreclaimed, an operator may request in writing to the Land Quality Division that a road be permitted to remain unreclaimed. The operator must furnish proof of the surface landowner's approval. Final decision of road reclamation will be made by the Land Quality Division Administrator. (B) In the event that the surface landowner, a city or town, another agency of the State of Wyoming or an agency of the United States government has requested that a road not be reclaimed, no bond shall be required of the applicant for the reclamation of the road and reclamation of the road shall not be required; provided, however, that the Administrator receives a copy of the written request from the surface owner, city or town, or agency of the State or Federal Government, for retention of the road.</p> <p>(j) Disposal of buildings and structures.</p> <p>(i) All buildings and structures constructed, used or improved by the operator must be removed or dismantled unless it can be demonstrated to the Administrator's satisfaction that the buildings or structures will be of beneficial use in accomplishing the proposed use of the land after reclamation or for environmental monitoring.</p> <p>(ii) If the operator does not wish to remove certain buildings or facilities, he must obtain the written consent of the surface landowner to leave the buildings or facilities intact. The operator must make a request in writing, providing written proof of the above to the Land Quality Division, that the buildings or facilities be permitted to remain intact.</p>
<p>Bonding Requirements</p> <p>Bond Amount And Calculation</p>	<p>Bonding provisions (a) The purpose of any bond required to be filed with the administrator by the operator shall be to assure that the operator shall faithfully perform all requirements of this act and comply with all rules and regulations of the board made in accordance with the provisions of this act.^{exli}</p> <p>(c) The amount of any bond to be filed with the administrator prior to commencing any mining shall be: (i) For an initial bond the amount equal to the estimated cost of reclaiming the affected land disturbed and restoring, as defined in W.S. 35-11-103(f)(iii), any groundwater disturbed by in situ mining during the first year of operation under each permit. The estimated cost shall be based on the operator's cost estimate submitted with the permit plus the administrator's estimate of the additional cost to the state of bringing in personnel and equipment should the operator fail or the site be abandoned. In no event shall the bond be less than ten thousand dollars (\$10,000.00), except for sand and gravel, pumice, scoria or jade mining or any mine, except surface coal mines, the affected land of which, excluding roads, is ten (10) acres or less, in which case the bond amount shall be set by the administrator with approval of the director to cover the cost of reclamation, and in no event less than two hundred dollars (\$200.00) per acre, for affected land.^{exlii}</p>

Bond Forfeiture (continued)	<p>information with respect to the alleged violation. At the conclusion of the hearing, the council shall either withdraw the notice of violation or enter an order forfeiting the bond.^{cxlvi}</p> <p>(e) When the reclamation plan for any affected land has been completed, the administrator may recommend to the director the release of up to seventy-five percent (75%) of the bond required for that affected land. The remaining portion of the bond shall be not less than ten thousand dollars (\$10,000.00), and shall be held for a period of at least five (5) years after the date of reduction to assure proper revegetation and restoration of groundwater. The retained portion of the bond may be returned to the operator at an earlier date if a release signed by the surface owner and approved by the administrator and director is obtained.^{cxlvii}</p>
Public Participation in Bonding	No specific provisions for public participation in bonding.
Other Significant Features	Self Bonding Program WR § 1717

3.8 U.S. FOREST SERVICE Reclamation and Closure Bonding Provisions

3.8.1 U.S. Forest Service Bonding Process

The U.S. Forest Service reclamation and closure bonding process is derived from 36 CFR Part 228 regulations, promulgated in 1974, that set forth the rules and procedures through which use of the surface of National Forest System lands are governed in connection with operations authorized by the United States mining laws. Part 228 contains the following reclamation and closure provisions:

Reclamation

Upon exhaustion of the mineral deposit or at the earliest practicable time during operations, or within 1 year of the conclusion of operations, unless a longer time is allowed by the authorized officer, operator shall, where practicable, reclaim the surface disturbed in operations by taking such measures as will prevent or control onsite and off-site damage to the environment and forest surface resources including: (1) Control of erosion and landslides; (2) Control of water runoff; (3) Isolation, removal or control of toxic materials; (4) Reshaping and revegetation of disturbed areas, where reasonably practicable; and (5) Rehabilitation of fisheries and wildlife habitat.^{cxlviii}

Bonds

(a) Any operator required to file a plan of operations shall, when required by the authorized officer, furnish a bond conditioned upon compliance with § 228.8(g), prior to approval of such plan of operations. In lieu of a bond, the operator may deposit into a Federal depository, as directed by the Forest Service, and maintain therein, cash in an amount equal to the required dollar amount of the bond or negotiable securities of the United States having market value at the time of deposit of not less than the required dollar amount of the bond. A blanket bond covering nationwide or statewide operations may be furnished if the terms and conditions thereof are sufficient to comply with the regulations in this part.

(b) In determining the amount of the bond, consideration will be given to the estimated cost of stabilizing, rehabilitating, and reclaiming the area of operations.

(c) In the event that an approved plan of operations is modified in accordance with § 228.4 (d) and (e), the authorized officer will review the initial bond for adequacy and, if necessary, will adjust the bond to conform to the operations plan as modified.

(d) When reclamation has been completed in accordance with § 228.8(g), the authorized officer will notify the operator that performance under the bond has been completed: Provided, however, That when the Forest Service has accepted as completed any portion of the reclamation, the authorized officer shall notify the operator of such acceptance and reduce proportionally the amount of bond thereafter to be required with respect to the remaining reclamation.^{cxlix}

In addition, the Forest Service has promulgated rules governing surface management and mineral management activities. The rules are cited in Forest Service Manual (FSM) 2801, and include the following provisions specific to reclamation and closure bonding:

Reclamation Performance Standards

In addition to a consideration of appropriate reclamation components (FSM 2841), a Plan of Operation shall include measurable performance standards for all reclamation requirements in the plan. Develop performance standards for at least the following:

1. Revegetation.
2. Soil and water conservation measures.
3. Mass stability of overburden or other waste embankments.
4. Concurrent reclamation.
5. Post-mining land configuration.

Regions or Forests should develop Region-wide or Forest-wide reclamation performance standards for common reclamation practices. Use performance standards in determining the amount of the reclamation bond, surety, or other financial guarantee and as criteria for release of these instruments.^{cl}

Reclamation Bonding

Tie dollar amounts of bonds or other financial guarantees to specific reclamation activities or standards to facilitate full or partial release of the instruments. Release bonds or other guarantees as satisfactory reclamation is performed and completed, and the area stabilized. Avoid multiple or excessive bonding. See FSM 2846 for direction on bonding when other agencies with bonding authority are involved in the administration of mineral activities on National Forest System lands.^{cli}

Reclamation Monitoring

Regional Foresters and Forest Supervisors shall determine those sites that need monitoring to assess the condition and environmental quality of reclaimed sites following release of bonds or other financial guarantees. Base monitoring priorities on the degree of risk to human health and safety or on long-term environmental effects. Reclaimed sites or structures that might require monitoring include, but are not limited to, revegetated areas, large waste embankments, tailing dams and impoundments, french-drains, stream diversions, dam structures on permanent water impoundments, and water treatment facilities.^{clii}

3.9 BUREAU OF LAND MANAGEMENT Reclamation and Closure Bonding Provisions

The Bureau of Land Management's (BLM) regulatory program for hard rock mining is authorized under 43 CFR Part 3809.^{cliii} These regulations are currently under review by the Department of the Interior, and modifications to the "surface management" regulations of the BLM are expected in the coming year.

Part 3809 contains the following provisions relative to reclamation and bonding:

3.9.1 Reclamation and Bonding Provisions

43 CFR 3809.1-9 Bonding requirements.

- (a) No bond shall be required for operations that constitute casual use (§ 3809.1 - 2) or that are conducted under a notice (§ 3809.1 - 3 of this title).
- (b) Any operator who conducts operations under an approved plan of operations as described in § 3809.1 - 5 of this title may, at the discretion of the authorized officer, be required to furnish a bond in an amount specified by the authorized officer. The authorized officer may determine not to require a bond in circumstances where operations would cause only minimal disturbance to the land. In determining the amount of the bond, the authorized officer shall consider the estimated cost of reasonable stabilization and reclamation of areas disturbed. In lieu of the submission of a separate bond, the authorized officer may accept evidence of an existing bond pursuant to State law or regulations for the same area covered by the plan of operations, upon a determination that the coverage would be equivalent to that provided in this section.
- (c) In lieu of a bond, the operator may deposit and maintain in a Federal depository account of the United States Treasury, as directed by the authorized officer, cash in an amount equal to the required dollar amount of the bond or negotiable securities of the United States having a market value at the time of deposit of not less than the required dollar amount of the bond.
- (d) In place of the individual bond on each separate operation, a blanket bond covering statewide or nationwide operations may be furnished at the option of the operator, if the terms and conditions, as determined by the authorized officer, are sufficient to comply with these regulations.

Bond Review

- (e) In the event that an approved plan is modified in accordance with § 3809.1 - 7 of this title, the authorized officer shall review the initial bond for adequacy and, if necessary, adjust the amount of the bond to conform to the plan as modified.

Bond Release

- (f) When all or any portion of the reclamation has been completed in accordance with the approved plan, the operator may notify the authorized officer that such reclamation has occurred and that she/he seeks a reduction in bond or Bureau approval of the adequacy of the reclamation, or both. Upon any such notification, the authorized officer shall promptly inspect the reclaimed area with the operator. The authorized officer shall then notify the operator, in writing, whether the reclamation is acceptable. When the authorized officer has accepted as completed any portion of the reclamation, the authorized officer shall authorize that the bond be reduced proportionally to cover the remaining reclamation to be accomplished.
- (g) When a mining claim is patented, the authorized officer shall release the operator from that portion of the performance bond which applies to operations within the boundaries of the patented land. The authorized officer shall release the operator from the remainder of the performance bond, including the

portion covering approved means of access outside the boundaries of the mining claim, when the operator has completed acceptable reclamation. However, existing access to patented mining claims, if across Federal lands shall continue to be regulated under the approved plan. The provisions of this subsection do not apply to patents issued on mining claims within the boundaries of the California Desert Conservation Area (see § 3809.6 of this title).

Reclamation Requirements

§ 3809.2 Prevention of unnecessary or undue degradation.

§ 3809.2 - 1 Environmental assessment.

(a) When an operator files a plan of operations or a significant modification which encompasses land not previously covered by an approved plan, the authorized officer shall make an environmental assessment or a supplement thereto to identify the impacts of the proposed operations on the lands and to determine whether an environmental impact statement is required.

(b) In conjunction with the operator, the authorized officer shall use the environmental assessment to determine the adequacy of mitigating measures and reclamation procedures included in the plan to insure the prevention of unnecessary or undue degradation of the land. If an operator advises the authorized officer that he/she is unable to prepare mitigating measures, the authorized officer, in conjunction with the operator, shall use the environmental assessment as a basis for assisting the operator in developing such measures.

(c) If, as a result of the environmental assessment, the authorized officer determines that there is substantial public interest in the plan, the authorized officer shall notify the operator, in writing, that an additional period of time, not to exceed the additional 60 days provided for approval of a plan in § 3809.1 - 6 of this title, is required to consider public comments on the environmental assessment.

§ 3809.2 - 2 Other requirements for environmental protection.

All operations, including casual use and operations under either a notice (§ 3809.1 - 3) or a plan of operations (§ 3809.1 - 4 of this title), shall be conducted to prevent unnecessary or undue degradation of the Federal lands and shall comply with all pertinent Federal and State laws, including but not limited to the following:

(a) Air quality. All operators shall comply with applicable Federal and State air quality standards, including the Clean Air Act (42 U.S.C. 1857 et seq.).

(b) Water quality. All operators shall comply with applicable Federal and State water quality standards, including the Federal Water Pollution Control Act, as amended (30 U.S.C. 1151 et seq.).

(c) Solid wastes. All operators shall comply with applicable Federal and State standards for the disposal and treatment of solid wastes, including regulations issued pursuant to the Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act (42 U.S.C. 6901 et seq.). All garbage, refuse or waste shall either be removed from the affected lands or disposed of or treated to minimize, so far as is practicable, its impact on the lands.

(d) Fisheries, wildlife and plant habitat. The operator shall take such action as may be needed to prevent adverse impacts to threatened or endangered species, and their habitat which may be affected by operations.

(e) Cultural and paleontological resources. (1) Operators shall not knowingly disturb, alter, injure, or destroy any scientifically important paleontological remains or any historical or archaeological site, structure, building or object on Federal lands.

(2) Operators shall immediately bring to the attention of the authorized officer any cultural and/or paleontological resources that might be altered or destroyed on Federal lands by his/her operations, and shall leave such discovery intact until told to proceed by the authorized officer. The authorized officer shall evaluate the discoveries brought to his/her attention, take action to protect or remove the

resource, and allow operations to proceed within 10 working days after notification to the authorized officer of such discovery.

(3) The Federal Government shall have the responsibility and bear the cost of investigations and salvage of cultural and paleontology values discovered after a plan of operations has been approved, or where a plan is not involved.

(f) Protection of survey monuments. To the extent practicable, all operators shall protect all survey monuments, witness corners, reference monuments, bearing trees and line trees against unnecessary or undue destruction, obliteration or damage. If, in the course of operations, any monuments, corners, or accessories are destroyed, obliterated or damaged by such operations, the operator shall immediately report the matter to the authorized officer. The authorized officer shall prescribe, in writing, the requirements for the restoration or reestablishment of monuments, corners, bearing and line trees.

3.9.2 Nevada BLM Bonding Process

The Nevada BLM bonding process is derived from the 43 CFR 3809 regulations. It is presented here to illustrate how the reclamation bonding and environmental standards included in the current BLM regulations are interpreted through Memorandum of Understanding between the federal agency and a state.

The following information relevant to bonding is included in the Nevada BLM Bonding Process:

Plans of Operations

1. For plans of operations (more than 5 acres of proposed disturbance), financial guarantees must be sufficient to cover 100 percent of the cost of reclaiming the proposed disturbance. All reclamation costs are to be calculated as if third party contractors were performing the reclamation after the site has been vacated by the operator. (It is recommended that the Reclamation Cost Estimation Summary Sheet for plans of operations be used).
2. Each acre of disturbance, or fraction thereof, shall require not less than \$2,000 per acre in bond coverage, regardless if the plan is for exploration or mining activities.
3. With the exception of sand and aggregate operations, all plan level operations must acquire a permit from the NDEP. The BLM in Nevada has a cooperative agreement with the NDEP concerning financial guarantees for plan level operations. Therefore, plans of operations do not require the certification of reclamation costs by a third party professional engineer. Each operation's bond amount will be set, cooperatively, by the appropriate BLM field office and the NDEP.
4. Although the Field Office District Manager sets the bond amount for BLM, all reclamation bonds held by the BLM, are to be filed with, processed by, and accepted or rejected by the BLM Nevada State Office in Reno. The bond instruments are held and maintained by the BLM Nevada State Office.
5. Financial guarantee instruments submitted to the BLM Nevada State Office are to be accompanied by the proper Nevada 3809 bond contract forms and power of attorney. The language of these bond contract forms has been approved by BLM's Regional Solicitor. Alternate language from an operator requires Regional Solicitor approval and will result in delays in bond acceptance by the BLM Nevada State Office.

Financial Guarantee Instruments

For plans of operations, the cooperative agreement between the Nevada BLM and the NDEP allows for joint cost determinations and the submittal of a single bond by an operator to satisfy the bond requirements of both agencies. Under cooperative agreement, the Nevada BLM will assume the responsibility for receiving, processing and holding all financial guarantees, except in the following cases:

1. The bond instrument for State of Nevada Reclamation Bond Pool coverage is approved and held by the Nevada Division of Minerals.
2. The bond coverage under the State of Nevada Corporate Guarantee is approved and held by NDEP.
3. In certain situations, such as an operation with little involved federal land, the bond instrument may be held by the NDEP through mutual agreement with BLM.

The BLM in Nevada accepts as financial guarantees for reclamation bonds the following instruments:

1. Surety Bonds – when the surety company is authorized to do business with the United States as approved by the U.S. Treasury Department.
2. Cash, Certified Check or Bank Draft – in an amount equal to the required dollar amount of the financial guarantee, to be deposited and maintained in a Federal depository account of the United States Treasury by the BLM.
3. Irrevocable Letters of Credit – from a bank or financial institution organized or authorized to transact business in the United States.
4. Certificates of Deposit – when placed through a bank whose deposits are insured by the FDIC, or a bank that is a Federal Reserve Branch Bank, and the deposit is not in excess of the insurable amount.
5. Negotiable Securities of the United States – having a market value at the time of deposit of not less than the required dollar amount of the financial guarantee.
6. State of Nevada Reclamation Bond Pool Coverage – when issued under NAC 519A510 and approved by the State of Nevada, Division of Minerals. The BLM Contract Form for Personal Bond is not required.
7. State of Nevada Corporate Guarantee (covers up to 75 percent of bond coverage) – when approved by NDEP under NAC 519A.350.

When bonding is completed through NDEP, under NAC519.350, the following financial guarantee instruments are accepted:

1. Trust Funds
2. Bonds (including Nevada Reclamation Bond Pool)
3. Irrevocable Letters of Credit
4. Insurance
5. Nevada State Corporate Guarantee

Statewide and Nationwide Bonds

The surface management regulations at 43 CFR 3802 and 3809 provide for statewide and nationwide bonds. Statewide bonds can be used to cover all of an operator's notices and plans of operations in one state, while nationwide bonds can be used in any states where the BLM administers lands open to general mining laws.

When notices or plans of operations (or both) are to be covered by the same statewide/nationwide bond, an operator must submit the bond, whether surety or personal, to the BLM for processing and acceptance.

Phased or Incremental Bonding

Upon request by the mining company, BLM in Nevada may allow phased or incremental bonding for plans of operations. Some plans can be designed so that operations will occur in distinct "blocks" or operational phases. Bond coverage will be adjusted to cover each of these phases as it progresses. In all cases, bond coverage is required prior to disturbance.

Similarly, reclamation can be designed to occur in distinct blocks or phases. An entire site may be reclaimed in phases or reclamation in one area may be completed while a new disturbance is beginning elsewhere in the same operation. In the latter case, a fixed amount of bond coverage may be "rolled over" from one part of the operation to another. The bond reduction and "roll over" provisions apply both to notices and plans of operations.

When earthwork and stabilization are completed for a site or area of an operation, the BLM may reduce the bond coverage by up to 60 percent of the reclamation cost. The remaining 40 percent will not be released until the disturbed area has been revegetated to a diverse, effective and permanent vegetative cover and any effluent discharge has met water quality standards without violation for at least a full year.

Transfer or Change of Operator

Any proposed change of operator must be promptly reported to the appropriate BLM field office. If the change of operator involves a submitted notice or approved plan of operations, reclamation responsibility will not be transferred until the BLM is assured that the new operator has satisfied the bonding requirements of the 43 CFR 3802 and 3809 regulations. Reclamation responsibility remains with the existing bond until satisfactory replacement bonding is certified (by notice) or accepted (by plan) for the operation.

Endnotes for Part III

- ⁱ AS § 27.19.010
- ⁱⁱ Id. § 27.05.010
- ⁱⁱⁱ Id. § 27.19.010
- ^{iv} Id. § 27.05.040
- ^v Id. § 27.19.060, see also AAC § 11.97.700
- ^{vi} Id. § 27.19.010, see also AAC § 11.97.100
- ^{vii} Id. § 27.19.050.
- ^{viii} Id. § 27.19.020
- ^{ix} AAC § 11 97.200
- ^x AS § 27.19.040
- ^{xi} AAC § 11.97.420
- ^{xii} Id. § 11.97.415
- ^{xiii} Id. § 11.97.400, see also AAC § 11.97.405, 410
- ^{xiv} AS § 27.20.021
- ^{xv} AAC § 11.97.435
- ^{xvi} AS § 27.19.040, see also AAC § 11.97.425
- ^{xvii} Red Dog Mine 1994 Reclamation Plan Outline, 1994-1999, Cominco Alaska, Inc.
- ^{xviii} IC § 47-1504
- ^{xix} Id. § 47-1504
- ^{xx} IAC § 20.03.02.001.04
- ^{xxi} Id. § 20.03.02.120.04
- ^{xxii} IC § 47-1518
- ^{xxiii} IAC § 20.03.02.140, see also IC § 47-1509, 1510
- ^{xxiv} Id. § 20.03.02.120.01, see also IC § 47-1512
- ^{xxv} Id. § 20.03.02.120.01
- ^{xxvi} Id. § 20.03.02.120.03
- ^{xxvii} Id. § 20.03.02.120.05
- ^{xxviii} Id. § 20.03.02.160.01
- ^{xxix} Id. § 20.03.02.120.04
- ^{xxx} Id. § 20.03.02.120.11
- ^{xxxi} Id. § 20.03.02.120.10
- ^{xxxii} Id. § 16.01.13.000
- ^{xxxiii} Id. § 16.01.13.001.02
- ^{xxxiv} L.F. Brown and Associates Inc. to John Lawson, Beartrack Mine, May 13, 1997.
- ^{xxxv} Steffen, Robertson and Kirsten to Thompson Creek Project, May 9, 1994.
- ^{xxxvi} Table provided by Salmon-Challis NF, Bond Amounts to Cover Thompson Creek Mine Through 1996.
- ^{xxxvii} MCA §2-15-3502
- ^{xxxviii} Id. §2-15-3501
- ^{xxxix} Montana Hard Rock and Placer Mining Requirements, p.1.
- ^{xl} MCA §82-4-323
- ^{xli} Montana Hard Rock and Placer Mining Requirements, p.1.
- ^{xlii} MCA §82-4-304
- ^{xliiii} Id. §82-4-305
- ^{xliv} Id. §82-4-336
- ^{xlv} Id. §82-4-338 (1)
- ^{xlvi} ARM §26.4.107T
- ^{xlvii} Id. §26.4.107T
- ^{xlviii} MCA §82-4-338 (1)
- ^{xliv} See also ARM §26.4.107V,W,X,Y,Z
- ^l MCA §82-4-341 (1)
- ^{li} ARM §26.4.107K
- ^{lii} MCA §82-4-341 (2)
- ^{liii} Id. §82-4-338 (2)

- liv Ibid.
- lv See also ARM §26.4.107U
- lvi MCA §82-4-341 (4)
- lvii Id. §82-4-341 (3)
- lviii Id. §82-4-338 (3) (4)
- lix Id. §82-4-355
- lx Id. §82-4-357
- lxi Montana Department of Environmental Quality Permitting and Compliance Division and United States Bureau of the Interior Bureau of Land Management – Headwaters Resource Area, June 29, 1998, Record of Decision for Proposed Mine Expansion, Golden Sunlight Mine Permit Amendments 008 and 010 to Operating Permit 00065, Jefferson County, Montana.
- lxii Montana Department of Environmental Quality Permitting and Compliance Division, Final June 29, 1998, Golden Sunlight Mine, Operating Permit #00065, Amendment 10 – Final Reclamation Bond.
- lxiii Montana Department of Environmental Quality Permitting and Compliance Division and United States Bureau of the Interior Bureau of Land Management – Phillips Resource Area, June 1998, Record of Decision, Zortman and Landusky Mines Reclamation Plan Modifications and Mine Life Extensions.
- lxiv Montana Department of Environmental Quality Permitting and Compliance Division, June 16, 1998, Revised Reclamation Estimate for the Record of Decision, Zortman and Landusky Bond Files, OP #00095.10 and #00096.10.
- lxv ORS § 517.840 (1)
- lxvi OAR § 632-035-0015 (4)
- lxvii ORS § 517.770
- lxviii OAR § 632-035-0016 (1) (b), see also ORS § 517.750
- lxix Id. § 632-035-0010 (19)
- lxx Id. § 632-035-0025 (2) (d)
- lxxi Id. § 632-035-0025 (2) (e) (A)
- lxxii Id. § 632-035-0025 (2) (e) (B)
- lxxiii ORS § 517.950
- lxxiv ORS § 517.810
- lxxv OAR § 632-035-0015 (2)
- lxxvi ORS § 517.860
- lxxvii OAR § 632-035-0045, see also ORS § 517.870
- lxxviii SDCL § 45-6B-73
- lxxix Id. § 45-6B-8
- lxxx Id. § 45-6B-9
- lxxxi Id. § 45-6B-53
- lxxxii Id. § 45-6B-3 (14)
- lxxxiii Id. § 45-6B-91
- lxxxiv SDAR § 74:29:07, see also SDAR § 74:29:02.11 and § 74:29:05
- lxxxv See also SDCL § 45-6B-37
- lxxxvi See also SDCL § 45-6B-38
- lxxxvii See also SDCL § 45-6B-39
- lxxxviii See also SDCL § 45-6B-40
- lxxxix See also SDCL § 45-6B-41
- xc See also SDCL § 45-6B-43
- lxi See also SDCL § 45-6B-42
- xcii See also SDCL § 45-6B-45(1)
- xciii See also SDCL § 45-6B-45(2)
- xciv See also SDCL § 45-6B-45(3)
- xcv See also SDCL § 45-6B-45(4)
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- xcviii Id. § 45-6B-21
- xcix SDAR § 74:29:02:08
- c SDCL § 45-6B-22
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 - cv Id. § 45-6B-25.
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 - cvi RCW § 78.44.040
 - cix Id. § 78.56.110
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 - cxii Id. § 78.44.070
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 - cxiii Id. § 78.44.031
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 - cxvii Id. § 78.44.087
 - cxviii Id. § 78.56.110
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 - cxxi Id. § 78.44.111
 - cxxii Id. § 78.44.087
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 - cxxv Id. § 78.56.070
 - cxxvi Id. § 78.44.087
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 - xxxi Id. § 78.56.110
 - xxxii See RCW § 78.56.140
 - xxxiii RCW § 78.56.160
 - xxxiv HEAPREC, Reclamation Financial Security Information, May 1997, Golder Associates.
 - xxxv WS § 35-11-112
 - xxxvi Id. § 35-11-104
 - xxxvii Id. § 35-11-401
 - xxxviii Id. § 35-11-401
 - xxxix ID. § 35-11-103 (e) (i)
 - xl WR § 523
 - xli WS § 35-11-417
 - xlii Id. § 35-11-417
 - xliiii Id. § 35-11-417
 - xliv LAND QUALITY DIVISION, Wyoming Department of Environmental Quality, Acceptable Bonding Instruments (<http://deq.state.wy.us/lqd/lqd.htm>)
 - xlvi WS § 35-11-417
 - xlvi Id. § 35-11-421
 - xlvi Id. § 35-11-417
 - xlvi 36CFR228.8(g)
 - xlvi 36CFR228.13
 - cl FSM 2842
 - cli FSM 2843
 - clii FSM 2844
 - cliii Nevada BLM Bonding Process for Notices and Plans of Operations Authorized by 43 CFR 3802/3809, 1998.

HARDROCK

Reclamation Bonding Practices

In the Western United States

Part IV - A NEW MODEL FOR RECLAMATION AND CLOSURE BONDING AND CRITIQUE OF PRESENT STATE AND FEDERAL STATUTES AND PRACTICES

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HARDROCK

Reclamation Bonding Practices In the Western United States

Part IV - A NEW MODEL FOR RECLAMATION AND CLOSURE BONDING AND CRITIQUE OF PRESENT STATE AND FEDERAL STATUTES AND PRACTICES

This section on reclamation bonding practices in the western United States contains a new regulatory model of bonding statutes for state and federal agencies. The recommended regulatory model is based largely upon the examination of present reclamation and closure statutes and practices in the western U.S. Existing statutes, which best represent the fundamental overall purpose and objectives of reclamation and closure bonding, are used to create the model. Because the recommended statutes represent the better features of current state programs, the reclamation bonding requirements in the model are reasonably attainable.

The section then takes this model and compares it to each state's current statutes and practices, giving recommendations on issues that need to be addressed. The critique of individual state statutes and practices is intended to point out the relative strengths and weaknesses of each state's current regulatory schemes and takes a critical approach to recognizing shortfalls and recommending modifications of these schemes. The U.S Forest Service and Bureau of Land Management regulations and practices are also critiqued.

4.1 A NEW MODEL FOR RECLAMATION AND CLOSURE BONDING

This section contains a recommended regulatory model for reclamation and closure bonding. The model is based on the objectives of reclamation bonding, an examination of present bonding regulations and consideration of the history of bonding issues such as environmental non-compliance and bankruptcy. The model suggests an overall common policy for reclamation and closure statutes and practices, and where state or federal regulations and practices might be improved.

The objectives of reclamation and closure bonding are to ensure:

- **Responsible conduct of mining operations**
- **Proper closure and reclamation**
- **Against potential catastrophe**
- **Against public liability**

The model is intended to achieve these objectives.

The model relies heavily on information derived from the examination of existing regulations and practices in each state. The case studies cited sometimes reflect past or site-specific practices that may not be consistent with overall state practices. Case studies also reflect an obvious difference in practices between mines in the same state. These differences occur either over time or in response to site-specific circumstances such as the occurrence of acid mine drainage.

The purpose of reclamation and closure bonding should clearly be to enable a response to the actions for which financial assurances are intended. For this reason, the recommended regulatory model also relies heavily on the agencies' past experiences with bankrupt mining operations.

The model articulates a uniform policy of minimum performance criteria and closure standards that should be adopted by the state and federal agencies. In addition, individual state and federal agencies should establish rules that allow more stringent goals and that take site-specific considerations into account.

Minimum reclamation performance criteria and closure standards should be used to establish uniform reclamation criteria and standards. In addition to these minimum performance standards, more stringent, state-specific performance criteria and standards should be adopted.

Currently no common yardstick exists to measure reclamation and closure bonding practices in the western United States. Neither the U.S. Forest Service nor the Bureau of Land Management (BLM) promotes use of its regulations as a minimum standard—neither of the agencies has established standards or engaged in consistent practices that could be adopted by the states. The U.S. Environmental Protection Agency (EPA) has produced numerous publications that make general recommendations for cleanup practices at abandoned mine sites. However, except in site-specific cases, the EPA has not developed any guidelines suggesting reclamation performance criteria and closure standards. It is also important to note that the EPA's primary mandate has normally been risk assessment and hazard abatement, which does not reflect all the goals of reclamation.¹

¹ Typically differentiating in EPA remediation resulting in "brownfields" versus typical reclamation goal of "greenfields; i.e., remediation versus restoration is separated by Superfund whereas most states don't differentiate in defining reclamation."

Unlike the hardrock metals mining industry, a primary federal regulatory authority oversees the coal industry, typically in cooperation with the state. Under the Surface Mining Control and Reclamation Act of 1977 (SMCRA), the U.S. Department of the Interior's Office of Surface Mining Reclamation and Enforcement (OSM) is responsible for reclamation of coal mining operations on federal, state and private lands. Among other things, the Act requires that a reclamation bond must be posted as a prerequisite for obtaining a coal mining permit. SMCRA also contains environmental protection and performance standards.

The purposes of SMCRA are to “establish a nationwide program to protect society and the environment from the adverse effects of surface coal mining operations” and to “assure that surface mining operations are not conducted where reclamation as required by this Act is not feasible.”² These objectives are also consistent with a demonstrated need to adopt a similar nationwide program for hardrock mining.

State reclamation statutes, regulations and guidelines should be regularly reviewed and revised as necessary to ensure the following: 1) that they meet minimum criteria and standards; 2) that they reflect current knowledge of reclamation and closure issues and practices and 3) that the means to achieve the objectives of reclamation bonding are enacted as law.

With the exception of Arizona and Nevada, the western states enacted various forms of mined land reclamation Acts in the 1960's and 1970's. Several states, particularly Alaska in 1992 and New Mexico in 1996, have recently revised their Acts to reflect current trends in mined land reclamation. Nevada passed its Mined Land Reclamation Act in 1989, which was followed by Arizona's Mined Land Reclamation Act in 1994.

The regulation of mined land reclamation is rapidly evolving and changing. As a result, many state statutes have become antiquated—a fact that becomes obvious when existing statutes fail to be consistent with accepted reclamation practice.

But there is also a wide discrepancy between more recent state laws. Arizona and New Mexico's Acts, which were enacted in 1994 and 1993, respectively, serve as an excellent example. Arizona's Act resembles those passed in the early 1970's—its scope and lack of specific provisions seem to ignore current trends in mining reclamation. New Mexico's Act, on the other hand, appears to have evolved with other states' regulations and, in many respects, represents “state-of-the-art” in bonding statutes and regulations.

In order to be consistent with the aforementioned “evolution,” a complete overhaul of the state laws is needed in Alaska, Arizona, Nevada and Utah. In most other states, revisions to specific portions of law have been identified in this section. Only minor changes in law have been recommended for Oregon and New Mexico.

The regulations under which both the U.S. Forest Service and the BLM operate are clearly antiquated and provide little or no guidance to the states. At best, these regulations are vague, allowing the federal regulators complete discretion as to interpretation. As a result, the federal agencies are of only minimal assistance in determining, bonding or enforcing reclamation and closure plans—their role has often done little to contribute to meeting the objectives of bonding regulation and practice. Substantial revisions to current federal agency regulations should be made.

² 30 USC 1202 Sec. 102

The alternative to revision of federal regulation is to look to the states to establish the authority for reclamation bonding and enforcement, relegating the federal agencies to an advisory role.

4.1.1 Governing State Body

The governing state body should be structured to ensure impartiality and provide for equal stakeholder representation.

A wide variety of governing state entities are responsible for the development and promulgation of reclamation and bonding regulations and standards. The scope of this study is insufficient to make particular recommendations as to which type of governing entity functions best. It is clear, however, that because of the political influence of the mining industry in most western states, governing entities (regardless of the number of individuals involved) are susceptible to bias, most often pro-industry.

Most multi-member governing entities attempt to provide for some form of representation from different stakeholder groups. However, because of their tendency to overemphasize the representation of regulatory officials, members of academia, chambers of commerce and other groups tied to the mining industry, these entities tend to be biased on the side of mining. It is possible to be both pro-mining and pro-environment, but such individuals are rare, especially within the entities responsible for mining/environmental affairs.

States should purposefully identify and include different stakeholder groups—such as landowner, tribal, conservation and environmental groups—in governing entities. States should particularly ensure their governing entities' function without the undue influence of industry or special interest groups.

4.1.2 Lead State Agency

A single state agency, preferably the agency responsible for environmental quality (water protection), should administer all reclamation and closure regulation. In cases where states choose to have the functions carried out by separate agencies, coordination between those agencies should be emphasized and a point of common knowledge and records established.

An examination of states whose surface reclamation programs and water quality programs are administered by different agencies, provides ample evidence of significant inconsistency, duplication of effort and, often times, failure to meet the objectives of reclamation and closure bonding. In many cases, the separation of authority makes it difficult or impossible to obtain clear information about existing bonds in the state.

One of the more common features of states with separate regulatory agencies is that closure issues are typically left unaddressed until closure of the mine is imminent. This means surface reclamation is not addressed from the standpoint of water quality. If one lesson stands clear from the information in this report's case studies, it is that surface reclamation must focus on water quality issues

It is currently the practice in Alaska, Arizona, California, Colorado, Idaho, Nevada and Utah to, for the most part, address water quality issues upon closure of the mine. These states might require bond funds for monitoring, but have failed to evaluate the potential for long-term water quality impacts; mines are not required to bond for water capture, conveyance, treatment or discharge facilities that might eventually be required. Montana, South Dakota and Washington require in most cases that water quality issues—including acid mine drainage (AMD) source control and water treatment in

perpetuity—be addressed in the reclamation plan and corresponding bond. New Mexico and Oregon, in future plans and bonds, will most likely also include up-front consideration of water quality issues.

While considered a progressive trend among most states to combine mine surface reclamation and water quality protection, some states, for various reasons, are hesitant to do so. Washington's regulatory scheme, in most respects, is a good example of how to successfully coordinate and conduct oversight using separate departments (in this case, the Department of Natural Resources and Department of Ecology). Washington's dual system lacks a common point of knowledge or records, however, which makes information less accessible to the public and creates an ambiguous sense of coordination between the two Departments.

4.1.3 Lands Bonded by State

I. All states should clearly specify that they require bonds for reclamation and closure on both state and private land. It should also be clear that bonding is required on any federal land relevant to the protection of state resources, particularly water.

All the western states currently require some form of reclamation and closure bonding. However, the authority for state regulators to require bonding on federal and private land varies considerably. For instance, some states require reclamation bonding on private land, but lack authority to require closure bonding.

Most states have statutes that clearly give them authority to bond on private, state and federal lands. In California, bonding is authorized at the county level for private, state and federal lands. South Dakota's statutes apparently do not provide for its authority over lands in the state.

Not all states have statutes that explicitly allow the requirement of bonding on federal land. Although most states provide for such authority (with provisions to prevent double-bonding), some states such as Arizona essentially dictate that the federal management agency has sole authority over the bonding of federal land. As a result, the state may not be able to bond for impacts to state water quality that occur on federal lands.

Although Nevada has the authority to require reclamation bonding on private land, it does not have the authority to bond for closure requirements on private land. This loophole in state law (which was apparently intended to allow private landowners to determine the end land-use) has resulted in a lack of bonding for heap leach dump rinsing and closure. One of Nevada's unique attributes is that, in many areas of the Carlin trend gold deposits and other rich areas in the state, every other section is made up of private land holdings. Many mining entities locate heap leach and tailings pond operations on private land to avoid the costs and necessary tasks required in closure regulations on state and federal land. Potential environmental problems—acid mine drainage from waste dumps, for instance—can also go unaddressed on the state's private lands. As a result, the bonding of private land operations is seriously questionable with respect to closure and long-term water quality. While this loophole is not readily evident in Nevada's statutes, its presence is apparently intended in the existing law. It is also probable that loopholes can be exploited in other state statutes to similarly avoid reclamation and closure responsibility on private land.

II. State and federal agencies should protect the interests of tribal governments and other entities affected by environmental impacts. This protection should allow tribal governments' full participation in addressing reclamation and closure issues that might affect their well being—culturally, aesthetically or environmentally. States should have clear authority to regulate

activities on tribal lands that might impact state waters or water quality. Tribal governments should be encouraged to adopt reclamation and closure performance and bonding standards.

The legacy of Native American mistreatment in the United States continues today. There have been significant environmental impacts caused by mining operations either on or adjacent to tribal lands. Although these impacts are more evident from coal and uranium mining, hardrock mines have also done their share of damage in the West. A recent and poignant reminder of these impacts—and the need to address them in reclamation and closure practice—is found at the Zortman-Landusky mine.

Since the 1970's, the Assiniboine and Gros Ventre tribes of the Fort Belknap Reservation in northeast Montana have been in a dispute with the agencies responsible for permitting the Zortman-Landusky mine. Together with the EPA, the Fort Belknap Indian Community brought suit against the mine in 1993. The result was a \$32.5 million dollar settlement for water quality violations and related mitigation.³ In 1999, the Interior Board of Land Appeals found that the BLM had failed to satisfy its trust obligation to protect the Fort Belknap Tribe's water, air and cultural resources.⁴

The Zortman-Landusky permitting process clearly demonstrates several deficiencies with respect to tribal concerns. First, the tribes lacked the technical capability and financial resources to participate in the permitting process. Second, they were not formally recognized as a co-lead or cooperating agency, much less a sovereign Nation, in the process. The current situation at Zortman-Landusky, which is unlikely to be resolved for several years, is both avoidable and unconscionable, and should serve as a lesson to substantially include tribal interests in the permitting process. In cases where impacts are likely, the tribal governments should retain the authority to require bonding. In cases where impacts are determined to be unacceptable, these governments should be able to veto permits.

Tribal governments should be encouraged to develop their own authority and capability for mining reclamation and closure or to provide oversight to state and federal regulatory authorities when their lands are affected. Reclamation performance criteria and closure standards should be developed for mining on tribal lands. The criteria and standards should include means to address cultural, historic and aesthetic values.

4.1.4 Relationship with Federal Agencies

States should cooperate with federal agencies. Memorandums of Understanding should set forth the terms of this cooperation to minimize conflict or duplication of roles. Where federal lands are involved, the applicant should be required to obtain approval from both the state and federal agencies before activities can begin. States should retain the authority to request additional bonding to ensure that requirements on all affected lands in the state are met.

Each state—and sometimes, each permit—establishes a unique relationship between state and federal agencies. The type of relationship between the agencies is dictated by the location of the project and the statutory relationship between the agencies. There are a variety of regulatory schemes between state and federal agencies.

The most common scheme is when the state acts as the lead agency or co-lead agency for projects on federal lands. Permit approval for state and federal lands is contingent upon the approval of both

³ U.S., et al., V Pegasus Gold Corp., et al, Civil Action No. 95-95-BLE-JDS; Gros Ventre Tribe v. Pegagus Gold Corp., Civil Action NO. 95-96-BLG-JDS.

⁴ Island Mountain Protectors, et al. V Bureau of Land Management, IBLA 97-76, 97-77, 97-85.

agencies, and is inseparable within the scope of each agency's specific regulatory authority. Likewise, acceptable reclamation is contingent upon meeting the criteria of both agencies, regardless of where specific facilities may be located. The state usually holds bonding on behalf of the federal agencies, and is responsible for the oversight of any necessary reclamation activities. The states that use this approach include Colorado, Montana, South Dakota and Washington. Montana's Memorandum of Understanding with the BLM and U.S. Forest Service is a good sample format of this type of relationship with federal agencies. California takes a similar approach, although the county, rather than the state, has the authority for reclamation and bonding on federal lands.

In Idaho and Alaska, the U.S. Forest Service or BLM can hold the entire bond, including bonds for state and private land. In Nevada, the applicant has a choice to meet either Nevada or Nevada BLM bond requirements for projects located on state, private and federal land. Arizona is at the other end of the spectrum, with entirely separate bonding for state, private and federal lands. A project located on multiple jurisdictions might have bonds with the Arizona Mine Inspector (for reclamation of private lands), the Arizona Department of State Lands (for state lands), the Arizona Department of Environmental Quality (for Aquifer Protection Permit monitoring bond requirements) and with either or both of the federal agencies (BLM or U.S. Forest Service.)

4.1.5 Exemptions to Bonding

Activities Prior to Regulation

In many states, mining operations initiated, in whole or in part, before promulgation of modern statutes, are either exempted or limited from compliance with current mining regulations. States should require these operations either to perform reclamation on affected properties within a set period of time (i.e. 10 years) or become subject to modern mining regulations.

Exemptions to bonding were originally intended to ensure that the establishment of new rules did not unfairly penalize pre-existing mining operations. In actuality, exemptions to bonding for these operations create a tremendous potential for abuse and public liability.

Most states have exempted or limited operations from reclamation requirements for areas disturbed prior to modern regulations. Generally, the exempted operations took place prior to the 1970's, although in some cases exemptions include more recent operations, such as those prior to 1981 in Nevada, prior to 1991 in Alaska and prior to 1996 in Arizona.

The copper mining industry—which includes the largest operations in the western U.S.—has particularly benefited from such exemptions. It should be noted that New Mexico, despite pressures from industry, does not exempt any mining activity in operation after December 31, 1994.

As a result of exemptions or limitations, insufficient bonding existing for open pits, tailings ponds, heap leach dumps, waste rock piles and other disturbances. In fact, it has become common practice for copper mining companies to locate their most potentially impacting operations on areas covered by exemptions, thereby avoiding modern reclamation standards. Federal regulatory history suggests that most of these large operations are likely to become EPA Superfund sites in the future—which means enormous public liabilities for remediation.

Eventually, any liability for cleanup will either remain with the company or will be passed on to the responsible state and federal agencies (i.e. the taxpayer). The potential liabilities related to closure could be enormous—hundreds of millions of dollars could be spent to clean up individual mine sites. In Arizona, because of the number of exempted copper mining operations, billions of dollars could be

necessary. In addition, water quality issues, many of which are severe, continue to be overlooked. As a result, many copper operations continue to compound the problem, making it progressively more infeasible to address reclamation issues as time goes on. As the problem grows, so does the cost and likelihood of public financial liability. The states that offer the most exemptions also tend to have the least stringent modern regulations, which further exacerbates the potential for public liability.

The only practical means of dealing with this problem is to provide a time during which mining companies must either close out their operations or become subject to modern reclamation and closure regulation. New Mexico has recently adopted this approach, and will see its benefits in the future. Arizona, on the other hand, risks the quality of state resources and tremendous public liability by continuing to ignore the potential impacts of mining operations. Utah and Nevada also have potential future liabilities from copper mining operations. The massive cleanup being undertaken around the Butte-Anaconda area has already given Montana and the responsible parties with the burden of liability, which is expected to require considerable water treatment “in perpetuity.” With the future of Superfund monies questionable, states may be forced to ask their own taxpayers, rather than the federal government or mining company, to fund cleanup.

4.1.6 Size Limitations (Small Mines)

Exemptions to reclamation requirements for small mines should not be allowed. Bonding requirements for small operations should be based on an amount reasonable to adequately reclaim surface features (minimum \$5000 per acre). Bonding should be evaluated on a site-specific basis for other potential impacts, including water quality and hydrology. If there is potential for significant impacts, any exemptions should be disallowed. A bond pool, financed by an actuarially determined contribution from each small operation, could be used to ensure reclamation of small operations.

Although not the focus of this study, the reclamation and closure of small operations, in many respects, is just as significant as that of large operations. On average, the potential costs of reclaiming small operations are drastically underestimated by most states.

When small mining operations affect water quality or other natural resources, the problem is typically not limited to a single mine site—cumulative impacts from numerous small operations can require significant expense to repair. In fact, more than \$100,000 has been spent on reclamation and closure at sites that would qualify for small mine exemption under many state Acts. These impacts are due to the formation of AMD, the location of mine sites in critical drainages, the location of mine facilities adjacent to waterways and the relative inaccessibility of some locations.

In most states, small mines are permitted with minimum bond amounts, usually not exceeding \$1,000 per acre. The size of the exemption ranges from one to 10 acres. Idaho is the only state that currently does not exempt small mines.⁵

Cost estimates for various practices have already been established by this study. These estimates can be similarly attributed to smaller mining operations, without the economy of scale. Using this assumption, reclamation and closure will average \$5,000 per acre in most cases, although site-specific costs can range up to \$50,000 per acre. For this reason, it is important that small mine reclamation bonds, in the absence of water quality issues or other site-specific considerations, be based on at least \$5,000 per acre. Where these site-specific issues do exist, small mines should have the same requirements as any other mining operation, with full bonding for reclamation and closure costs.

⁵ 1996 Revised Idaho Code.

In order to accomplish this distinction, it is necessary that all proposed mine sites, regardless of size, be required to submit at least a site-specific reclamation plan. This plan should be followed by an inspection to determine actual proximity to critical water resources and the potential for other adverse outcomes. In the event the mine is determined as potentially hazardous, additional information should be required. If additional information does not disprove such potential, the mining company should be required to submit site-specific plans and bond for full reclamation consistent with the state and federal standards for larger mining operations.

4.1.7 Reclamation Plan Requirements

States should establish a clear definition of reclamation. This definition should provide for the restoration of all surface resources through the use of landforming, revegetation techniques and soil application. It should also provide for measures to protect surface and ground water resources as well as other measures appropriate to the subsequent use of affected lands and water resources.

States should incorporate the following provisions as requirements for all reclamation and closure plans, and adopt specific performance standards for their administration:

- A. Salvage, storage and replacement of topsoil or other acceptable growth medium.*
- B. Recontouring, stabilization and/or topsoil replacement of all disturbed areas.*
- C. Revegetation of all disturbed areas consistent with future use. Revegetation includes seedbed preparation, mulching, fertilizing, seeding and planting, and shall encourage the propagation of native species and selection. The plan must also include provisions for noxious weed control. At least three years, and up to 10 years, should be allowed for evaluation of revegetation prior to acceptance. Criteria with which to measure the success/failure of revegetation should be established.*
- D. Slope stability requirements, including maximum acceptable slope angles and achievement of erosion control, static and seismic stability.*
- E. Stream channel, stream bank and natural hydrologic flow restoration.*
- F. Measures to protect air and water resources by preventing discharges not meeting state and federal standards.*
- G. Requirements for geochemical modeling and AMD prediction and prevention.*
- H. Protection of public health and safety.*
- I. Protection of wildlife habitat and standards for habitat restoration.*
- J. Addressing aesthetic impacts, including visual impacts, on public, residential and natural (wilderness and other) areas.*

Based on examination of the case studies contained in this report, the listed provisions are all necessary components of any regulatory scheme. Inadequacies are evident in the schemes of any states that lack the listed provisions. In addition, many schemes are inadequate due to limitations, and/or discretion afforded to regulators by unspecific provisions. Unspecified regulations can also lead to broad inconsistencies in reclamation requirements and bonding practices.

Although all the western states require reclamation plans to be submitted and approved, the specific requirements vary considerably from state to state, and even from site to site in many cases.

Discussion of reclamation plan requirements in detail is beyond the scope of this study. Table 4.1.1, **Reclamation Plan Requirements, Provisions Required by Western U.S. States**, shows which states presently have, or don't have, the recommended provisions, as indicated by a "Yes" or "No" for each provision. As noted, some state reclamation Acts do not contain provisions for certain considerations—particularly water quality and geochemical considerations—which are covered by other state regulations.

Table 4.1.1 also contains information on the extent to which each provision is treated by the various states. The notation "limited" indicates that the provisions are required only in certain areas or are otherwise restricted either in scope or definition. The notation "general" indicates that the statutes contain provisions addressing the requirement, but do not provide extensive detail or are not specific in scope. The notation "specific" indicates that the provisions are described in detail and may contain specifications and other required parameters.

Reclamation plan requirements are important in determining bond amounts. In general, the states with less specific or non-existent requirements exhibit lower overall bond amounts than states with more specific requirements. On the other hand, it is also evident that more extensive requirements do not always translate into higher bonding amounts. Other factors, such as the basis for calculating the bond amount, also play an important role in determining bond amounts.

Reclamation provisions identified as "specific" could be considered an initial template for a model of reclamation plan requirements. In many cases, the existing statutes with specific provisions require little improvement, particularly if the various aspects required by the individual states were combined to ensure more thorough and comprehensive coverage. In addition, each state should further improve upon the template by including state-specific requirements that might substantially exceed general requirements.

As indicated by Table 4.1.1, the states of California and South Dakota contain the most specific and substantive reclamation and closure regulations for most of the recommended provisions. The states of Idaho, New Mexico, Oregon, Washington and Wyoming also contain detailed provisions in some areas. The reclamation plan requirements of Arizona, Alaska, Colorado, Montana, Nevada and Utah are less comprehensive. These requirements allow the regulatory agency broad discretion in determining actual reclamation activities and subsequent bonding; in many cases crucial provisions are either limited or non-existent.

4.1.8 Bonding Requirements

State and federal agencies should require that the applicant submit a bond attached to the operating permit to assure full compliance with all requirements of the law and the reclamation plan. State and federal agencies should require that all bonds be received and approved prior to final permit issuance. Review of existing permits that result in new bonding requirements should require receipt of the modified bond amount within 60 days.

Most western states, if not all, require that operating permits include bonding for reclamation prior to approval. Typically, the determination of financial assurance is performed as one of the final stages of the permitting process. Providing the bond is usually the applicant's last obstacle prior to issuance of the permit.

**Table 4.1.1 – Reclamation Plan Requirements
Provisions Required by Western States**

Reclamation Plan Requirements	Alaska	Arizona	California	Colorado	Idaho	Montana	Nevada	New Mexico	Oregon	South Dakota	Utah	Washington	Wyoming
A. Topsoil	Yes – limited	No	Yes – specific	Yes – specific	Yes – specific	No	Yes – limited	No	Yes – general	Yes – specific	Yes – general	Yes – general	Yes – specific
B. Recontouring	Yes – general	Yes – general	Yes – specific	Yes – general	Yes – general	Yes – general	No	Yes – general	Yes – specific	Yes – general	Yes – general	Yes – specific	Yes – general
C. Revegetation	Yes – limited	Yes – limited	Yes – specific	Yes – general	Yes – specific	Yes – general	Yes – limited	Yes – specific	Yes – general	Yes – specific	Yes – general	Yes – specific	Yes – specific
D. Stability	Yes – general	Yes – general	Yes – general	Yes – general	Yes – general	Yes – general	Yes – limited	Yes – general	Yes – general	Yes – general	Yes – general	Yes – general	Yes – general
E. Hydrology	Yes – general	Yes – limited	Yes – general	Yes – general	No	Yes – limited	No	Yes – specific	Yes – general	Yes – specific	Yes – general	Yes – general	Yes – specific
F. Water Quality	No ⁶	No ⁷	Yes – specific	Yes – specific	No ⁸	Yes – general	No ⁹	Yes – general	Yes – general	Yes – specific	Yes – general	Yes – general	Yes – general
G. Geochemical – ARD	Yes – general	No ⁵	Yes – general	Yes – general	No ⁸	Yes – general	No	Yes – general	Yes – general	Yes – limited	Yes – general	Yes – general	Yes – general
H. Public Safety	Yes – limited	Yes	No ¹⁰	No	No	Yes – general	No	Yes – general	Yes – general	No	Yes – general	Yes – general	No
I. Wildlife Habitat	No	No	Yes – specific	Yes – general	No	No	No	Yes – general	No	Yes – specific	No	No	Yes – limited
J. Aesthetics	No	No	No	No	No	Yes – general	No	No	Yes – limited	No	No	No	No

⁶ ADEC has limited provisions addressing water quality.

⁷ ADEQ APP Program includes limited provisions addressing water quality and geochemical-AMD.

⁸ IDWR has limited provisions addressing water quality and geochemical-AMD.

⁹ NDEP has other limited provisions addressing water quality and geochemical-AMD.

When agencies act independently in permitting and bonding, mining operations can potentially begin operations, at least on part of the proposed disturbance area, prior to final permit approval or approval of the bond. The commencement of activities on one area usually carries with it the assumption that permit authorization will be gained on other areas. However, the basic principal of permitting requires that no assumption be acted upon. It is therefore recommended that prior to the commencement of any operations, final permits for all properties to be disturbed be bilaterally approved.

When bond amounts are either first established or are re-established as a result of bond review, new financial assurances should be submitted and approved within a reasonable time period (60 days) prior to re-issuance of the permit. In some cases, the changed bond amount is ignored or the change delayed—particularly when financially strapped companies are at critical financial junctures. More rapid turn-around requirements would ensure that bonding remains current with potential costs, and would help foretell any financial difficulties.

4.1.9 Bonding Requirements for Cyanide/Toxic Operations

State and federal agencies should require additional bonding for mining operations that employ cyanide leaching or other toxic chemicals when extracting minerals from the ore. The amount of bonding should consider any site-specific factors related to the protection of public health and safety or the environment (including the potential to impact nearby surface and groundwater resources, the technical ability of the operator to respond to these releases, the type and scale of the operation, and contingencies and safeguards built into the operations). The amount of the financial assurance should not be limited. Instead, it should reflect all the costs of reclamation, including those in the event of an accident.

Because chemical-processing activities can require extraordinary costs related to detoxification, remediation, restoration and response to accidents, many states have enacted specific bonding for chemical use scenarios. Among these states are California, Idaho, Oregon, South Dakota and Washington.

The various statutes enable the states to require financial assurance for the following:

- (1) The estimated cost of detoxification of heap leach piles, tailings ponds and other contaminated material.
- (2) The estimated cost of disposal of processing solutions and pond sludge.
- (3) The estimated cost of restoration of contaminated soil, surface and ground water and other resources, including aquatic and wildlife, related to potential spills or accidents at the site or in transportation of chemicals to and from the site.
- (4) The estimated cost of removal and disposal of chemicals on site.
- (5) Estimated emergency response and other agency contracted services including indirect costs should the agency be required to perform such reclamation.

4.1.10 Reclamation Bond Calculation

State and federal agencies should require the following provisions in calculating the reclamation and closure bond amount:

- A. The state or federal agency shall determine the necessary amount of financial assurance. The amount of financial assurance shall be determined as if the agency or a third party was to perform the required reclamation and closure activities.*

In the event the mining company is not able to carry out its reclamation obligations, the public will not be fully insured unless bonding is based on the cost for the agency, or a contractor hired by the agency, to perform reclamation activities. For the same reason, it is equally necessary for the bonding amount to be determined by the responsible agencies, rather than by the company itself.

The amount of financial assurance will vary significantly— both in estimation and in reality— between costs to the company and costs to the agency. Estimates based on costs for the company to perform reclamation typically assume no costs of equipment ownership. Operating costs employ economies of scale and costs that are shared with on-going mining operations. Reclamation and closure management by the company normally assumes extensive use of existing infrastructure and management. In contrast, if the agencies are required to perform reclamation and closure activities, the costs associated with these activities will stand alone. They will require dedicated equipment, manpower, infrastructure and management. As a result of the difference between the two approaches, agency costs can range from 20 percent to 100 percent greater than company costs for the same activity. For this reason, it is absolutely crucial that costs accurately reflect reclamation activities as if the agency, without the involvement of the company, were performing them.

B. Cost estimate information should be derived from verifiable sources such as:

- (1) Cost estimating guides from appropriate sources.***
- (2) Catalog and bid quotations for materials and supplies.***
- (3) Equipment ownership, operation and equipment cost handbooks.***
- (4) Comparable costs from similar projects conducted by state and federal agencies.***

Prevailing wage rates (Davis Bacon) should be used to determine labor costs. The applicant may be asked to provide information to verify quantities, distances, times, material take-offs, etc., but applicant-provided cost estimates should not be used in bond determination.

Commonly used and accepted cost-estimating guides and equipment handbooks include the Caterpillar Performance Handbook and VEHSIM Caterpillar Software Program, the Means Heavy Construction Cost Data and the Dataquest Cost Reference Guide. Additional information developed by state and federal agencies is available in various other forms including the OSM handbook for Calculation of Reclamation Bond Amounts, South Dakota's BOND CALC spreadsheets and state and federal agency reclamation files. Similarly, state-specific Davis Bacon heavy construction wage rates are typically used to estimate labor costs.

Costs derived from these sources are generally more indicative of costs that would be incurred by the agencies or a third party contractor. Although it may be necessary to use some company-derived information, that information should only be used to specify activities. The agencies can then independently calculate the cost to them of performing those activities, and base the bond on those costs.

C. In determining the amount of financial security, the agencies should include, but not be limited to, consideration of the following:

- (1) Costs of owning or leasing, operating and maintaining equipment and vehicles.***
- (2) Costs of labor.***
- (3) Removal or disposal of all buildings, facilities and structures, foundations, debris and chemicals.***
- (4) Backfilling, contouring, engineered covers, regrading and topsoil placement.***
- (5) Erosion control, drainage, and stormwater control features.***

- (6) Revegetation costs including soil tests, seedbed preparation, fertilization and bacterial inoculation, seeding, mulching, netting, tackifiers, other stabilization techniques, tree and shrub planting, fencing and noxious weed control.***
- (7) Long-term measures, including operation and maintenance, to assure stabilization and erosion control and efficacy of reclamation covers and other features.***
- (8) Costs of remedial activities identified to clean up releases of AMD and other contaminants associated with mining or processing that are likely to cause a threat to public health and safety or the environment***

As indicated in this report's case studies, there are myriad potential costs associated with reclamation and closure activities. The case studies also show that states vary considerably in their approach to what is required in mine site reclamation.

All of the factors identified here need to be considered in calculating reclamation costs, based on a review of the costs found in the case studies. In most cases, costs that should seemingly be typical to all operations are not evident or are not included. Often this is due to the conceptual nature of reclamation plans, which are commonly inadequate to identify the real tasks and costs necessary for reclamation. In other cases, these missing costs are due to a simplified or standardized approach—a one-size fits all, non-site specific approach that is contradictory to most of what is known about mine reclamation and closure issues. Another explanation is that the applicant and/or agencies are inexperienced in determining the actual activities and costs involved in reclamation and closure.

Finally, there appears in some cases to be an almost intentional exclusion of various reclamation and closure activities and costs. Particularly where low maximum bond amounts are stipulated, there is no serious intent to make the costs reflect the actual activities that may be necessary. In Alaska and Arizona, for example, this approach seriously compromises the purposes of reclamation and closure bonding.

D. The amount of financial assurance should include funding for interim operations as necessary to maintain existing critical operations in the event of mine closure. During this closure (due to bankruptcy, accidents or other causes) the state or federal agency would continue critical operations until the necessary reclamation activities could be conducted. At least two years of interim operations should be bonded for, although some sites, depending on the type and scale of the interim activities, will require five or more years. Interim operations shall also include interim water quality and air monitoring during reclamation and closure activities.

The lack of financial assurance to provide for interim operations has been identified as a major shortfall in the regulatory mechanisms of most agencies. Currently, with few exceptions (i.e., the case study on Florida Canyon, NV), funding for interim operations is not identified in reclamation and closure activities or bond amounts. Most regulators have identified this shortfall as a major concern—the one with which they are most likely to be confronted when companies declare bankruptcy and the agencies become responsible for operations.

The most common activities in this regard are related to maintenance and reduction of process solutions in heap leach pads, solution ponds and tailings impoundments. Typically, the operation of pumps to transport, balance, treat and discharge excess or remaining process fluids is involved. The activities, depending on the site and situation, and how soon reclamation and closure might be affected, may require intermittent or continuous operation for several months or for several years. In some cases, it takes until reclamation and closure is completed. The costs for such operations can be considerable—for larger operations involving multiple or large volumes of process fluids or tailings solution pump-back systems, costs can be several million dollars per year.

In the event an agency is required to perform interim operations, the existing water and air quality monitoring programs will need to be modified and continued in order to verify reclamation and closure efficacy. These programs will need to be assumed by the state agency responsible for water quality. These costs can be substantial, ranging from \$10,000 per year to several hundred thousand dollars per year for larger operations with more complex geohydrologic features.

E. The amount of financial assurance should include indirect costs, as they would be incurred by the agencies. These costs include:

- (1) Agency investigation and oversight of reclamation and closure activities.*
- (2) Contractor mobilization/ demobilization costs.*
- (3) Cost of final reclamation and closure engineering, procurement and construction management activities.*
- (4) Contractor insurance, performance bonding and profit.*
- (5) Contingency.*
- (6) Cost inflation.*

In simple terms, indirect costs are the overhead costs that would be borne by the agencies in the event they were to perform reclamation and closure of a mine site. These costs are otherwise paid for by the company, but are associated with the operation of any project rather than the performance of particular tasks. Many of the costs mentioned are not significant if the company performs the reclamation—they are either not relevant to company-performed reclamation or are included in the company's existing general, administrative and engineering infrastructure. However, in the event a state or federal agency becomes liable to perform reclamation and closure activities, those costs can become significant, and might range from 10 percent to more than 45 percent, depending on site-specific circumstances.

In extreme cases, indirect costs might exceed direct costs, as the potential \$180 million dollar price tag of the Summitville cleanup aptly demonstrates. This is particularly true when a site is determined to warrant remediation and restoration well beyond the level imagined in the existing reclamation and closure plan and bond.

Agency investigation and oversight of reclamation and closure activities can include: remedial investigations, ground and surface water investigations and monitoring activities, coordination of activities between various agencies and stakeholder groups, public notices and meetings, dealing with bankruptcy courts and surety companies, preparation of work plans, specifications and engineering, procurement, and construction management bid packages, participation in engineering design, procurement and construction management, provision of overall quality control and quality assurance and general administrative duties. The costs for these activities are typically not included in the budget of most state and federal agencies. Unless existing staff can be shifted to those activities, the agency will incur additional unbudgeted expense in performing them. The authority of the responsible agencies depends upon the ability to perform these activities unencumbered by financial considerations. To protect this authority, bonding must include the substantial costs that might be incurred in this area. Various state and federal agencies typically estimate these costs at two to five percent of direct costs.

Contractor mobilization/ demobilization costs are an allowance for moving equipment to and from the site being reclaimed. Costs for mobilization/demobilization vary depending on the type and amount of equipment as well as the distance being moved and other related logistics. When the contractor is based reasonably close to the site (within 20 miles), the mobilization/demobilization costs might be as low as 1 percent of direct costs. If the site is in a relatively isolated location but can be accessed by road, the costs typically range from two to five percent. Where the site is inaccessible by

road, as is the case with some Alaskan mines, the mobilization/demobilization costs can run more than 10 percent of direct costs.

Cost of final reclamation and closure engineering, procurement and construction management activities (EPCM) includes the costs of redesign and final detailed design suitable for bidding and construction purposes. The reclamation and closure plan submitted by the companies as part of the permitting process is usually lacking sufficient detail to be useful in actually performing reclamation activities. In addition, the submitted reclamation and closure plan often fails to adequately reflect site conditions at the time when reclamation and closure occurs.

In the event of bond forfeiture the agencies and/or their contractor might:

- (1) Undertake surveys and prepare current maps and plans to show the extent of required reclamation.
- (2) Survey and calculate topsoil, subsoil, non-acid generating waste, tailings, dump and pit volumes to determine amounts of backfill necessary and material available to perform various reclamation activities.
- (3) Analyze and evaluate existing vegetation, revegetation, soils and subsoils to determine appropriate methods for additional revegetation pursuant to full reclamation and closure.
- (4) Evaluate existing reclamation plans for efficacy with relation to various reclamation and closure requirements, such as treatment of acid mine drainage, water treatment systems, long-term tailings impoundment stability, etc.
- (5) Evaluate equipment and structures to determine requirements for removal and/or demolition and disposal.
- (6) Assess performance and provide construction management oversight during reclamation and closure activities.
- (7) Procure necessary dirtwork and other contractors and materials and supplies.

Depending on the site-specific circumstances and the overall cost, the cost for EPCM can range from two percent for relatively large projects with minor changes to the reclamation plan to more than 10 percent where more substantial changes are necessary. In the case of most mining projects where the agencies are required to perform reclamation, substantial changes to the original reclamation plan are typical. Costs of 10 to 15 percent of direct costs are not uncommon.

Contractor insurance, performance bonding and profit are based on the expense of labor-related insurance not part of the Davis - Bacon wage rate calculation, on bonding to assure contractor performance of specified activities, and for contractor overhead and profit. None of these expenses are typically included in the calculation of direct costs. Both insurance and bonding costs typically range from 1.5 to 2.5 percent. Contractor profit, which usually includes overhead costs, ranges from five to 10 percent, although it can be higher if competitive bids are difficult to obtain.

Contingency costs provide for project uncertainties and unexpected events or requirements. Contingency costs can be calculated using a wide variety of methods. These costs typically become smaller as the scale of the project grows, although the project complexity may add to the contingency costs. Where agencies are required to take over the performance of mining activities, the degree of project uncertainty and unexpected events is typically high, dictating a contingency of five to 10 percent in most cases.

Cost inflation is typically included in bond calculations to account for any increases in reclamation cost due to inflation. Inflation may have occurred since the bond was originally calculated or during the time prior to review which the bond will be in effect. The rate of inflation is usually tied to various cost indices and other established methods. During periods of modest or low inflation, one to two percent per year is typically used.

The application of indirect costs to bond amounts varies by state, as has been discussed. In general, indirect costs vary from 15 percent to nearly 40 percent, with most states applying about 25-35 percent. Only the states of Alaska and Arizona do not include indirect costs in determining reclamation and closure bond amounts. This exclusion presents a major contradiction with respect to the purposes of bonding in those states' statutes. By assuming that indirect costs will not be incurred, Arizona and Alaska essentially make themselves incapable of adequately performing reclamation and closure activities without automatically charging taxpayers for the excluded indirect costs.

The amount of financial assurance should be based on the cost of reclamation determined over the project life. The amount of financial assurance currently held should be based on the expected disturbance and necessary reclamation activities that would occur if the mine were to be reclaimed during the current bonding period. In all cases, at all times, the amount of financial assurance must equal or exceed the potential cost to the regulatory agencies in the event reclamation and closure becomes necessary.

In order to facilitate and make the reclamation and closure bonding process more economical, various forms of phased bonding are allowed by most of the western states. In most cases, phased bonding is based on reclamation and closure bonding relative to the number of acres disturbed in any one year. The approach is illustrated by Table 4.1.2, **Phased Bonding by Acreage Disturbed**, which shows the relative acres disturbed versus the total reclamation cost for a theoretical mine case. In this case, the reclamation and closure cost was calculated for the end of year 10, the projected end-of-mine life. At that time, a total of 1000 acres are presumed disturbed. The total reclamation and closure cost is estimated at \$20,000,000 (or \$20,000 per acre). Based on the projected acres disturbed each year, the phased bond amount is shown in the right hand column.

Table 4.1.2 - Phased Bonding by Acreage Disturbed

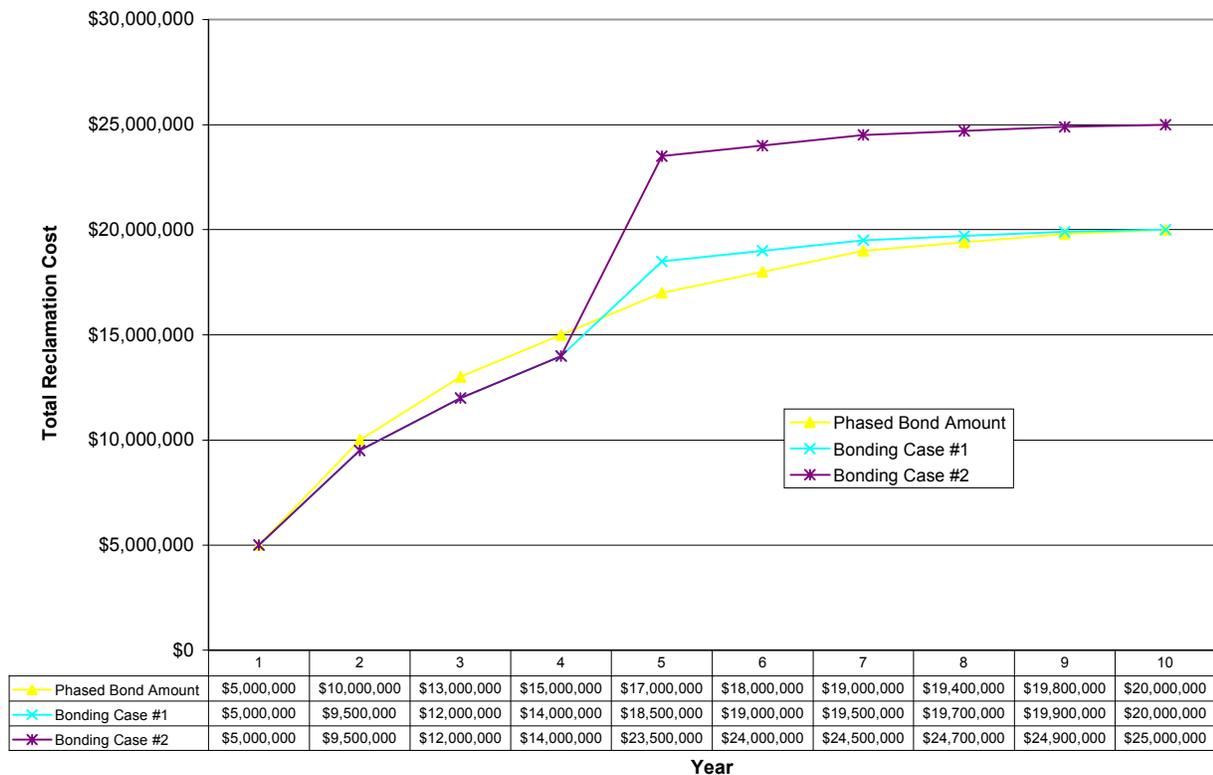
Year	Total Disturbed Acreage	Reclamation and Closure Bond Amount
0	250	\$5,000,000
1	500	\$10,000,000
2	650	\$13,000,000
3	750	\$15,000,000
4	850	\$17,000,000
5	900	\$18,000,000
6	950	\$19,000,000
7	970	\$19,400,000
8	980	\$19,600,000
9	990	\$19,800,000
10	1000	\$20,000,000

Experience in mine reclamation and closure has revealed a number of circumstances where the use of phased bonding yields a potential for shortcomings in bond amounts. First, the costs inferred in year 10 are based on an economy of scale that may not exist in all years (particularly during the first five years of project life). Second, in the event the project entails water treatment or other methods to deal with AMD, those costs may be negligible during initial years and become 100 percent realizable at some year prior to the end of the project's life. Third, any inadequacies in bond amounts typically become noticeable as the mine's life progresses—phased bonding is frequently not accompanied by

inspections or revisions to the original reclamation plan. As a result, the bond may be moderately or altogether inadequate at times.

Comparison of Phased Bonding to Theoretical Actual Costs. As depicted in Table 4.1.3, Bonding Case #1 assumes \$5,000,000 of the total bond amount is for water treatment, which does not become applicable until mining commences past year four, resulting in a moderate shortfall in the bond amount during years five through nine. Bonding Case #2 assumes that an additional \$5,000,000 in water treatment costs is incurred as a result of more severe acid mine drainage impacts, resulting in a severe shortfall in the bond amount after year four, until such time as the bond amount is recalculated to include the additional costs.

Table 4.1.3 - Comparison of Phased Bonding with Theoretical Actual Costs



To varying degrees, all actual reclamation bond amounts are similar to Case #1 in that they differ at various times during the project life from a theoretical \$/acre bond amount. The amounts are generally moderate, although they may become more significant at certain periods during the mining project's life. For this reason, it is strongly recommended that the reclamation bond amounts for phased bonding be predicated on a detailed analysis and determination of reclamation and closure costs for each year, rather than an average cost per acre predicated on final reclamation and closure cost estimates. And as Case #2 demonstrates, it is important that bond reviews incorporate actual inspection and evaluation of existing versus predicted reclamation and closure requirements, and that bond amounts be changed as necessary to reflect changed conditions and associated costs.

4.1.11 Forms of Financial Assurance

State and federal agencies should only accept the following forms of financial assurance:

- (1) cash*
- (2) surety bonds*
- (3) letters of credit*
- (4) limited forms of other financial assurance mechanisms that are readily liquid and can be assumed as cash in the event reclamation and closure by the agencies becomes necessary.*

No type or variety of corporate guarantee or self-bond shall be accepted as financial assurance.

States with a history of incidents that have required state agencies to perform reclamation and closure (such as Montana and Colorado), recognize the value of holding bonding instruments that are readily convertible to cash. In cases where financial assurances include self-bonding or a corporate guarantee, self-insurance or application of net worth or equipment and buildings, the responsible agency is often not able to recover the bond's stated value. In many cases, the bond has little or no real value (which is often the case when considering the value of equipment, machinery and buildings—so-called "assets"). In many cases, other liens and creditors—with prior call to the agencies' claims—also encumber the assets.

Experience has proven the ideal bonding mechanism begins with a surety bond to cover the full cost of reclamation and closure. Eventually, the surety bond should be replaced with cash as the mining operation progresses into production. The goal should be to replace the entire surety bond with cash over the first five years of project life. The cash should be invested by the state into an interest-bearing Treasury bill or similar instrument. Any subsequent expansions or modifications to the permit should be similarly structured. As various tasks are completed and approved, the company would be allowed to apply for compensation from the cash fund.

There is a sharp distinction between the states that allow self-bonding and the states that don't. The mining-dominated states of Arizona, Colorado, Nevada and Utah all allow self-bonding, while New Mexico explicitly does not accept any variety of self-guarantee. None of the northern states allow for self-bonding as a form of financial assurance. As a practical matter, corporate guarantees and self-bonding cannot fulfill the purposes of bonding practice—namely, to protect the public against liability—and cannot be considered a responsible modern regulatory practice.

4.1.12 Monitoring and Compliance

State and federal agencies should conduct at least yearly—preferably quarterly—on-site inspections of mining operations as necessary to ensure compliance with the terms of the operating permit and the approved reclamation plan. During active reclamation and closure operations, inspection should occur on an irregular basis, at least once per month. The inspection should note the procession of activities in accordance with the approved plan, and should note any deficiencies. Corrective action should be taken to correct such deficiencies. Particular attention should be paid during the inspection of water management, toxic chemical use and occurrence of AMD or predictors to AMD formation.

All states have provisions for monitoring and compliance, usually in the form of inspections by the appropriate agency. However, the frequency of these inspections is highly variable. Inspections are required quarterly in some cases and annually in others. Most frequently, monitoring and compliance inspections are conducted as determined necessary by the agency. Most states try to monitor sites at least yearly, with more frequent monitoring of larger, more complex, and problematic sites.

Monitoring and compliance inspections are often conducted as a routine visit by the regulatory agency to the mine site. This inspection might consist of a meeting at the mine office to inquire about progress and difficulties and a brief driving tour of the mine site. More often than not, these inadequate inspections are followed by reports that indicate no substantive consideration of reclamation and closure issues. Sometimes an aberration from the reclamation plan is noted in the report. Usually, it is the public that reports these aberrations (sometimes it's the responsible agencies, but it's almost never the mining companies). In many cases, the company knows of the existence of AMD or other reclamation-altering factors for years before the public reports, and the agencies reluctantly respond, to the problem.

In other cases, states take monitoring and compliance inspections seriously. These states make concerted efforts to assure compliance with the reclamation plan and operating permit and to proactively evaluate the potential for changed circumstances.

4.1.13 Bond Review Period

State and federal agencies should review the bond amount at least every three years, adjusting the amount of the bond to reflect actual current conditions and reclamation requirements. This provision should not preclude modifications to reclamation and closure plans and bond amounts at other times as circumstances warrant.

Bond review is a crucial aspect of bonding practices. The review period affords the regulatory agency an opportunity to consider the reclamation and closure plan in detail and compare it to existing site-specific information gathered during monitoring and compliance inspections. With this information, it should be possible for agencies to reconsider the previous estimate, and adjust the bond to reflect the most current and accurate information. If an agency determines that an existing reclamation plan or bond is inadequate or does not represent the present costs of compliance, necessary changes can be made as a routine part of the bond review process.

State requirements vary considerably in this regard. Bond review is discretionary in many states—in those with specific provisions, review periods range from annually to every five years. In many cases, review periods accomplish nothing more than an adjustment of the bond for inflation (sometimes, even that adjustment is not made). This practice has extended nearly 20 years in some cases. These inadequate reviews cause a significant departure from the original reclamation plan and estimated costs. As a result, the potential for shortfalls in terms of both enforceable reclamation plans and bond amounts becomes significant. The bonding of California's McLaughlin mine is a case in point. Additional information on this case is contained in Part II of this study.

It should be kept in mind that without the modification of reclamation plans and bond amounts, the public is exposed to potential liability from undiscovered environmental dangers and inadequately bonded circumstances. It is incumbent upon the regulators to take advantage of the opportunity that diligent inspections afford—the opportunity to ensure that plans and bond amounts are sufficient to achieve the desired objectives of reclamation.

4.1.14 Closure Regulations

State and federal agencies should establish closure performance criteria to ensure compliance with applicable water and air quality regulations, including detoxification/ neutralization of waste

materials, monitoring and operation and maintenance of water collection, conveyance, treatment and discharge systems.

Although not specifically stipulated in most states' reclamation statutes, closure requirements are a key aspect of bonding. In most cases, under the authority of water quality protection statutes, states have established specific rules and regulations pertaining to closure and applicable water standards for any discharges that might result during or after reclamation activities. These statutes also come under the heading of "Environmental Protection," so any bonding in excess of that required for surface reclamation is typically held as an environmental protection bond, separate from the surface reclamation bond.

Most states establish the relationship between closure and surface reclamation in their Acts by requiring that reclamation plans include provisions on preventing objectionable discharges to post-mining water resources and preventing pollution of air or water and degradation of adjacent lands and resources.

Post-Closure Care

There is major conflict over post-closure care of reclaimed mining operations. Post-closure care includes addressing the long-term efficacy of reclamation activities and insuring the public against potential liabilities from long-term operation and maintenance of reclaimed sites. At present, the requirements of post-closure care are under consideration by most states, but only South Dakota's Mined Land Reclamation Act has specific provisions that directly address this critical aspect of reclamation and closure regulation.

South Dakota's requirements, which are paraphrased nearly verbatim below, represent the model regulations recommended by this study. These requirements allow the regulators to address post-closure care in a comprehensive and specific manner. In South Dakota's only case example—the Richmond Hill mine—post-closure bonding has been determined and applied. For more detail, see that case study in Part III of this report. At the Richmond Hill Mine, a reclamation and closure bond amount of \$10.7 million was determined prior to reclamation and closure activities. The state determined that post-closure bond costs would be \$10.0 million—a figure roughly equivalent to the original cost of reclamation and closure, for the mandated 30-year post-closure period.

The state and/or federal agencies shall require the operator to prepare a detailed post-closure plan for a mining operation. The plan shall include, at a minimum, a description of the activities, methods, procedures and processes necessary to ensure the continued effectiveness of reclamation measures and compliance with applicable performance standards including, as necessary:

- (1) Treatment of tailings to ensure continued neutralization or immobilization of any parameters of concern.***
- (2) Operation of monitoring systems.***
- (3) Inspection and maintenance activities to ensure compliance with all applicable reclamation, design and operating criteria.***
- (4) Procedures for maintaining the final cover and controlling erosion and fugitive dust.***

For each mining operation requiring a post-closure plan, the operator shall begin post-closure care immediately following the release of reclamation surety and continue post-closure care for thirty years. The agency with the concurrence of its governing state body may modify the permit to reduce the length of the post-closure care period at any time after reclamation surety release if a reduced period ensures compliance with all applicable performance standards. The respective agency or

board may modify the permit to extend the period beyond thirty years if necessary to ensure compliance with all applicable performance standards or design and operating criteria.

For each mining operation requiring a post-closure plan, the operator shall post with the responsible agency financial assurance to guarantee the costs of post-closure care and maintenance over the post-closure period. If maintenance and monitoring of mine facilities, such as tailings dams, diversion ditches, and the seepage of tailings pond effluent to groundwater, is likely to occur beyond the 30 year period of the post-closure, then a Long Term Maintenance and Monitoring Fund shall be established. The principle from this fund shall generate enough interest to pay for the maintenance and monitoring on an ongoing basis (i.e. in perpetuity). This fund shall be established once it is known that costs beyond the period of time covered by a bond will be incurred.

After completion of post-closure care of the mine area, the operator shall submit to the responsible agency a statement certifying that post-closure activities have been completed in accordance with the post-closure plan. The responsible state and/or federal agencies shall conduct an on-site inspection of the affected mine area and provide public notice of its findings at least 30 days prior to approving the certification of completion of post-closure care.

Liability of an operator for the affected mine area under this chapter shall continue until the certification of completion of post-closure care is approved by all the appropriate state and federal agencies.

4.1.15 Noncompliance and Bond Forfeiture

The state and federal agencies shall cause the bond to be forfeited if:

- (1) Reclamation and closure is not pursued in accordance with the reclamation and closure plan or actions are not taken to prevent deficiencies have not been taken within a reasonable time period (30 days).*
- (2) Reclamation and closure activities are not properly initiated within one year and completed within a reasonable time in accordance with the reclamation and closure plan.*
- (3) In the event of abandonment (immediate forfeiture).*
- (4) In the event the surety refuses or fails to perform the work to the satisfaction of the agency within the time required.*
- (5) In the event the mine operator is unable to maintain the financial surety.*

The holder of the security deposit shall pay the amount of the bond to the responsible state and/or federal agency upon the agency's demand.

In order to be effective, the responsible agencies need the ability to obtain bond funds without interference in the event of non-compliance, abandonment or failure by the surety company. Bonding is an essential tool in the enforcement and compliance of mining operations with reclamation plans. In the event the mining company does not take the necessary actions to prevent or remedy deficiencies at the mine site, the bond can be used to perform such activities, and the responsible agency can require that the bond be modified to reflect such actions.

The agencies should also be able to use bonding to ensure that reclamation and closure activities are initiated and completed within a reasonable time frame. In the event of abandonment, the agencies can provide for interim operations and proceed with the performance of mine reclamation and closure. In some cases, the surety company may choose to perform reclamation and closure itself, believing it can perform the necessary tasks at a lower cost than the bond value. However, the agencies must have

the ability to require forfeiture of the bond in the event the surety company fails to perform the work to the satisfaction of the agency within the time allotted for such activities.

4.1.16 Bond Release

Surety liability should continue until the time of bond release. Operator and surety provider liability should remain until the bond is released in whole or part by the responsible agency. The provisions of the surety should allow it to be modified and used to ensure post-closure requirements. As an alternative, separate post-closure bonding should be required prior to release of reclamation and closure bonding. The responsible agency should inspect and approve the reclamation and closure activities in order to ensure compliance with the applicable performance standards prior to bond release. Partial release of the bond should only occur for those activities or areas that can be clearly distinguished as fully, acceptably completed. Public participation should be required when partial or complete bond release is requested.

The surety should remain in effect until all reclamation and closure activities are completed and the responsible agency agrees to release the bond. It is important that the surety be structured so that it can be renewed and remain effective in the event it becomes necessary for the agencies to perform reclamation and closure. The surety instrument should provide for the ongoing liability of both the operator and surety company until such time as the bond is released.

For existing operations, liability should also be extended for the duration of the post-closure period. Alternatively, it should be replaced with a new financial assurance. For new operations, post-closure bonding should be included in the original reclamation and closure bond calculations. It is important that release of the bond be contingent upon inspection and approval by the responsible agencies. The inspection should be detailed and comprehensive and should employ the use of various experts in evaluating revegetation, stability, water quality and other critical areas. The inspection should take place at the optimum times to determine reclamation and closure efficacy, and should not be constrained to facilitate quick release. It may be necessary for multiple inspections over a period of three to twelve years (depending on the existing release criteria of the various states).

Partial release of bonding is a common practice in most states. However, the practice of releasing portions of the bond as individual tasks are performed fails to ensure proper conduct of reclamation. For example, if recontouring and topsoil placement are completed and the bond released, subsequent revegetation failure might be linked to the need to modify or re-perform tasks for which a bond no longer exists. Similarly, it is the practice in some states to release all but a fraction (typically 10 percent) of the bond pending proof of revegetation success, despite the likelihood that revegetation failure will cost more than 10 percent to remedy.

4.1.17 Reclamation Funds or Pools

State and federal agencies should establish the means to support a permanent emergency response and reclamation fund to be used at the discretion of the agency for reclamation activities.

For the most part, reclamation funds or pools are not widely used to provide financial assurance for major hardrock mines. Rather, they are primarily intended to make bonding affordable to small miners or start-up companies emerging as major hardrock producers. In the event a company does not perform, it would not be eligible for permitting in the future. The theory behind most reclamation bond pools is that, since a company that doesn't perform reclamation would not be eligible for future permitting, only a few operations will actually require the agencies to perform the tasks. The bond then is based on the presumption that only a small percentage (say, 10 percent) of the total costs in the

bond pool will ever be actually needed. A slightly larger contribution (say, 15 percent) of the mines' potential liability would exceed the perceived liability of the combined operations, and allow the bond pool to be self-sustaining.

In most cases, bond pools charge a non-refundable fee—typically five percent of the total cost estimate—that must be paid on a yearly basis. The additional annual contribution to the bond pool—typically 15 percent of the bond estimate—is refundable upon completion of reclamation and closure. The time-value of the interest associated with the refundable portion of the bond, along with the non-refundable fee, typically means the annual bond cost exceeds six percent of the bond amount (it can be as high as 10 percent in some cases). Most major mining companies are able to attain a surety bond at an annual cost of 1.75 to 2.25 percent of the total bond. They are not therefore inclined to participate in reclamation bond pools. In many states, the amount of reclamation and closure liability that can be assumed by the bond pool is limited. Alaska and Nevada are among the states that currently have a bond pool program.

Various states have emergency response funds (Colorado) and reclamation funds (South Dakota). These funds were established to allow the agencies to conduct emergency response and reclamation activities where funding does not exist because of bonding insufficiencies or because of limited budget allocations.

Colorado's statute calls for the creation of an Emergency Response Cash Fund that is accessible to the Executive Director. The fund is to conduct emergency response activities, emergency prevention, containment or control, safeguarding or reclamation activities at mining operations. South Dakota's statute allows the Board of Minerals and Environment to allocate funds to be used in the reclamation of previously affected lands. The fund deposits all application fees and renewal fees into the Environment and Natural Resources Fee Fund. In both Colorado and South Dakota, the size of the reclamation fund is normally limited to less than \$100,000. In all cases it's less than \$1,000,000.

As this report demonstrates, Arizona, New Mexico, Nevada and Utah currently have potential liabilities of enormous magnitude. These liabilities are presently unfunded by existing bonding. As a practical matter, even if statutes were changed immediately to address those shortfalls, it would be difficult to establish credible bond amounts in a reasonable time period. New Mexico, for example, has been in the process of establishing reclamation and closure plans for nearly six years.

One solution that should be considered by all states is to levy a set fee against mineral production. The fee would be placed into an emergency response and reclamation fund and allowed to accumulate. For example, a \$1 per ounce gross production fee in Nevada could accrue \$5 to \$10 million dollars per year. Over the next decade a fairly healthy fund could be established. At the same time, statutes and practices should be revised to address the potential costs of AMD-related water treatment in perpetuity, for which the eventual cost could easily exceed the suggested funding pool.

4.1.18 Public Participation

State and federal agencies should provide for full and unrestricted public participation in the entire bonding process, including bond release. Consideration of reclamation plans and bond amounts should be given full treatment in any documents prepared pursuant to the National Environmental Policy Act during the permitting process. Citizens should have the right to bring information to the attention of the regulators, and require that plans and bond amounts be reconsidered and modified to reflect such information.

Reclamation and closure planning and bonding should be given full consideration in all EIS/EA processes conducted under the National Environmental Policy Act or state environmental policy laws. Specific reclamation and closure plans should be developed for each alternative fully considered, costs for bonding should be developed and the likelihood of efficacy of those plans to meet performance standards and cause long-term effects with respect to each alternative should be analyzed. Specific closure requirements for each alternative should be developed. Those requirements should include identification of the potential requirements for water-treatment in perpetuity and post-closure care.

New Mexico is the only western state that specifically provides for public participation in the planning, bonding and permitting process. The statutes allow a public hearing for issuance, renewal or revision of a mining or exploration permit. The hearing is allowed on applications for stand-by status or variance and for the release of bonding. Other states allow similar public participation at selected times, such as on bond release (Colorado and Montana) and prior to the issuance of the final permit (Utah).

Public participation in the permitting process represents a significant opportunity for public education and involvement that has been largely overlooked in state statute and by the regulatory agencies. While reclamation and closure planning is viewed as a critical aspect of the permitting process, it is often a secondary consideration in the analysis performed by the agencies. Better informing the public about reclamation and closure issues, and giving them the opportunity to comment on those issues, would ensure public participation in this critical issue. The development of reclamation and closure alternatives, and comparison of outcomes and costs for those alternatives, would further provide for public participation. These alternatives can provide a needed assurance that the agencies have in fact adequately considered aspects of reclamation and closure planning.

It is recommended that the statutes to address public participation include the following:

- ***The public should be given the opportunity for a hearing on the issuance, renewal, partial or full return of a bond or revision of a new or existing mining permit. A hearing should also be allowed upon application for standby status or upon application for a variance. The hearings should be accompanied by a formal period during which comments from the public would be received. The agencies should reply to substantive and specific comments with their decision.***
- ***The public should have the right to request an inspection of mining operations by furnishing the responsible agency with reason to believe that a violation of the act has occurred. Requests should also be allowed if there exists a condition or practice that can be reasonably expected to cause imminent danger to the public or the environment. The agency should require the public to identify the basis for the allegation or provide corroborating evidence. However, this should not prevent the agency from conducting its own investigation prior to dismissing any potential violation. If requested, the agency should keep the identity of the person making the request confidential. The agency shall send the requestor and the alleged violator a written response describing any inspections, violations noted and enforcement actions taken or an explanation as to why no enforcement actions have been taken.***
- ***The public should be able to request an adjustment of the bond upon submission of evidence. The evidence should demonstrate that the method of operation or other circumstances will change the estimated cost of contingency procedures, completing reclamation or monitoring activities.***

4.2 A CRITIQUE OF PRESENT RECLAMATION AND CLOSURE BONDING FEATURES AND PRACTICES IN THE WESTERN UNITED STATES

4.2.1 ALASKA

- Four major metallic hardrock mining operations are currently permitted in Alaska. There are two gold and silver mines (one operating and one operating with new operations suspended) and two base metals mines (both operating). There are other mines that would normally be included as major mines, but their inclusion in the Alaska Bond Pool program brings their individual bond amounts below the \$250,000 cut-off.
- Existing operations disturb a total of 3,603 acres in the state, for a total reclamation and closure bond amount of \$9,462,910. The state's average bond amount of \$2,626 per acre ranks in the low mid-range of bonding values in the western states.
- One major mine in the state is currently in bankruptcy (Illinois Creek). Another mine, which is part of Alaska's Bond Pool Program, is also bankrupt with reclamation and closure costs likely to exceed \$1.0 million (Nixon Fork).

4.2.1.1 State Reclamation Statutes, Regulations and Guidelines

- Alaska's Reclamation Act was established in 1990, and was followed by the promulgation of the Mining Reclamation rules in 1991.

Since Alaska's Reclamation Act was established relatively recently, it should contain most of the desirable characteristics of reclamation statutes found in other states. Instead, it appears from the contents of Alaska's Reclamation Act indicate that the legislature intended to enact statutes favoring industry at the risk of exposing the public to higher liability.

***Recommendation:** Major revisions are needed to the Alaska Reclamation Act as suggested further in this section. These revisions should be sought with a sense of urgency in order to ensure the objectives of reclamation and closure bonding as suggested in this study. Changes are particularly necessary to protect the Alaskan public from unnecessary pollution of the state's water resources and against public liability. Because Alaska is relatively undeveloped, it has a unique opportunity to enact statutes that proactively encourage responsible mining activities. Alaska should ensure that operations do not unnecessarily result in degradation of the state's pristine resources or in public liability.*

4.2.1.2 Lead State Agency

- The Division of Mining and Water Management of the Department of Natural Resources is the lead state agency responsible for administering the Alaska Reclamation Act. The Alaska Department of Environmental Conservation (ADEC) is responsible for permitting and bonding tailings ponds and heap leach facilities. Either the U.S. Forest Service or Bureau of Land Management (BLM), along with the ADEC and the Division of Mining and Water Management, administers mining regulations on federal lands.

The separate administration of reclamation, water issues and tailings impoundments and heap leach facilities on state and private land, along with the separate authorities of the U.S. Forest Service, BLM

and state agencies on federal land, presents a difficult regulatory scheme with the potential for shortcomings on water quality issues.

***Recommendation:** Alaska's Division of Mining and Water Management must ensure coordination with the ADEC and federal agencies. Authority must be established to require bonding for environmental protection on all lands in the state, including for long-term water treatment.*

4.2.1.3 Lands Bonded by State

- The Reclamation Act applies to private, state and federal lands in Alaska. The state does not require bonding on federal lands if the responsible federal agency has an approved reclamation plan and bonding mechanism consistent with state statutes. This provision limits the state's authority to require bonding on federal lands.

The state has authority on state and private lands. Authority on federal lands, however, is limited and is not clearly stated in the statutes. As a result, state and federal agencies might conduct separate permitting processes for operations located on both state and federal lands. This creates an unnecessary duplication of effort and results in a demonstrable lack of coordination between the agencies.

Despite a large area of tribal lands and lands affected by treaty, the state has no formal relationship with the various tribal organizations with respect to mining and reclamation issues. Given the tremendous influence of tribal issues in Alaska, it is strongly recommended that the state consider entering into formal agreements to provide for cooperative decision making on reclamation issues with various tribal organizations.

The limited state authority on federal lands predicates that federal land managers have the authority to require bonding on federal lands. Unfortunately, the BLM clearly lacks authority to adequately address reclamation issues and the U.S. Forest Service lacks specific authority in water quality and closure regulations.

***Recommendation:** Alaska statutes must allow the state full authority for reclamation and closure on all public lands. The state must either assume primacy over the federal agencies within the context of a Memorandum of Understanding (MOU) or allow for bonding above and beyond that required by the federal agency. However, this recommendation is predicated on major revisions of Alaska's statutes as suggested herein. Otherwise, it is suggested that the federal authorities are equally ill suited for the task.*

4.2.1.4 Relationship with Federal Agencies

- Alaska's state agencies have the discretion to establish formal relationships and protocols for planning and bonding with the federal agencies in an MOU or other formal agreement.

Discussions with the state and federal agencies in the state revealed only limited cooperation between the agencies. Despite a multi-agency project team that is intended to coordinate permitting and bonding, there is only limited coordination in treating reclamation and closure issues between the agencies. This lack of cooperation may extend from long-standing differences over natural resource authority issues between the state and federal government.

Recommendation: *Alaska, following significant modification of its statutes, must enter into a formal state-wide MOU with the federal agencies. The state should retain either the primary authority for bonding or the authority to bond separately and in excess of the amount allowed by federal authority.*

4.2.1.5 Exemptions to Bonding

- The Alaska Reclamation Act only applies to that portion of a mining operation active after October 15, 1991.

All of Alaska's existing major mines were active in their entirety after October 15, 1991.

- The Alaska Reclamation Act allows for the exemption of operations of five acres or less from reclamation and bonding requirements. No provisions are made for site-specific features or the consideration of whether exemptions should apply.

Alaska's existing exemption for operations of less than five acres essentially allows small mining operations in the state to be conducted without regard for reclamation and closure issues. Historical evidence indicates that Alaska should have a serious concern in this regard. There are numerous small mines located throughout the state, and Alaska lacks any substantial means to address environmental impacts or potential public liability. Alaska's provisions are particularly arcane in that they do not recognize the potential for small operations to seriously impact the environment, taking into account site-specific considerations.

Recommendation: *Alaska must develop a specific small mine reclamation scheme that establishes a reasonable minimum amount (\$5000 per acre) to adequately reclaim surface features. The scheme should evaluate and bond for additional site-specific features to ensure reclamation and against public liability.*

4.2.1.6 Reclamation Plan Requirements

- Alaska's Reclamation Act contains general provisions addressing recontouring, stability, hydrology and geochemical-AMD. There are limited provisions pertaining to topsoil, revegetation and public safety. The Act does not include direct provisions for water quality and does not address wildlife habitat and aesthetics.

The Alaska Reclamation Act lacks substance in terms of comprehensive and specific performance standards and other requirements, and fails to substantively address most key issues relative to the reclamation and closure requirements of most other western states. Reclamation planning in Alaska fails to adequately address water quality and fails to consider wildlife habitat and aesthetic considerations. The limitations on topsoil, revegetation, and public safety seriously compromise the statutes as well.

Recommendation: *The Alaskan Reclamation Act should be extensively modified to emulate the statutes of more progressive states and to provide for more comprehensive and specific treatment of critical planning issues. As currently written, the Reclamation Act fails to provide the requirements necessary to affect the purposes of modern mine reclamation practice.*

4.2.1.7 Bonding Requirements

- The Alaska Reclamation Act requires that financial assurance be provided, but that it not exceed an amount reasonably necessary to ensure the faithful performance of the approved reclamation plan.

Recommendation: *The financial assurance should be submitted and approved in conjunction with final permit approval.*

Alaska's Division of Mining and Water Management's practice of approving bonding independently of other agencies can potentially lead to a lack of consideration of all information. By not allowing for the consideration of information and issues that might be raised by other agencies in its analysis, the Division is likely to fail in its responsibility to make informed and coordinated decisions.

Recommendation: *Part of the proposed state-wide MOU should require that any and all bond amounts be bilaterally reviewed and approved by all the responsible agencies.*

- Alaska's Department of Environmental Conservation (ADEC) does require additional bonding for the employment of cyanide leaching or other toxic chemicals' use.

The ADEC can require bonding for the agency's estimate of actual costs to reclaim solid waste facilities involving the use of toxic chemicals. The level of bonding typically required by ADEC reflects the full cost of reclamation and closure by the agency.

Recommendation: *ADEC should develop and institute specific standards for the detoxification of leach dumps and establish bonding for remediation in the event of an accident.*

4.2.1.8 Reclamation Bond Calculation

- Under provision of the Reclamation Act, the amount of performance bond may not exceed \$750 for each acre of mined area. An operator may provide a bond for more than the amount required.

Currently, most mines bond for their estimated cost to perform reclamation, voluntarily exceeding the \$750 per acre limit. However, some mines, such as the Red Dog Mine, are currently bonded at the \$750 per acre limit.

In cases where the company volunteers a higher bond amount, the \$750 per acre limit essentially compels the Division to accept the original cost estimate of the company. The company's determination of the bond amount and the assumption that it will conduct the required activities are the key provisions of Alaska's Reclamation Act that prevents the state's scheme from fulfilling the purpose of modern reclamation and closure practices. The result is evident both in a general disregard for accepted reclamation practices and in bond amounts that are well below what the rest of the western U.S. has established. The existing method of cost estimation likely underestimates the potential reclamation cost to the agencies by 50 to more than 400 percent.

Recommendation: *Alaska's statutes must be revised to require that the Division of Mining and Water Management determine and set the bond amount. The estimation should be based on the agency performing the necessary reclamation and post-closure activities.*

- The reclamation and closure costs examined in this report's Alaska case studies show the cost estimate was either based on the \$750 per acre limit, or based on information and costs provided by the company, with only limited information based on reliable sources.

Recommendation: *Alaska's statutes should be modified to require that verifiable sources be used in determining reclamation and closure costs, as recommended in the regulatory model.*

- Alaska's Reclamation Act does not provide for the application of various facets of reclamation and closure costs, including overhead (indirect costs).

As demonstrated by the indirect cost information developed in this report's case studies, Alaska is the only state, with the exception of Arizona, that permits reclamation and closure costs to be calculated on the basis of costs to the company. There is no regard for the indirect costs that would be necessary if the agencies were forced to perform reclamation and closure. The accepted practice of bonding in all other western states is to provide for performance by the responsible agencies. Alaska's statute stands out as an example of the failure of Alaska's reclamation and closure statutes to generally fulfill the purpose of modern bonding practice.

Recommendation: *The Alaska Reclamation Act must be revised to ensure that reclamation and closure costs estimates be determined, under all circumstances, on the basis of the responsible agencies performing the necessary activities.*

- No provisions for financial assurance to fund interim operations are provided in the Alaska Reclamation Act.

Recommendation: *Alaska should adopt statutes to provide for funding interim operations as a part of the bond, as recommended in the regulatory model.*

- Alaska bases the cost of reclamation and closure on the acreage to be mined over the anticipated project life. Bonding is allowed on an incremental basis for planned surface disturbances described in the reclamation plan.

Alaska's statutes in this regard are not consistent with the recommended regulatory model. Given the other limitations on Alaska's reclamation and closure statutes as noted elsewhere in this section, it does not appear that a phased approach would result in sufficient bonding during some period of the project lifetime.

Recommendation: *Alaska should revise the statutes to delete the provision for phased bonding.*

4.2.1.9 Forms of Financial Assurance

- Alaska only allows for participation in the statewide bonding pool, surety bonds, or personal bonds accompanied by a letter of credit, certificate of deposit or by a deposit of cash or gold.

Alaska's statutes in this regard are for the most part consistent with the recommended regulatory model.

4.2.1.10 Monitoring and Compliance

- Alaska can conduct mine inspections as necessary to determine compliance with the statutes.

Alaska's regulatory history does not indicate that compliance inspections have been routinely conducted with the intent of determining regulatory compliance. The state's responsible regulatory agencies should be encouraged to exercise this authority and make routine on-site inspections of mining operations to ensure compliance with the operating permit and the reclamation plan. More frequent but irregular inspections should be made during active reclamation activities.

Recommendation: *It is recommended that the inspections pay particular attention to investigating groundwater contamination issues, toxic chemical containment and the occurrence or evidence of the potential for acid mine drainage.*

4.2.1.11 Bond Review Period

- A bond review period is not specifically addressed in the Alaska Reclamation Act or Mining Reclamation rules.

In the provisions for bond calculation, the Act infers an annual review to adjust the bond amount for acreage disturbed.

Alaska's statutes and policies in this regard are inconsistent with the recommended regulatory model and the practice of most states. As provided in the model discussion, bond review is a crucial aspect of bonding practices. The review allows the responsible agency to review the reclamation and closure plan in detail and to compare it to existing site-specific information derived from inspections. In order to be effective, bond review must incorporate adjustment of the bond as necessary to ensure the most current and accurate information.

Recommendation: *Alaska must change the Reclamation Act to incorporate an effective bond review practice, as in the recommended regulatory model.*

4.2.1.12 Closure Regulations

- Closure requirements are not addressed in the Alaska Reclamation Act or Mining Reclamation rules.

Recommendation: *Alaska must develop and promulgate specific and substantive closure and post-closure criteria and standards as in the recommended regulatory model. These criteria should be incorporated into the Reclamation Act or Mining Reclamation rules.*

4.2.1.13 Noncompliance and Bond Forfeiture

- Alaska's statutes allow for forfeiture in the event the operator violates or permits the violation of an approved reclamation plan or fails to comply with a lawful order of the Department.

Alaska's statutes in this regard are for the most part consistent with the recommended regulatory model and the practice of most states. However, the statute fails to provide for a time period following closure for reclamation activities to be commenced and completed, and lacks the specificity of the noncompliance and bond forfeiture regulations of most other states.

Recommendation: *The Alaska Reclamation Act should be modified to include a time period following closure for reclamation activities to be commenced and completed similar to the recommended regulatory model.*

4.2.1.14 Bond Release

- Alaska's Reclamation Act allows for bond release once the miner has examined the requirements of his or her approved reclamation plan, has investigated the nature and extent of reclamation and certifies as true that all applicable reclamation responsibilities have been completed.

Alaska's bond release statutes do not address the liability of the operator and surety provider with respect to bond release. No provisions are included that allow the state to modify or extend the surety agreement to fulfill closure/post-closure requirements. Inspections are not required to approve the reclamation and closure activities, and no substantive or specific vegetative growth performance standards have been developed to measure vegetative growth efficacy.

Alaska's statutes appear to seek to return the financial assurance to the mining company at the earliest opportunity, with little regard for the accepted purposes of modern reclamation and closure practices. By not withholding the bond and engaging in practices that ensure the completion of proper reclamation, Alaska is unable to insure against public liability.

Recommendation: *It is strongly recommended that Alaska modify its Reclamation Act to resemble that suggested in the regulatory model.*

4.2.1.15 Reclamation Fund or Pools

- Alaska has a reclamation bond pool. Alaska's statutes do not include reclamation funds.

Alaska's reclamation bond pool allows participants to contribute an initial deposit of no more than 15 percent of the bond plus an additional, nonrefundable annual fee of no more than five percent of the bond. The 15 percent deposit is returned upon completion of reclamation. This allows operators that would otherwise be unable to obtain standard bonds for various reasons, including financial difficulties, to obtain necessary bonding.

Alaska has not established a reclamation fund that addresses potentially unbonded liabilities, particularly those associated with potential contamination of the state's water resources from AMD and other water-degrading impacts.

Recommendation: *Alaska, like all states, should establish an emergency response fund to allow the agencies to conduct emergency response activities in a manner that is unencumbered by immediate financial constraints.*

The fund could be established based on a levy against metals production. The establishment of a substantial account could be used to finance research and development with respect to water quality issues and cleanup activities.

4.2.1.16 Public Participation

- No specific provisions for public participation are provided in the Alaska Reclamation Act.

Alaska emulates most of the western states by limiting public participation in the reclamation planning and bonding process. The analysis typically conducted by the state in approving new mining operations contains limited discussion and information relevant to bonding. However, Alaska does allow for proposed bonding to be included in the public review process for new permits.

Recommendation: *Alaska must provide for public participation by including the aspects recommended in the regulatory model. These aspects include the critical right to request an investigation of potential violations and the right to request an adjustment of the performance bond.*

4.2.1.17 Conclusion

In its present form, Alaska's Reclamation Act fails to protect the public from paying the potential costs associated with reclamation of the mines currently active in the state. Issues with respect to surface and groundwater contamination are not being currently addressed. Also, existing bond amounts do not reflect the state's cost to conduct reclamation and closure in the event a mining company fails to fulfill its obligations. Urgent and significant reform of the Alaska Reclamation Act should be a priority to encourage responsible mining practices and to protect against public liability.

4.2.2 ARIZONA

- 15 major copper mining operations are currently permitted in the state, with 12 operating mines, one proposed mine, and two mines presently being reclaimed.
- Existing bonds cover 78,837 total disturbed acres, for a total of \$146,456,779. Arizona's average bond amount of \$1,850 per acre ranks among the lowest of all the western states.
- No major Arizona mines are currently in foreclosure or bankruptcy. However, copper prices are at a 20-year low, and many companies are exhausting known reserves. Closure of several mines is imminent in the next five years.

4.2.2.1 State Reclamation Statutes, Regulations and Guidelines

- Arizona's Mined Land Reclamation Act was enacted in 1994, followed by the promulgation of rules in 1996. Arizona's Aquifer Protection Permit Program was promulgated in 1996.

Because Arizona's Mined Land Reclamation Act was established relatively recently, it should contain most of the desirable characteristics of other states' statutes. The contents of Arizona's act, however, indicate that the legislature appeared to favor industry at the risk of exposing the public to higher liability from mining.

Arizona's Aquifer Protection Permit Program, also promulgated relatively recently, is fairly comprehensive and could serve as an effective means to require reclamation activities and bonding. However, there are key problems with the program that seriously compromise its ability to protect water quality. These problems include allowing:

- a. existing contamination to go unaddressed, which prevents the state from dealing with closure issues until closure actually occurs.
- b. bond amounts to be calculated as if activities will be performed by the company.
- c. the company to self-bond.

Recommendation: *As further suggested in this section, major revisions are needed to both the Mined Land Reclamation Act and Aquifer Protection Permit Program. Changes are particularly necessary to protect Arizona against the pollution of its rare and extremely precious water resources as well as the potential for the enormous public liability associated with reclamation and closure issues in the future.*

4.2.2.2 Lead State Agency

- Reclamation and closure regulations are administered by three different agencies in Arizona. The State Mine Inspector's Division of Mined Land Reclamation is responsible for administration of the Mined Land Reclamation Act on private lands. The State Land Department is responsible for administration of the Act of state lands and the Arizona Department of Environmental Quality is responsible for administration of the Aquifer Protection Permit Program.

The separate administration of the Reclamation Act and Aquifer Protection Permit programs creates inefficiencies in Arizona's regulatory scheme. These inefficiencies involve dealing with multiple agencies in permitting, duplication of roles in each division (which causes inefficient expenditure of resources) and a lack of coordination between reclamation and closure planning. Discussions with the various agencies relative to this study indicate that there is little opportunity to coordinate the activities of the various agencies or to otherwise ensure that separate administration has not seriously compromised the reclamation planning and bonding process.

Recommendation: *Arizona needs to transfer the authority of the State Mine Inspector and State Land Department to the Department of Environmental Quality. Within the DEQ, a Division of Mined Land Reclamation, which would work in close cooperation with the Division of Water Quality, should be created. This could be effectively accomplished with a transfer of the separate agencies' records and staff into the DEQ. It is also recommended, either pending or barring transfer of authority, that the various state agencies coordinate reclamation planning and bonding activities between themselves.*

4.2.2.3 Lands Bonded by State

- The existing statutes do not clearly delineate the authority of the state to bond on private, state or federal lands, nor do they clearly prohibit authority on tribal lands. Arizona does not require bonding on federal lands if the responsible federal agency holds an approved reclamation plan and bond that is consistent with state statutes. This clearly limits the state's authority to require bonding on federal lands.

The state maintains lead authority on private and state lands and limited authority on federal lands. This authority, however, is not clearly stated in the statutes. As a result, operations located on both state and federally managed lands often undergo separate permitting processes for state and federal agencies. This creates an unnecessary duplication of effort and results in a demonstrable lack of coordination between the agencies.

Despite a large area of tribal lands in the state, Arizona has no formal relationship with tribal organizations or governments with respect to mining reclamation, either on or adjacent to tribal lands. Given the significant influence of tribal issues on the state as a whole, it is strongly recommended that Arizona consider entering into formal agreements with the various tribal organizations or governments. These agreements should provide for cooperation on reclamation and closure issues as well as tribal inclusion in decision-making processes.

While Arizona relies largely on federal land managers to bond for reclamation on federal lands, the BLM clearly lacks the authority to adequately address reclamation and closure issues and the U.S. Forest Service lacks specific authority in the area of water quality and closure regulations.

Recommendation: *Arizona statutes must allow the state full authority for reclamation and closure on all public lands in the state. In order to ensure compliance with state reclamation standards, Arizona must either assume primacy over the federal agencies within the context of an MOU or allow for bonding above and beyond that required by the federal agency. This recommendation, however, is contingent on major revisions of Arizona's statutes (as suggested herein). Without these revisions, the state remains as ill suited for authority as the federal agencies are.*

4.2.2.4 Relationship with Federal Agencies

- None of Arizona's state agencies have established formal relationships or protocols for reclamation planning and bonding with the federal agencies in an MOU or other formal agreement. Discussions with both sides revealed only limited coordination between agencies.

Arizona is the only state that does not have an apparent mandate to enter into MOU's with the federal agencies. This lack of cooperation may extend from long-standing differences between the states and federal government with respect to authority on natural resource issues.

Recommendation: *Arizona, following modification of its statutes, must enter into formal MOU's with both federal agencies, and retain either the primary authority for bonding or the authority to bond in excess of the amount allowed by federal authority.*

4.2.2.5 Exemptions to Bonding

- Arizona's statutes contain a key provision, which allows special consideration by the inspector for any surface disturbances created, in whole or in part, before July 17, 1994. The provision is based on special technical and economic constraints that are not encountered for new surface disturbances.

Due to Arizona's specific circumstances, this provision by itself exerts a tremendous influence on reclamation and closures practices in the state. With the exception of the proposed Carlota project, all of Arizona's major copper mines existed, in whole or part, prior to 1994. These operations were designed and constructed with little or no forethought as to reclamation and closure. As a result, the inspector has essentially used the broad discretion allowed by this statute to accept whatever reclamation measures are proposed by the company.

Similarly, the Aquifer Protection Permit program can address only discharges that are causing or contributing to the violation of any aquifer water quality standard and has limited authority to deal with discharges if the aquifer already exceeded standards. While there is evidence that the groundwater aquifers in the vicinity of some of Arizona's major mines were contaminated prior to 1994, the Department of Environmental Quality has not used its discretionary authority to require more extensive investigation of the problem. Instead, DEQ has deferred consideration of most groundwater issues until these facilities' closure.

In essence, nearly all of Arizona's existing major hardrock mines are exempted from the modern reclamation and closure statutes of the state. Surface reclamation and closure is dictated largely by the operating company. Under these regulations, continuous operations that could lead to additional contamination are similarly exempted from consideration. As a result, Arizona's reclamation and

closure scheme fails to provide for the modern purposes of reclamation practices and, in general, does not contribute towards responsible mining practices.

Recommendation: *Arizona must revise its statutes to address mining operations in their entirety. This revision includes requiring that all mining operations comply in full with modern reclamation and closure practices, without exemptions for previous surface disturbances or groundwater contamination, within a reasonable period of time (5 years). If the state fails to so revise these statutes, the potential liability for future cleanup could fall more significantly on the public.*

- Arizona statutes allow operations disturbing five acres or less to be exempt from reclamation and bonding requirements. No provisions are made for site-specific features or the consideration of whether exemptions should apply.

Arizona's existing exemption for an operation under five acres essentially allows small mining operations in the state to be conducted without regard for reclamation or closure issues. Historical evidence indicates that Arizona should have serious concern about this issue, as numerous small mines have littered the landscape while the state lacked substantial means to address environmental impacts or public liability associated with these mines. The fact that Arizona does not even allow site-specific considerations for small operations makes its provisions particularly arcane.

Recommendation: *Arizona must develop a specific small mine reclamation bonding program that establishes a reasonable minimum amount (\$5000 per acre) to adequately reclaim surface features. This scheme should also evaluate and bond for additional site-specific features to the extent necessary to ensure reclamation and protect against public liability.*

4.2.2.6 Reclamation Plan Requirements

- Arizona's Mined Land Reclamation Act contains general provisions that address recontouring, stability and public safety. There are also limited provisions with respect to revegetation and hydrology. The Act does not include provisions for topsoil, water quality, geochemical-AMD, wildlife habitat or aesthetics.

Arizona's Act lacks specific performance standards and other requirements and, relative to the Acts of other western states, fails to address many key issues. Reclamation planning in Arizona fails to incorporate topsoil or growth medium in achieving revegetation and site stability, fails to address water quality and geochemical-AMD considerations and fails to consider wildlife habitat and aesthetic considerations. The limitations on revegetation and hydrology seriously compromise the State's ability to address those issues as well.

Recommendation: *The Act should be extensively modified to emulate the statutes of more progressive states and to provide for a more comprehensive treatment of critical issues. As it exists, the current Mined Land Reclamation Act fails to provide the necessary reclamation and closure plan requirements of modern mine planning and bonding practice.*

- Arizona's Aquifer Protection Permit (APP) program relies on the Arizona Mining Best Available Design Control Technologies (BADCT) Guidance Manual to define applicable reclamation practices. The BADCT Manual provides general standards with respect to topsoil, recontouring, revegetation, stability, hydrology, water quality and geochemical-AMD considerations.

The BADCT Guidance Manual is primarily oriented towards regulating the design of mining facilities. Reclamation and closure considerations in the document are limited in scope. Using "Best Available

Design Control Technologies”, it allows a great deal of discretion as to actual requirements and the Manual lacks specific criteria and performance standards. This is evidenced in the fact that the Department of Environmental Quality has the authority under the APP program rules to require additional bonding for reclamation and closure, but does not typically do so, other than what is required under the Act by the State Mine Inspector’s office.

Recommendation: *Additional requirements containing specific criteria and standards for reclamation and closure should be developed. These requirements should allow, as a provision of the APP program, the Department of Environmental Quality to bond for the full cost of reclamation and closure, regardless of the Act’s limitations. The Department of Environmental Quality should fulfill its responsibility to ensure reclamation and closure by independently determining the necessary activities and the corresponding bond amount.*

4.2.2.7 Bonding Requirements

- Arizona requires that financial assurance be provided within sixty days after a reclamation plan is approved. Final action (approval) of the bond occurs within thirty days of its receipt. Arizona’s separate agencies approve their bonds independent of both each other and federal agencies.

Arizona’s current statutes allow for the approval of the reclamation plan prior to submittal and prior to approval of the bond.

Recommendation: *The bond should be submitted and approved in conjunction with final permit approval.*

- The state agencies’ practice of approving bonds independently leads to a lack of consideration on all information and bonding issues. By not allowing for the analysis of other agencies, individual state agencies are likely to fail in making informed and coordinated decisions.

Recommendation: *An MOU with other state and federal agencies should require that any and all bond amounts be bilaterally reviewed and approved by all the responsible agencies.*

- Arizona does not require additional financial assurance for mining operations that employ cyanide leaching or other toxic chemicals.

The leachant used in copper heap and dump leaching is sulfuric acid. This use results in the co-leaching of other mineralization (besides copper) including toxic metals. The existing and potential environmental impacts from copper mining operations, which are largely overlooked, may easily dwarf those of gold mining. The extent of these impacts is due to the large scale on which copper dump leaching is conducted as well as the relative lack of quality control in design and installation of leaching facilities (often a groundwater pump-back system is used in lieu of a liner).

Recommendation: *Arizona should develop and institute specific standards for the detoxification of leach dumps, remediation in the event of an accident and methods for determining the full potential cost of reclamation and closure relative to the use of chemical extraction methods.*

4.2.2.8 Reclamation Bond Calculation

- Arizona, under both the provisions of its Act and its Aquifer Protection Permit (APP) program, allows the amount of the bond to be determined by the company. The bond amount is determined as if the company will perform the required reclamation and closure activities.

Although it is an undesirable practice, most states allow the companies to take the lead in suggesting reclamation and closure costs by submitting an initial cost estimate with their reclamation plans. To varying degrees, the states then review those costs and either make corrections or require the company to do so. The scope of the changes required reflects the agencies' understanding of its own cost protocols. In most actual cases, Arizona's agencies accept the original reclamation and closure cost estimate by the company, as they generally lack the expertise to question the company's submittal.

Another ineffective provision of Arizona's Act and APP program is that companies are allowed to determine the bond amount as if they themselves will be conducting the required activities. The result is evident in a general disregard for accepted reclamation practices and in bond amounts that are well below those of the other western states. The existing cost estimation likely underestimates the potential cost of reclamation by between 50 percent and 200 percent.

Recommendation: *Arizona's statutes must be revised to require that the state's responsible agencies determine and set the bond amount. This determination should be made based on the cost for the agency—not the company—to perform the necessary reclamation and closure activities.*

- The reclamation and closure costs examined in this report's Arizona case studies show cost estimates, for the most part, that are based on information provided by the company, with only limited use of reliable sources.

Recommendation: *Modified statutes should require that verifiable sources be used in determining reclamation and closure costs, as is recommended in the regulatory model.*

- Arizona statutes provide for the application of various facets of reclamation and closure costs, including overhead (indirect costs). However, the mines examined in this report's case studies only include limited reclamation and closure costs, and do not include any provision for indirect costs.

Arizona's statutes allow the amount of the bond to be reduced to reflect the costs of the operator if sufficient financial ability to perform the reclamation can be demonstrated. As the state usually considers the construction and other activity of the mining operation as adequate demonstration of financial ability, all costs of reclamation activity are determined as if the company will perform them. No consideration is given to the indirect costs the agencies would incur in the event they had to perform those activities.

As demonstrated in the case studies considered in this report, Arizona is the only state, with the exception of some mines in Alaska that permits reclamation and closure costs to be calculated on the basis of costs to the company. The Arizona statute that allows this practice stands out as an example of the state's failure with regard to reclamation and closure statutes.

Recommendation: *The statutes must be revised to ensure that cost estimates be determined, under all circumstances, on the basis of the responsible agencies' performance of the necessary activities.*

- No provisions for bonding to fund interim operations are provided in Arizona’s Act or Aquifer Protection Permit program statutes.

Recommendation: *Arizona should adopt statutes to provide for the funding of interim operations as a part of its bonding practices, as is suggested in the regulatory model.*

- Arizona bases reclamation costs over the expected project life. Bonding amounts are based on reclamation and closure at the end of project life. Bonding is allowed on an incremental basis for any surface disturbances, current or projected, that are described in the reclamation plan.

Arizona’s statutes in this regard are consistent with the recommended regulatory model and the practice of most states, but are overshadowed by other shortcomings in the state’s regulatory scheme. Given the other limitations on Arizona’s reclamation and closure statutes, it does not appear that a phased approach will result in sufficient bonding over the project’s lifetime. This is particularly true because the APP program’s closure requirements are not determined until actual closure, which leaves those parts of the operation unbonded for a period after they become necessary (as is illustrated by Case #2 on Table 4.1.3). This provision makes Arizona particularly vulnerable in that operators could decide to forego closure and post-closure decisions, and declare bankruptcy or otherwise relieve themselves of financial responsibility (using the “sale” of such “assets” as one possibility) upon closure.

Recommendation: *Arizona should revise the statutes to delete the provision for phased bonding.*

4.2.2.9 Forms of Financial Assurance

- Arizona allows for nearly every possible form of financial assurance, including a corporate financial test, corporate guarantees (self-bonding) and any other bonding mechanisms that are acceptable to the agencies.

The broad discretion of Arizona’s regulatory agencies with regard to bonding mechanisms represents perhaps the greatest shortcoming in the state’s mine reclamation scheme. Because of Arizona’s loose definitions of “financial assurance,” described previously in this section, the majority of the state’s bonding is represented by non-liquid and essentially unenforceable guarantees. In the event of foreclosure, these “guarantees” will probably not enable the state to perform the necessary reclamation and closure acts without taxpayer funding.

Recommendation: *Arizona must revise its statutes to accept only secure and readily liquid financial assurance in the form of cash, surety bond or letters of credit.*

4.2.2.10 Monitoring and Compliance

- Arizona can conduct mine inspections as necessary to determine compliance with the statutes.

Arizona’s regulatory history does not indicate that compliance inspections have been routinely conducted for the purpose of determining regulatory compliance. The state’s responsible regulatory agencies should be encouraged to exercise this authority. More frequent, but irregular, inspection should occur during active reclamation.

Recommendation: *The inspections need to pay particular attention to investigating groundwater contamination issues, toxic chemical containment and the occurrence or potential evidence of AMD.*

4.2.2.11 Bond Review Period

- Arizona statutes require the adjustment of the bond amount at least every five years to adjust for inflation, new areas of planned surface disturbance or to reflect changed costs resulting from modifications of the reclamation plan.

With the exception of a five-year review period (as opposed to the recommended three-year period), Arizona's statutes in this category are consistent with the recommended regulatory model and the practice of most states. The statute, however, is overwhelmed by other aspects of Arizona's reclamation scheme that do not allow for modification—particularly of water quality protection—within the reclamation plan until actual closure.

4.2.2.12 Closure Regulations

- Arizona has general closure and post-closure regulations contained in the Arizona Mining Best Available Design Control Technology Guidance Manual.

Arizona is one of few states to have established extensive closure and post-closure regulations, having done so in the BADCT Manual. The BADCT closure/post-closure regulations typically address physical stability, chemical stability (AMD and other) and rinsing/detoxification. As previously discussed in this section, the BADCT requirements address surface reclamation in a limited manner.

In many respects, Arizona's BADCT requirements contain desired elements—particularly in terms of providing for closure and post-closure standards. Unfortunately, the BADCT requirements are compromised in that neither closure/post-closure planning nor any substantive bonding takes place until after the termination of mining activities. The need for hydrogeologic studies or other means to determine potential impacts of AMD and other contaminants is left to the discretion of the agencies. In addition, Arizona's statutes do not recognize open pits as “discharging facilities,” which makes them exempt from the BADCT requirements. As water treatment associated with pit lakes and AMD from open pits is a key aspect of closure requirements in states with successful regulatory programs, the exclusion of open pits from Arizona's statutes constitutes a major shortcoming in the state's regulatory scheme.

Another criticism of Arizona's BADCT requirements is the implied presumption that all the best available design control technologies were known, developed and selected by the authors of the Manual, and that no additional information will be developed. Review of the BADCT Manual clearly indicates that many modern reclamation and closure methods and standards are not included in the Manual. In addition, the Manual fails to provide specific guidelines for closure consistent with those of other states. In many cases, the Manual suggests that because the research on a particular subject (such as the detoxification of copper leach dumps) is lacking, it is not necessary. Overall, the Manual appears to be written more to facilitate the mine design process than as an effective regulatory guidance manual for reclamation and closure issues.

Recommendation: *Arizona must develop and promulgate specific and substantive closure and post-closure criteria and standards, in addition to other relevant modifications recommended elsewhere in this section.*

4.2.2.13 Noncompliance and Bond Forfeiture

- Arizona's statutes allow for forfeiture in the following events: abandonment, completion or closure, the operator stops doing business in the state and/or is subject to foreclosure or the operator fails to perform the approved reclamation or comply with the bonding conditions.

Arizona's statutes in this regard are consistent with the recommended regulatory model and the practice of most states. As a practical matter, the statutes do not address how the forfeiture would occur when only a financial test or corporate guarantee (self-bonding) is held as financial assurance.

4.2.2.14 Bond Release

- Arizona's statutes allow for the incremental release of bonding as reclamation tasks are performed. Ten percent is retained for the costs of care, monitoring and a single reseeded, if necessary, for areas that have been revegetated. Those monies are released not more than three growing seasons after supplemental management or other man-induced inputs have been discontinued.

Arizona's bond release statutes do not address the liability of the operator and surety provider with respect to bond release. No provisions are included that would allow the state to modify or extend the surety agreement to fulfill closure/post-closure requirements. Inspections are not required to approve the reclamation and closure activities, and no specific vegetative growth performance standards have been developed.

Arizona's statutes appear to release the bond to the mining company at the earliest opportunity (although assurance is typically in the form of self-bonding anyway), with little regard for the purposes of modern reclamation practices in most western states. The state is unable to insure against public liability or incomplete reclamation by quickly releasing the bond.

Recommendation: *The state needs to modify its statutes so they are similar to those in the recommended regulatory model.*

4.2.2.15 Reclamation Fund or Pools

- Arizona's statutes do not include reclamation pools or reclamation funds.

Arizona has not established a reclamation fund in order to address potentially unbonded liabilities, particularly those associated with possible groundwater contamination from AMD or other impacts. Many mines' economic reserves are near exhaustion. As these mines approach closure, and the companies further jeopardize the solvency of their U.S. operations by divesting resources in undeveloped countries, the threat of public liability becomes more real.

Recommendation: *Arizona, like all states, should establish an emergency response fund to allow the agencies to conduct emergency closure activities in a manner that is unencumbered by immediate financial constraints.*

The fund could be established through a levy on copper production of no more than 1 cent (\$0.01) per pound. This levy could establish a substantial account (\$100,000,000) to be used to finance research and development for water quality issues or cleanup activities resulting from copper mining operations in the state.

4.2.2.16 Public Participation

- Public participation in Arizona is limited to giving notice of a new or substantially changed reclamation plan in the county of the site's location. Any person who may be adversely affected by the plan or substantial change may file a written objection and/or request a public hearing. If there is sufficient public interest, the agency may hold a public hearing in the county.

Because the bond is typically determined and submitted after the reclamation plan is approved, the bond calculation is not necessarily subject to the provisions for public participation. In addition, the ADEQ has openly displayed a lack of interest in public participation in many circumstances.

Arizona emulates most of the western states in limiting public participation. The analysis typically conducted by the state for approving new mining operations contains limited discussion relevant to bonding.

***Recommendation:** Arizona must provide for public participation by including the aspects recommended in the regulatory model, including the critical right to request an investigation of potential violations, and to request the adjustment of the required performance bond amount.*

4.2.2.17 Conclusion

In its present form, Arizona's Mined Land Reclamation Act fails to protect the public from paying the potential costs associated with reclamation. Issues with respect to groundwater contamination from mining are not currently being addressed; existing bond amounts do not reflect the state's cost to conduct reclamation in the event a mining company fails to fulfill its obligations; and these obligations are typically based on the companies' self-guarantee, rather than a readily liquid bonding mechanism. Urgent and significant reform of the Arizona Mined Land Reclamation Act should be a priority to encourage responsible mining practices in the state and protect the public against liability.

4.2.3 CALIFORNIA

- 13 major gold and silver mining operations are currently permitted in the state, with nine operating mines, three mines presently being reclaimed and the status of one mine unknown.
- Existing bonding covers 8,926 total disturbed acres in the state, with a total reclamation and closure bond amount of \$34,031,851. The state's average bond amount of \$3,812 per acre ranks in the lower mid-range of the western states.
- No major mines in the state are currently in foreclosure or bankruptcy.

4.2.3.1 State Reclamation Statutes, Regulations and Guidelines

- California's Surface Mining and Reclamation Act (SMARA) was enacted in 1975, and was significantly amended in 1980.

California's SMARA was one of the more progressive mined land reclamation Acts promulgated in the 1970's. It contains many of the desirable characteristics of reclamation statutes found in other states. However, the SMARA fails to ensure adequate bond amounts, in part because of the discretion

allowed to individual county governments. Another shortcoming is that the statutes fail to require adequate inspection and recalculation of the bond to account for changed circumstances.

Recommendation: *Revisions are needed to SMARA as suggested further in this section, particularly in the areas of geochemical-AMD requirements in reclamation and closure planning, bond calculation and bond review. Most importantly, the lead agencies and the Department of Conservation must take a more pro-active role in enforcing the provisions of SMARA.*

4.2.3.2 Lead State Agency

- The “Lead agency” in California can be the city, county, a conservation district or commission, or the state Department of Conservation.

In most cases, the city, county or a conservation district has the primary authority for reclamation and closure plans and bonding. Only where a local government is not present or does not wish primacy does the California Department of Conservation assume primary responsibility for reclamation permitting and bonding. Otherwise, the Department of Conservation primarily serves in an advisory role, ensuring that the county complies with the state’s reclamation and closure requirements. Presently, most of the major mines in California are subject to county authority.

On the whole, the aspects of separate state and county authority have served to create a confusing and inefficient bonding scheme in California. The primary result of this deficiency appears to be a lack of trained technical staff at the county level. California’s scheme essentially requires that each county in which a mine is located hires a dedicated staff to administer both county and state regulations. The ability to carry out this mandate is impractical within most counties; as a result, a great deal of inconsistency is evident.

California’s statutes intend for the Department of Conservation to provide assistance and oversight to ensure that the counties’ regulation processes are conducted in accordance with the Surface Mining and Reclamation Act. However, the Department has apparently limited its role to an advisory capacity, and does not take an active role in the determination of reclamation and closure plans, bond calculation, compliance monitoring or other planning and bonding measures.

Recommendation: *California must increase the capacity and the authority of the Department of Conservation. This agency must actively oversee the reclamation process to ensure that local “lead agencies” adequately and consistently apply the Surface Mining and Reclamation Act to mining activities. The Department of Conservation’s authority should also be expanded to include oversight relative to water quality issues, particularly with respect to hydrogeologic characterization and closure.*

4.2.3.3 Lands Bonded by State

- Under the Act, the county or other lead agency performs bonding on private, state and federal lands.

California’s statutes in this regard are consistent with the recommended regulatory model and the practice of most states, except that the state, rather than the county, typically performs bonding.

- Significant areas in California contain potentially affected tribal and treaty lands. The state has no formal relationship with the various tribal organizations with respect to mining issues.

Recommendation: *California must enter into formal agreements to provide for cooperation on reclamation and closure issues, and inclusion in the decision making process, with potentially affected tribal entities.*

4.2.3.4 Relationship with Federal Agencies

- The counties typically enter into MOU's with federal and state agencies.

California's statutes in this regard are consistent with the recommended regulatory model and the practice of most states. However, federal agencies frequently disagree with the counties in which mining lands are found. The lack of agreement on critical reclamation and closure issues is a potential drawback to allowing county control.

4.2.3.5 Exemptions to Bonding

- The California SMARA applies to lands affected by operations conducted after January 1, 1976.

All of the existing major hardrock metallic mines in the state were proposed and operated subsequent to 1976. As a result, all the lands affected by major hardrock mines in the state are subject, in their entirety, to the reclamation and closure planning and bonding provisions of SMARA.

- The SMARA allows for the exemption of operations of one acre or less and those not removing 1,000 cubic yard of materials or overburden. No provisions are made for site-specific features in the consideration of whether exemptions should apply.

California's existing exemption for operations of under one acre and less than 1,000 cubic yards essentially allows "hobby" mining operations in the state to be conducted without regard for reclamation and closure issues. Historical evidence indicates that California has a serious concern in this regard, with numerous small mines littering the landscape, and the state lacking any substantial means to address environmental impacts or potential liability to the public. California's provisions do not recognize the potential for even small operations to seriously impact the environment depending on site-specific considerations.

Recommendation: *California should develop a specific small mine planning and bonding scheme that establishes a reasonable minimum amount (\$5000 per acre) to adequately reclaim surface features. This scheme should evaluate and bond for additional site-specific features to the extent necessary to ensure reclamation and against public liability.*

4.2.3.6 Reclamation Plan Requirements

- California's SMARA contains specific provisions to address topsoil, recontouring, revegetation, water quality and wildlife habitat. General provisions on stability, hydrology and geochemical-AMD are also present. The SMARA does not include provisions for public safety and aesthetics.

The SMARA contains comprehensive and specific performance standards and other requirements. The SMARA provisions for topsoil, recontouring, revegetation, water quality and wildlife habitat are recommended as examples of modern regulation intended to ensure proper reclamation and closure.

A potential weakness of SMARA, that might in part be responsible for a lack of pro-active treatment of water quality issues at California mines in general, is the lack of geochemical-AMD considerations

specifically required in the SMARA. This leaves the potential for geochemical-AMD considerations to be inadequately evaluated during the permitting process, and has resulted in a general lack of geochemical-AMD prediction at California mines. The AMD issues that were realized at the McLaughlin mine AMD issues are an example of what might result from a lack of specific geochemical-AMD requirements or standards.

The SMARA does not address public safety and aesthetics. It is probable that public safety is assumed by its incorporation into other statutes; however, it should be included as a specific reclamation and closure requirement.

Recommendation: *The SMARA should be modified to specifically address geochemical-AMD issues, including requiring adequate prediction and mitigation to be identified during the permitting process. The statute must also be applied to operating mines and those presently undergoing reclamation to ensure that failure to previously address this key issue does not result in eventual public liability. Consideration should be given to additional standards to address public safety and aesthetics.*

4.2.3.7 Bonding Requirements

- The SMARA requires that financial assurance be provided after a reclamation plan is approved.

California's statutes in this regard are consistent with the recommended regulatory model and the practice of most states.

- California does require additional financial assurance for mining operations that employ cyanide leaching or other toxic chemicals.

Under the provisions of the California Water Code and the authority of the California Regional Water Quality Control Boards, bonding for leach pads and/or tailings ponds detoxification is required, in addition to bonding for potential accidents and some indirect water quality related costs.

4.2.3.8 Reclamation Bond Calculation

- The SMARA allows the amount of the bond to be determined by the company. The amount of financial assurance must be based on the lead agencies' costs, or costs for third party contracting. A contingency not to exceed 10 percent of the reclamation costs is also prescribed.

Although it is an undesirable practice, most states allow the company to suggest reclamation and closure costs by submitting an initial estimate of those costs in accordance with the reclamation and closure plan. To varying degrees, the states then review those costs and either make corrections or require the company to do so. In practice, California's counties and the Department of Conservation usually accept the company's original cost estimate, lacking the expertise to question the company's submittal.

The matter of allowing the company to determine the bond amount and allowing them to assume they will conduct the required activities is a key provision of the SMARA that prevents the state's reclamation and closure scheme from fulfilling the purpose of modern reclamation and closure practices. The result is evident in bond amounts that are in the lower mid-range of the western U.S., and in some cases might result in the disregard of accepted reclamation practices and costs. The existing method of cost estimation likely underestimates the potential cost to the agencies of performing reclamation by 50 to 200 percent.

Recommendation: *California's SMARA must be revised to require that the lead agency or the Department of Conservation determine and set the bond amount. Also, the agencies must determine the bond amount on the basis of the agency performing the activities necessary to achieve compliance with state statutes.*

- The reclamation and closure costs examined in this report's California case studies show the cost estimate was largely based on information and costs provided by the company, with only limited information based on reliable sources.

Recommendation: *Modified statutes should require that verifiable sources be used in determining reclamation and closure costs, as recommended in the regulatory model.*

- California's SMARA does not specifically address overhead (indirect costs), except to provide for a contingency of up to 10 percent. This report's case studies indicate inconsistencies in this regard. The Briggs mine, for example, includes nearly 40 percent of indirect costs (including contingency), while the McLaughlin mine includes no indirect costs other than a 10 percent contingency.

Because SMARA requires that the reclamation and closure costs be based on the agency's costs to perform the necessary tasks, the inclusion of indirect costs could be assumed. However, as demonstrated by the indirect cost information developed in the case studies, assumptions in regulation often lead to significant shortfalls in bonding.

The Department of Conservation's Financial Assurance Guidelines require that charges be added for supervision, profit, overhead, contingencies and mobilization. The McLaughlin cost estimate was possibly formulated prior to issuance of the guidelines. However, this serves as an example of the failure of SMARA to require adequate review and adjustment of the bond amount so as to reflect any changes in circumstance or interpretation of the statutes.

Recommendation: *The SMARA must be revised to ensure that cost estimates be determined, under all circumstances, on the basis of the performance of necessary activities by the responsible agency or agencies, including indirect costs.*

- No provisions for financial assurance to fund interim operations are provided in the SMARA.

Recommendation: *California should adopt statutes to provide for funding interim operations as a part of the financial assurance as recommended in the recommended regulatory model.*

- California bases the cost of reclamation and closure over the expected project life, with bonding based on reclamation and closure at the end of project life. Financial assurance is allowed on an incremental basis for planned surface disturbances described in the reclamation plan.

California's statutes in this regard are consistent with the recommended regulatory model and the practice of most states, but are compromised by other shortcomings in the state's regulatory scheme. Given the other limitations on California's reclamation and closure statutes pertaining to geochemical-AMD prediction and bond cost calculation, a phased approach might not result in sufficient bonding during some period of the project lifetime.

Recommendation: *California should revise the statutes to delete the provision for phased bonding.*

4.2.3.9 Forms of Financial Assurance

- California allows for nearly every possible form of financial assurance, with the exception of self-bonding.

California's statutes in this regard are consistent with the recommended regulatory model and the practice of most states, except for California's acceptance of "Pledges of Revenue" or "Budget Set-Aside's."

The practice of allowing for pledges of revenue or budget set-asides allows the operator to finance reclamation and closure costs from the hoped-for revenue stream from the mine. This practice cannot ensure that reclamation and closure bond amounts are adequately taken into consideration by the operator prior to proceeding with the project, just as it cannot ensure that the operator will in fact realize the hoped for revenues.

Recommendation: *California must revise it's statutes to accept only secure and readily liquid financial assurance up-front in the form of cash, surety bonds, or letters of credit.*

4.2.3.10 Monitoring and Compliance

- California can conduct mine inspections as necessary to determine compliance with the statutes.

California's regulatory history does not indicate that compliance inspections have been routinely conducted with the intent of determining regulatory compliance. The state's responsible regulatory agencies should be encouraged to exercise this authority and make routine on-site inspections of mining operations to ensure compliance with the terms of the operating permit and the approved reclamation and closure plan, with more frequent but irregular inspection during active reclamation activities.

Recommendation: *It is recommended that the inspections pay particular attention to investigating groundwater contamination issues, toxic chemical containment and the occurrence or evidence of the potential for AMD.*

4.2.3.11 Bond Review Period

- California's statutes require the operator to submit an annual revision of the bond calculation.

California's statutes in this regard are inconsistent with the recommended regulatory model and the practice of most states. As provided in the model discussion, bond review is a crucial aspect of bonding practices that affords the responsible agency the opportunity to review the reclamation and closure plan in detail and compare it to existing site-specific information derived from monitoring and compliance inspections. In order to be effective, bond review must incorporate adjustment of the bond as necessary to ensure an adequate bond level based on the most current and accurate information.

As a case in point, the McLaughlin mine reclamation and bond cost was originally calculated in 1982 based on the original reclamation and closure plan. The existing bond, last adjusted in 1998, has only been revised to reflect cost-inflation during the past 17 years. During that time the mine's plan of operations and reclamation and closure plans have undergone significant changes, primarily due to the realization of AMD issues at the site. For example, since 1987, reclamation has included encapsulation of the acid-generating waste rock, regrading and redistribution of topsoil. However, the

current bond estimate does not reflect that change, and therefore, either presently or at one time, failed to ensure adequate reclamation.

***Recommendation:** California must change SMARA to incorporate an effective bond review practice as in the recommended regulatory model.*

4.2.3.12 Closure Regulations

- California has general closure regulations contained in SMARA and in provisions of the California Water Code under the authority of the California Regional Water Quality Control Boards.

This study did not conduct a detailed review of the closure regulations in the California Water Code or otherwise as determined by authority of the water quality control boards.

***Recommendation:** California must develop and promulgate specific and substantive closure and post-closure criteria and standards as in the recommended regulatory model, and they should be incorporated into SMARA.*

4.2.3.13 Noncompliance and Bond Forfeiture

- California's statutes allow for forfeiture in the event of abandonment or in the event the operator is financially incapable of performing reclamation in accordance with the approved reclamation plan.

California's statutes in this regard are for the most part consistent with the recommended regulatory model and the practice of most states. However, the statutes fail to provide for a time period following closure for reclamation activities to be commenced and completed.

***Recommendation:** The SMARA should be modified to include a time period following closure for reclamation activities to be commenced and completed.*

4.2.3.14 Bond Release

- SMARA requires that the financial assurance provisions remain in effect for the duration of the surface mining operation and any additional period until reclamation is completed.

California's statutes in this regard are generally consistent with the recommended regulatory model.

4.2.3.15 Reclamation Fund or Pools

- California's SMARA does not include reclamation pools or reclamation funds.

California has not established a reclamation fund in order to address potentially unbonded liabilities, particularly those associated with potential groundwater contamination from AMD and other impacts that could significantly degrade the state's water resources.

***Recommendation:** California, like all states, should establish an emergency response fund to allow the agencies to conduct emergency response activities at permitted or illegal mining operations in a manner that is unencumbered by immediate financial constraints.*

The fund could be established based on a levy against metals production. The substantial account could then be used to finance research and development with respect to water quality issues and cleanup activities resulting from both modern and historic mining operations in the state.

4.2.3.16 Public Participation

- California's SMARA does not contain specific provisions for public participation in bonding.

California emulates most of the western states with regards to limiting public participation in reclamation and closure planning—particularly in the bonding process. The analysis typically conducted by the state in approving new mining operations contains limited discussion and information relevant to bonding.

Recommendation: *California must provide for public participation by including the aspects recommended in the regulatory model, including the critical right to request an investigation of potential violations, and to request the adjustment of the required performance bond amount.*

4.2.3.17 Conclusion

In most respects, California's Surface Mining and Reclamation Act serves as an excellent example of modern mining reclamation and closure statutes. California fails in its implementation to ensure responsible mining and to protect the public from potential liability. The primary weakness of SMARA appears to be in the separation of the Department of Conservation's regulatory authority from that of the counties, which are designated as the lead agencies. As a result, a lack of expertise and initiative exists (both at the department and the county level) to ensure adequate investigation during the permitting process with respect to hydrogeologic-AMD issues. Also, a lack of adequate operational monitoring and compliance inspections leaves the state potentially susceptible to water quality concerns. In addition, bond calculations by the company are typically accepted at face value, and bond review does not incorporate adjustments to the bond to reflect changes in current conditions. The Department of Conservation should assume full authority of SMARA as well as primary responsibility for bonding in the state. Reform of the California Surface Mining and Reclamation Act should be encouraged to address these inadequacies and to realize the SMARA's potential to promote responsible mining practices in the state and protect the public's liability.

4.2.4 COLORADO

- Eight major hardrock mining operations are currently permitted in the state. There are two gold and silver mines (one operating and one closed), one primary gold mine (suspended) and one primary silver mine (closed), two molybdenum mines (one operating and one suspended) and two precious and base metals mines (both suspended). The Summitville mine Superfund cleanup is not included in this list.
- Existing bonding covers 10,986 total disturbed acres in the state, with a total reclamation and closure bond amount of \$97,846,815. The state's average bond amount of \$8,907 per acre ranks in the upper mid-range of the western states.
- No major mines in the state are currently in foreclosure or bankruptcy.

4.2.4.1 State Reclamation Statutes, Regulations and Guidelines

- Colorado's Mined Land Reclamation Act was enacted in 1973, and has since been amended numerous times.

Colorado's Mined Land Reclamation Act, promulgated in the 1970's, was one of the earlier acts. While it contains many of the desirable characteristics of reclamation statutes found in other states, it is general in scope and does not contain many of the specific requirements which other states have since incorporated in more modern reclamation and closure statutes.

***Recommendation:** Revisions are needed to Colorado's Act, as is suggested in this section. Particularly attention should be paid to geochemical-AMD requirements in planning, bond calculation and bond review.*

4.2.4.2 Governing State Body

- The Colorado Mined Land Reclamation Board is responsible for the promulgation of rules under the Colorado Mined Land Reclamation Act.

According to the Act, the board shall consist of seven members: the executive director (of the DNR), a member of the state soil conservation board, three individuals with substantial experience in agriculture or conservation and two individuals with substantial experience in the mining industry.

The Colorado Mined Land Reclamation Board is a typical example where pro-industry bias in the make-up of the governing body is evident. The existing Board make-up contains two industry representatives, a professor from the Colorado School of Mines and four governmental officials. There is no representative from the environmental community or anyone with specific environmental expertise included on the Board. This at least in part might explain why Colorado's statute, despite numerous amendments, fails to specifically address many aspects of modern mining reclamation and closure practice.

***Recommendation:** The Colorado Mined Land Reclamation Act should be revised to provide for a more impartial make-up and include different stakeholder groups, including landowner and environmental groups, to ensure the Board functions without undue industry influence.*

4.2.4.3 Lead State Agency

- The Division of Minerals and Geology, Department of Natural Resources, is the lead state agency responsible for administering the Colorado Mined Land Reclamation Act. The Colorado Department of Public Health and Environment, Water Quality Control Division is responsible for the regulation of any discharges from the mine and other water quality considerations.

The separate administration of the Reclamation Act and Water Quality Control program in Colorado's regulatory scheme has resulted in an apparent gap with respect to water quality issues. The Water Quality Control program lacks authority to require bonding relevant to water treatment and other water quality issues. Under the Mined Land Reclamation Act, the Division of Minerals and Geology has limited authority to bond for short-term water treatment during reclamation of a site as necessary. Colorado's situation is typical of most states with separate agencies responsible for reclamation and water quality protection. The result, to varying extents, is a lack of ability to provide for water resource protection.

***Recommendation:** Colorado needs to ensure coordination with the Water Quality Control program and either provide it the authority to require bonding for environmental protection or ensure that the Division of Minerals and Geology acts on its authority to require bonding for environmental protection, including for long-term water treatment.*

4.2.4.4 Lands Bonded by State

- Bonding is required under the Colorado Mined Land Reclamation Act on private, state and federal lands.

Colorado's statutes in this regard are consistent with the recommended regulatory model.

4.2.4.5 Relationship with Federal Agencies

- The state typically enters into Memoranda of Understanding (MOU) with the U.S. Forest Service and BLM.

Colorado's statutes in this regard are consistent with the recommended regulatory model.

4.2.4.6 Exemptions to Bonding

- The Colorado Mined Land Reclamation Act applies to lands affected by operations conducted after June 30, 1976.

Many of the existing major hardrock metallic mines in the state were operated prior to 1976. However, because the Act applies to lands affected by operations conducted after 1976, the Act enables the state to apply the modern statutes and bond for the entire disturbed area.

- Since July 1, 1993, all applications for permits to conduct mining operations, regardless of size, are required to include a financial warranty in the amount determined pursuant to the Act.

By eliminating the exclusion of bonding for small mining operations after 1993, and requiring bonding pursuant to the Act, Colorado's statutes in this regard are consistent with the recommended regulatory model.

4.2.4.7 Reclamation Plan Requirements

- Colorado's Mined Land Reclamation Act contains specific provisions addressing topsoil and water quality. General provisions are included for recontouring, revegetation, stability, hydrology, geochemical-AMD and wildlife habitat. The Act does not include provisions for public safety or aesthetics.

The Colorado Mined Land Reclamation Act contains comprehensive and specific performance standards and other requirements. The Act's provisions for topsoil and water quality are recommended as examples of modern regulation intended to ensure proper reclamation and closure.

A potential weakness of the Colorado Mined Land Reclamation Act is the lack of comprehensive and specific provisions for recontouring, revegetation, stability, hydrology, geochemical-AMD, and wildlife habitat. This leaves the potential for bonding relative to these issues, particularly

geochemical-AMD considerations, to be inadequately addressed during the permitting process and in reclamation and closure planning and bonding.

The Act does not address public safety or aesthetics. It is probable that public safety is assumed by its incorporation in other statutes, but it should be included as a specific reclamation and closure requirement.

Recommendation: *The Colorado Mined Land Reclamation Act should be modified to specifically address geochemical-AMD issues and to more specifically address recontouring, revegetation, stability, hydrology and wildlife habitat. Consideration should be given to additional standards to address public safety and aesthetics.*

4.2.4.8 Bonding Requirements

- The Colorado Mined Land Reclamation Act requires that financial assurance be provided before a permit is issued.

Colorado's statutes in this regard are consistent with the recommended regulatory model.

- Colorado does not require additional financial assurance for mining operations that employ cyanide leaching or other toxic chemicals, except for detoxification of heap leach pads.

Recommendation: *Colorado should develop and institute specific standards for the detoxification of leach dumps, remediation in the event of an accident and the full potential cost of reclamation and closure relative to the use of chemical extraction methods.*

4.2.4.9 Reclamation Bond Calculation

- The Colorado Mined Reclamation Act allows the amount of the bond to be calculated by the company. The amount of financial assurance must be based on the agency's costs to complete reclamation. An amount equal to five percent of the reclamation costs is included for administrative cost.

Although it is an undesirable practice, most states allow the company to take the lead in suggesting reclamation and closure costs by submitting an initial estimate of those costs in accordance with the reclamation and closure plan. To varying degrees, the states then review those costs and either make corrections or require the company to do so. In practice, Colorado's Division of Mines and Geology reviews the original reclamation and closure cost estimate by the company, and may in some cases require changes in the estimate.

Recommendation: *Colorado's Mined Land Reclamation Act should be revised to require that the Division of Minerals and Geology independently determine the bond amount on the basis of the agency performing the necessary reclamation and closure activities.*

- The reclamation and closure costs examined in this report's Colorado case study show the cost estimate was for the most part based on information from reliable sources.

Colorado's statutes in this regard are consistent with the recommended regulatory model and the practice of most states.

- Colorado's Mined Land Reclamation Act does not specifically address overhead (indirect costs), except to provide for administrative costs of five percent of the total reclamation costs. The case study included in this report included nearly 24 percent in indirect costs including contingency.

Because Colorado's Act requires that the reclamation and closure costs be based on the agency's costs to perform the necessary tasks, the inclusion of indirect costs could be assumed. However, as noted elsewhere in this study, assumptions in regulation often leads to significant shortfalls in ensuring the intended mandates of the regulations.

Recommendation: *The Act should be revised to ensure that reclamation and closure costs include all indirect costs that might be incurred, in accordance with the recommended regulatory model.*

- No provisions for financial assurance to fund interim operations are provided in the Act.

Recommendation: *Colorado should adopt statutes to provide for funding interim operations as a part of bonding, as is recommended in the regulatory model.*

- The Colorado Mined Land Reclamation Act requires that the bond amount not exceed the estimated cost of fully reclaiming all lands to be affected in the current year, plus all lands affected in previous years and not fully reclaimed.

Although the statutes allow incremental bonding, the cost of reclamation in the Colorado case study was based over the expected project life, with the amount of financial assurance based on reclamation and closure at the end of project life.

Colorado's statutes in this regard are not consistent with the recommended regulatory model, and might not result in sufficient bonding during some period of the project lifetime.

Recommendation: *Colorado should revise the statutes to delete the provision for incremental bonding.*

4.2.4.10 Forms of Financial Assurance

- Colorado allows for nearly every possible form of financial assurance, including a corporate financial test or corporate guarantees (self-bonding), and equipment salvage value.

The broad discretion afforded to the state's regulatory agencies with regard to forms of bonding represents perhaps the greatest shortcoming in the state's bonding scheme. Bonding amounts may be represented by non-liquid and essentially unenforceable guarantees, which in the event of foreclosure, would not enable the state to perform the necessary reclamation and closure Acts without taxpayer funding.

Recommendation: *Colorado must revise its statutes to accept only secure and readily liquid financial assurance in the form of cash, surety bonds or letters of credit.*

4.2.4.11 Monitoring and Compliance

- Colorado can conduct mine inspections as necessary to determine compliance with the statutes.

Colorado's statutes in this regard are consistent with the recommended regulatory model.

Recommendation: *The inspections need to pay particular attention to investigating groundwater contamination issues, toxic chemical containment and the occurrence or evidence of the potential for AMD.*

4.2.4.12 Bond Review Period

- Colorado’s Act allows the bond amount to be reviewed at any time, at the Division’s discretion.

Colorado’s statutes in this regard are consistent with the recommended regulatory model and the practice of most states, except that a specific time period for bond review is not mandated. Information provided by the Division indicates that most bonds have been reviewed in the past five years.

Recommendation: *Colorado should change the Act to mandate bond review at least every five years.*

4.2.4.13 Closure Regulations

- Colorado has general closure regulations contained in the Act.

Recommendation: *Colorado must develop and promulgate specific and substantive closure and post-closure criteria and standards as in the recommended regulatory model, and they should be incorporated into the Act.*

4.2.4.14 Noncompliance and Bond Forfeiture

- Colorado’s Act allows for forfeiture in the event of failure to perform corrective actions. Forfeiture is also allowed if the company is in default under its performance warranty, the bond is not maintained in good standing or the operator is financially incapable of performing reclamation in accordance with the Act.

Colorado’s statutes in this regard are for the most part consistent with the recommended regulatory model and the practice of most states. However, the Act allows for “temporary cessation” for a period of five years if it can be demonstrated that mineral reserves remain and that the site has been adequately stabilized for the cessation period. At the conclusion of five years of temporary cessation, an operator must resume mining, reclaim the site or petition the Mined Land Reclamation Board for a one-time, five-year extension.

Some mines have taken advantage of the allowance for temporary cessation to avoid reclamation indefinitely. It is common knowledge that the Climax Molybdenum mine has avoided full reclamation and closure by periodically operating its mine and mill in order to take advantage of this provision, which appears to have been intentionally provided for this purpose.

Recommendation: *The Colorado Act should be modified to ensure reclamation activities are commenced and completed similar to the recommended regulatory model.*

4.2.4.15 Bond Release

- Colorado’s Act allows for the partial release of bonding as requirements are performed.

Colorado’s bond release statutes do not address the liability of the operator and surety provider with respect to bond release. No provisions are included that allow the state to modify or extend the surety

agreement to fulfill closure/post-closure requirements. Inspections are required to approve the reclamation and closure activities, and substantive vegetative growth standards have been developed to measure revegetation efficacy.

***Recommendation:** The state should modify its statutes similar to that suggested in the recommended regulatory model.*

4.2.4.16 Reclamation Fund or Pools

- Colorado's Act establishes an emergency response cash fund available for use by the Division to conduct emergency responses or to perform emergency reclamation activities at mining operations subject to the Act.

Colorado has not established a reclamation fund in order to address potentially unbonded reclamation and closure liabilities, particularly those associated with potential groundwater contamination from AMD or other impacts that could significantly degrade the state's water resources.

***Recommendation:** Colorado, like all states, should establish a substantial account that could be used to finance research and development with respect to water quality issues and cleanup activities resulting from mining operations in the state.*

4.2.4.17 Public Participation

- Colorado's Mined Land Reclamation Act contains limited provisions for public participation in bond release, and also infers limited public participation with respect to bonding during project permitting and bond review.

Colorado emulates most of the western states in limiting public participation in the reclamation planning and bonding process. The analysis typically conducted by the state in approving new or modifying existing mining operations contains limited discussion and information relevant to bonding.

***Recommendation:** Colorado must provide for public participation by including the aspects recommended in the regulatory model, including the critical right to request an investigation of potential violations and the right to request the adjustment of the bond amount.*

4.2.4.18 Conclusion

In most respects, Colorado's Mined Land Reclamation Act serves as a good example of modern mining reclamation and closure statutes. It falls short, however, of ensuring responsible mining and protecting the public from potential liability. The primary weakness of the state's planning and bonding practice is with respect to geochemical-AMD and other water quality issues. This weakness leaves the state susceptible to liability for water quality concerns. In addition, bond calculations by the company are, at least to some extent, accepted at face value. Reform of the Colorado Mined Land Reclamation Act should be encouraged to address these inadequacies and realize the Act's potential to promote responsible mining practices in the state and protect the public's liability.

4.2.5 IDAHO

- Seven major hardrock surface mining operations are currently permitted in Idaho. There are six gold and silver mines (one operating, three suspended, two closed and undergoing reclamation) and one primarily molybdenum mine currently in operation.
- Existing operations disturb a total of 5,790 acres, with a total reclamation and closure bond amount of \$39,926,236. The state's average bond amount of \$6,895 per acre ranks around the mid-range of the western states.
- The parent company of one major mining operation (Dakota Mining Corp, Stibnite Mine) is currently bankrupt.

4.2.5.1 State Reclamation Statutes, Regulations and Guidelines

- Idaho's Surface Mining Act was established in 1971 and was significantly revised in 1996. Rules were promulgated in 1989 and were significantly revised in 1998.

Since Idaho's Surface Mining Act was revised relatively recently, it should contain most of the desirable characteristics of reclamation statutes found in other states. Unfortunately, most of the key facets in other states' provisions are absent from Idaho's Act. Overall, the Surface Mining Act does not adequately promote responsible reclamation and closure practices.

***Recommendation:** Major revisions are needed to the Idaho Surface Mining Act, as suggested further in this section. These revisions should be sought with a sense of urgency in order to ensure the objectives of reclamation bonding. Changes are particularly necessary to protect Idaho's public from the pollution of its rare and extremely precious water resources and from the potential for enormous public liability.*

4.2.5.2 Lead State Agency

- The Idaho Department of Lands administers the Surface Mining Act. The Department of Water Resources administers the Idaho Dam Safety Act. The Idaho Department of Health and Welfare administers the Rules for Ore Processing by Cyanidation.

The administration of the Surface Mining Act, the Dam Safety Act and the Rules for Ore Processing by Cyanidation by separate agencies presents a difficult regulatory scheme—one with the potential for shortcomings with respect to water quality and other issues.

***Recommendation:** Idaho must ensure coordination between the various agencies. Authority must be established to require bonding for environmental protection on all lands in the state, including for long-term water treatment.*

4.2.5.3 Lands Bonded by State

- The Idaho Surface Mining Act applies to all private, state and federal lands.

Idaho's statutes in this regard are consistent with the recommended regulatory model and the practice of most states.

Despite significant areas of tribal lands in the state, Idaho has no formal relationship with the various tribal organizations with respect to mining issues that affect those lands.

Recommendation: *Idaho must consider entering into formal agreements with the various tribal organizations. These agreements should provide for cooperation on reclamation and closure issues, and inclusion in the decision making process.*

4.2.5.4 Relationship with Federal Agencies

- Idaho typically enters into project specific Memoranda of Understanding with the Bureau of Land Management and U.S. Forest Service.

Idaho's statutes in this regard are for the most part consistent with the recommended regulatory model and the practice of most states. Either the state or the federal agency may hold the surety.

4.2.5.5 Exemptions to Bonding

- The Idaho Surface Mining Act does not apply to lands affected by operations conducted prior to May 31, 1972. Underground mines are exempt from the Surface Mining Act.

All of the existing major surface mines in the state were proposed and operated after 1972.

Idaho's Surface Mining Act is the only state regulatory scheme that exempts underground mines from normal reclamation and closure provisions in the western US. The exemption of underground mines from the Act leaves a serious gap in Idaho mine reclamation and closure regulations with respect to water quality and other issues relevant to underground mining operations. Idaho has several large underground mining operations—both historic and modern—that have the potential to significantly impact hydrology and water quality. The exemption appears to have been purposefully intended to exempt historic mining operations from modern reclamation and closure statutes. Some of those operations are now active Superfund sites with significant water quality and other remediation and reclamation issues.

Recommendation: *Idaho should either eliminate the exemption of underground mines from the Surface Mining Act or enact separate statutes to address reclamation and closure issues relative to underground mining operations in the state.*

- Idaho's statutes do not contain exemptions for small mining operations.

By not exempting small mining operations from the requirements of the Surface Mining Act, Idaho's statutes are consistent with the recommended regulatory model. However, the exemption for underground operations leaves a significant gap in regulation for small mining operations that employ underground mining methods. This gap can result in significant reclamation and closure issues.

Recommendation: *Idaho should develop a specific small mine planning and bonding scheme for all mines (surface and underground) that establishes a reasonable minimum amount (\$5000 per acre) to adequately reclaim surface features. The scheme should evaluate and bond for additional site-specific features to ensure reclamation and against public liability.*

4.2.5.6 Reclamation Plan Requirements

- Idaho's Surface Mining Act contains specific provisions addressing topsoil and revegetation. There are general standards addressing recontouring and stability. The Act does not include provisions for hydrology, water quality, geochemical-AMD, public safety, wildlife habitat or aesthetics.

The Idaho Surface Mining Act lacks substance in terms of comprehensive and specific performance standards and other requirements and, relative to the requirements of most other western states, fails to address many key issues. Idaho's scheme fails to adequately address hydrology, water quality and geochemical-AMD considerations. It also fails to consider public safety, wildlife habitat and aesthetics. The limitation on reclamation and closure issues in the Surface Mining Act essentially precludes the ability of the state to require responsible mining practices.

***Recommendation:** The Idaho Surface Mining Act should be extensively modified to emulate the statutes of more progressive states and to provide for more comprehensive and specific treatment of critical planning issues. As currently written, the Act fails to provide for the requirements necessary to affect the purposes of modern and responsible planning and bonding practice.*

4.2.5.7 Bonding Requirements

- The Idaho Surface Mining Act requires that financial assurance be provided before operations begin.

Idaho's statutes in this regard are generally consistent with the recommended regulatory model.

- Idaho does require additional financial assurance for mining operations that employ cyanide leaching or other toxic chemicals. The Rules for Ore Processing by Cyanidation authorize the Board of Health and Welfare to require a reasonable fee for processing permit applications and to require bonding for permanent closure.

The maximum amount of financial assurance allowed under the Rules is \$100,000. As provided in this report's case studies, the costs of detoxification and other measures to obtain permanent closure at operations using cyanide are significantly in excess of this limit. Therefore, the limitation essentially makes the rules ineffective to ensure closure.

***Recommendation:** Idaho should develop and institute specific standards for the detoxification of leach dump and remediation in the event of an accident. The authority to bond for the full potential cost of reclamation and closure relative to the use of chemical extraction methods should also be provided.*

4.2.5.8 Reclamation Bond Calculation

- Idaho allows the amount of the bond to be determined by the company. The Surface Mining Act requires that cost estimations reflect reasonable costs of reclamation, plus 10 percent. No performance bond shall exceed \$2,500 per acre unless required by the board to meet the conditions of the Act.

In Idaho, the company is allowed to take the lead in suggesting reclamation and closure costs by submitting an initial estimate. In some cases, those costs exceed the \$2,500 dollar limit, but in others,

the costs are well below the limit. In practice, it appears that the Idaho Department of Lands accepts the original cost estimate, in most cases lacking the expertise or initiative to question the submittal. On the other hand, the Idaho Department of Water Regulation, under the Dam Safety Rules, appears to require bonding that is more reflective of the real cost of reclamation and closure, at least at tailings dam facilities.

Allowing the company to determine the bond amount based on the assumption that it will be conducting the activities, and placing a \$2,500 per acre limit on those bonds, prevent the state's scheme from fulfilling the purpose of modern reclamation and closure practices. The result is evident in bond amounts that are typical of other states with unacceptable practices. The existing method of cost estimation probably underestimates the potential cost to the agencies of performing reclamation by 50 to 400 percent.

This inadequacy is confirmed by examination of the Thompson Creek case study. At Thompson Creek, the Idaho Department of Water Resources required a bond of over \$35,000 per acre for the tailings impoundment, while the Idaho Department of Lands (and the U.S. Forest Service) allowed a bond of approximately \$750 per acre for all other disturbances.

Recommendation: *Idaho's statutes must be revised to require that the Department of Lands set the bond amount. The bond should be determined on the basis of the agency performing the activities necessary to achieve compliance with (otherwise modified) state statutes.*

- The reclamation and closure costs examined in this report's Idaho case studies show the cost estimate was largely based on information either provided by the company or by a third-party engineering estimate conducted for the company. Only limited information was based on reliable sources.

Recommendation: *Idaho's statutes should require that the responsible agencies use verifiable sources in determining reclamation and closure costs, as recommended in the regulatory model.*

- Idaho's Surface Mining Act does not specifically address overhead (indirect costs), except to provide for an additional 10 percent.

This report's case studies indicate gross inconsistencies with regard to indirect costs in reclamation estimates. While the Beartrack Mine included mobilization/demobilization, contract administration, insurance and profit at approximately 35 percent of the direct costs, the Thompson Creek Mine provided no allowance for indirect costs.

Recommendation: *The Idaho Surface Mining Act must be revised to ensure that reclamation and closure cost estimates be determined, under all circumstances, on the basis of the responsible agencies performing the necessary activities, including indirect costs, on a site-specific basis.*

- No provisions for bonding to fund interim operations are provided in the Act.

Recommendation: *Idaho should adopt statutes to provide for funding interim operations as a part of the bond, as recommended in the recommended regulatory model.*

- Idaho bases the cost of reclamation and closure over the expected project life, with the bond based on reclamation and closure at the end of project life. Financial assurance is allowed on an incremental basis for planned surface disturbances described in the reclamation plan.

Idaho's statutes in this regard are consistent with the recommended regulatory model and the practice of most states, but are compromised by other shortcomings in the state's regulatory scheme. Given the other limitations on Idaho's reclamation and closure statutes, as noted elsewhere in this section, it does not appear that a phased approach would result in sufficient bonding during some period of the project lifetime.

Recommendation: *Idaho should revise the Act to delete the provision for incremental bonding.*

4.2.5.9 Forms of Financial Assurance

- Idaho allows for surety bonds, collateral bonds, or letters of credit as a form of acceptable surety.

Idaho's statutes in this regard are consistent with the recommended regulatory model and the practice of most states.

4.2.5.10 Monitoring and Compliance

- Idaho can conduct mine inspections as necessary to determine compliance with the statutes.

Idaho's statutes in this regard are consistent with the recommended regulatory model and the practice of most states.

Recommendation: *It is recommended that the inspections pay particular attention to investigating groundwater contamination issues, toxic chemical containment and the occurrence or evidence of the potential for AMD.*

4.2.5.11 Bond Review Period

- Idaho's statutes require the operator to submit an annual revision of the bond calculation for any increase in affected acreage.

Idaho's statutes in this regard are inconsistent with the recommended regulatory model and the practice of most states. As provided in the model discussion, bond review is a crucial aspect of bonding practices. The review allows the responsible agency to review the reclamation and closure plan in detail and to compare it with existing site-specific information derived from inspections. In order to be effective, bond review must incorporate adjustment of the bond as necessary, based on the most current and accurate information.

As a case in point, the Thompson Creek bond was originally calculated in 1982 based on the reclamation and closure plan. The existing bond, last adjusted in 1996, has primarily been revised to reflect 17 years' inflation and decreased reclamation costs based on company information. During that time, the mine's plan of operations and reclamation plan have undergone significant changes, primarily due to the realization of AMD issues at the site. The current bond estimate, however, does not reflect those changes, and therefore fails to ensure adequate reclamation.

Recommendation: *Idaho must change the Surface Mining Act to incorporate an effective bond review practice as in the recommended regulatory model.*

4.2.5.12 Closure Regulations

- Closure requirements are not included in the Surface Mining Act.

Recommendation: *Idaho must develop and promulgate specific and substantive closure and post-closure criteria and standards, as in the recommended regulatory model.*

4.2.5.13 Noncompliance and Bond Forfeiture

- A bond may be forfeited when the operator has not conducted the reclamation in accord with the approved reclamation plan and the applicable requirements of the Surface Mining Act.

Idaho's statutes in this regard are for the most part consistent with the recommended regulatory model and the practice of most states. However, the statutes fail to provide for a time period following closure in which reclamation activities are to be commenced and completed.

Recommendation: *The Idaho Surface Mining Act should be modified to include a time period following closure during which reclamation activities are to be commenced and completed, similar to the recommended regulatory model.*

4.2.5.14 Bond Release

- The Idaho Surface Mining Act allows for the incremental release of bonding as specific aspects of reclamation are performed. For revegetation, 60 percent of the surety is released upon completion of earthwork, 25 percent is released upon completion of revegetation and 15 percent is retained until all requirements of the permit have been satisfied.

Idaho's bond release statutes do not address the liability of the operator or surety provider with respect to bond release. No provisions are included allowing the state to modify or extend the surety agreement to fulfill closure/post-closure requirements.

Recommendation: *The state should modify its statutes similar to those suggested in the recommended regulatory model.*

4.2.5.15 Reclamation Fund or Pools

- Idaho's statutes do not include emergency response or reclamation funds.

Idaho has not established a reclamation fund in order to address potentially unbonded liabilities, particularly those associated with potential groundwater contamination from AMD and other water-degrading impacts.

Recommendation: *Idaho, like all states, should establish an emergency response fund to allow the agencies to conduct emergency response activities at mining operations in a manner that is unencumbered by immediate financial constraints.*

The fund could be established based on a levy against metals production. A substantial account could be established and used to finance research and development with respect to water quality issues and cleanup activities made necessary by the state's mining operations.

4.2.5.16 Public Participation

- No specific provisions for public participation are provided in the Idaho Surface Mining Act.

Idaho emulates most of the western states by limiting public participation in the planning and bonding process. The analysis typically conducted by the state in approving new mining operations contains limited information relevant to bonding.

***Recommendation:** Idaho must provide for public participation by including the aspects recommended in the regulatory model. These aspects include the critical right to request an investigation of potential violations and the right to request adjustment of the bond.*

4.2.5.17 Conclusion

Idaho's Mined Land Reclamation Act does not adequately protect the public against the potential costs associated with reclamation of the major surface mines currently active in the state. The Act completely fails to address underground mining operations. Issues with respect to groundwater contamination caused by mining pollution are not being addressed. Existing bond amounts do not reflect the state's cost to conduct reclamation and closure in the event a mining company fails to fulfill its obligations. Overall, significant reform of the Idaho Surface Mining Act should be a priority to encourage responsible mining practices in the state and protect against public liability.

4.2.6 MONTANA

- Twelve major hardrock metals mining operations are currently permitted in the state. There are seven gold and silver mines (one operating, two suspended and four closed and undergoing reclamation), two copper and silver mines (one suspended and one pre-development), one primarily copper mine (operating), one gold, lead and zinc mine (operating) and two platinum and palladium mines (one operating and one in development).
- Existing operations disturb a total of 14,006 acres, with a total reclamation and closure bond amount of \$209,362,000. The state's average bond amount of \$14,948 per acre ranks as the highest of the western states.
- Five major mines in the state were affected by the bankruptcy of Pegasus Gold Co. Three of the mines are closed and are being reclaimed by the state with the existing bonds. The two remaining mines were included among the assets of the reformed company named Apollo Gold Co.
- In November 1998, the Montana voters passed Initiative 137 (I-137), which bans all future metals mining operations from utilizing open pit and cyanide leaching methods. In 1999, the legislature changed the initiative to exempt the expansion of existing mining operations from the ban.

4.2.6.1 State Reclamation Statutes, Regulations and Guidelines

- Montana's Metal Mine Reclamation Act (MMRA) was established in 1971. The rules governing the MMRA were promulgated in the 1970's and 1980's. Both the rules and the MMRA have been modified several times.

Montana's Metal Mine Reclamation Act (MMRA) was one of the early Acts promulgated in the 1970's. While it contains many of the desirable characteristics of reclamation statutes found in other states, it is general in scope and does not contain specific requirements which other states have since incorporated in more modern statutes.

***Recommendation:** Revisions are needed to the MMRA as suggested further in this section, particularly in the areas of more substantive and specific requirements for reclamation and closure and geochemical-AMD. In addition, recommendations are made specific to Montana's experience with reclamation and closure issues, including the disavowal of water treatment in perpetuity.*

4.2.6.2 Lead State Agency

- Reclamation and closure regulations are administered by the Montana Department of Environmental Quality.

Montana's Department of Environmental Quality combines mine reclamation and environmental protection of into a common department, consistent with the recommended regulatory model.

4.2.6.3 Lands Bonded by State

- Bonding is required under the Montana MMRA on private, state and federal lands.

Montana's statutes in this regard are consistent with the recommended regulatory model and the practice of most states.

Despite a large area of tribal lands in the state, and a history of significant issues with tribal entities and mining operations, the state has no formal relationship with the various tribal organizations regarding mining affecting those lands.

***Recommendation:** Given the tremendous conflict with respect to tribal issues in Montana, the state must enter into formal agreements with the various tribal organizations. These agreements should provide for cooperation on reclamation and closure issues, and for inclusion in the decision making process.*

4.2.6.4 Relationship with Federal Agencies

- There is a statewide Memorandum of Understanding between the Montana Department of Environmental Quality, the Bureau of Land Management and the U.S. Forest Service.

Montana's statutes in this regard are consistent with the recommended regulatory model and the practice of most states. The surety is typically held by the state.

4.2.6.5 Exemptions to Bonding

- The Montana MMRA does not apply to lands affected by operations conducted prior to 1971.

All of the existing major hardrock metallic mines in the state were proposed and operated after 1971. However, parts of the Continental mine operations comprise a piece of the historic Anaconda Copper Mining Co. Berkeley Pit operations. Those parts are exempted from existing mining statutes and are subject to historic maximum bonding levels of \$250 per acre and \$750 per acre, depending on the

area. As a result, with this single exception, all of the hardrock mines in the state are subject in their entirety to the reclamation and closure planning and bonding provisions of the MMRA. The Berkeley Pit operations and surrounding areas are subject to federal actions under Superfund law and are not included in this study.

- Montana statutes allow operations of five acres or less to be exempt from the stricter provisions of the MMRA. The amount of the bond must cover the actual cost of reclamation if it had to be performed by the department, including consideration of site-specific characteristics.

Montana's existing exemption for operations of less than five acres allows small mining operations in the state to be potentially conducted without adequate regard for reclamation and closure issues. The state does require that the operator cannot pollute or contaminate any stream, and other significant provisions of the small miner program, including allowing the agency to bond for its cost and a fairly intensive monitoring and compliance program. For this reason, Montana's small miner exclusion is more restrictive than that of most states, and better ensures against potential environmental degradation and public liability.

Montana has a serious concern in this regard, with numerous small mines littering the landscape and causing significant degradation of water resources. The state uses part of a coal tax trust fund (in excess of \$600 million) to address the environmental impacts of small, historic mines. This trust fund limits potential liability to the public.

Recommendation: *Montana should establish a reasonable minimum amount (\$5000 per acre) to adequately reclaim surface features, and should more aggressively evaluate and bond for additional site-specific features to ensure reclamation and against public liability.*

4.2.6.6 Reclamation Plan Requirements

- Montana's MMRA contains general provisions to address recontouring, revegetation, stability, water quality, geochemical-AMD, public safety and aesthetics. The provisions addressing hydrology are limited. The Act does not include provisions for topsoil or wildlife habitat. In addition to Montana's unique consideration of aesthetics, the MMRA contains specific provisions for open pit reclamation.

The MMRA lacks substance in terms of comprehensive and specific performance standards and other requirements. The Act fails to address some key issues relative to the requirements of most other western states. The state has developed additional guidelines and policies, but they are not included as specific and enforceable statutes.

Montana is an excellent example of how non-specific standards can be interpreted by different sectors of the public, as well as different administrations. Montana's Constitution uniquely entitles citizens to a "clean and healthful environment." Over the years, this Constitution, along with the state's administration of statutes, has resulted in numerous legal challenges, many of which continue today. Some of the more pertinent questions deal with whether the lack of reclamation of open pits and allowing water treatment in-perpetuity is consistent with the state Constitution.

Past interpretation of the MMRA compromised the ability of the state to require responsible mining practices. As a result, several mining operations from the 1980's have proven to significantly impact the environment, and have become a source of considerable controversy in the state. Although recently the Montana Department of Environmental Quality has adopted a more restrictive posture,

without significant changes to the existing statutes, the Department remains susceptible to legal challenges from mining corporations without changes to the statutes.

Recommendation: *The reclamation and closure planning requirements in the MMRA should be extensively modified to emulate the statutes of more progressive states and to provide for more comprehensive and specific treatment of critical planning issues. As currently written, the MMRA is vague and subject to discretionary interpretation by the MDEQ. There is potential that the MMRA could fail to provide the necessary requirements of planning and bonding practice.*

4.2.6.7 Bonding Requirements

- The Montana Metal Mine Reclamation Act requires that bonding be provided before a permit is issued.

Montana's statutes in this regard are consistent with the recommended regulatory model and the practice of most states.

- Montana does not require additional bonding for mining operations that employ cyanide leaching or other toxic chemicals, except for detoxification of heap leach pads.

Recommendation: *If the ban on cyanide leaching were to be removed, Montana must develop specific standards for the detoxification of leach dumps and remediation in the event of an accident. The authority to bond for the full potential cost of reclamation and closure relative to the use of chemical extraction methods must be included.*

4.2.6.8 Reclamation Bond Calculation

- The Montana Department of Environmental Quality (MDEQ) determines the amount of the bond. The MMRA requires that the bond is no less than \$200 per acre and no more than \$2,500 per acre. Regardless of limits, the bond may not be less than the estimated cost of ensuring compliance with the statutes.

Montana allows the company to take the lead in suggesting reclamation and closure costs by submitting an initial estimate in accordance with the plan. In most cases, those costs exceed the \$2,500 dollar limit. In practice, the MDEQ employs qualified mining engineering, hydrology, water quality, geochemical and reclamation staff to carefully examine the company's estimate. Typically, substantive changes are made before the cost estimate is finally approved by MDEQ.

The result is evident in bond amounts that are significantly higher than other states that allow the company to determine the bond amount. However, even this method of cost estimation might sometimes underestimate the state's potential expense by 10 to 25 percent. The careful examination of cost estimates is a relatively recent practice in Montana.

Recommendation: *Montana's statutes should be revised to give the MDEQ certain authority to set the bond amount at a level that will achieve compliance with (otherwise modified) state statutes.*

- The reclamation and closure costs examined in this report's Montana case studies show the cost estimate was based on limited information provided by the company, and reclamation and closure costs are typically based on reliable sources.

Montana's statutes in this regard are generally consistent with the recommended regulatory model.

- Montana's MMRA specifically addresses overhead (indirect costs), providing for additional design work, applicable public contracting requirements, equipment and personnel mobilization and demobilization and cost-inflation.

Montana's statutes in this regard are for the most part consistent with the recommended regulatory model.

- No provisions for bonding to fund interim operations are provided in the MMRA.

Recent experience at the bankrupt Zortman-Landusky mining project demonstrates the need for bonded interim operations. Interim operations, which were not included in the bond calculation, will cost at least \$600,000, and could be in excess of several million dollars.

***Recommendation:** Montana should adopt statutes to provide for funding interim operations as a part of the bond, as recommended in the recommended regulatory model.*

- Montana bases the cost of reclamation and closure over the expected project life, with bonding based on reclamation and closure at the end of project life. Financial assurance is allowed on an incremental basis for planned surface disturbances described in the reclamation plan.

Montana's statutes in this regard are consistent with the recommended regulatory model and the practice of most states, but are compromised by other shortcomings in the state's regulatory scheme. Given the other limitations on Montana's reclamation and closure statutes as noted elsewhere in this section, it does not appear that a phased approach would result in sufficient bonding during some period of the project lifetime.

***Recommendation:** Montana should revise the MMRA to delete the provision for incremental bonding.*

4.2.6.9 Forms of Financial Assurance

- Montana allows for a surety bond, cash deposit or certificate of deposit. The department may also accept other forms of surety.

Montana's statutes in this regard are generally consistent with the recommended regulatory model and the practice of most states. However, the discretion afforded the Department could cause them to accept forms of surety that are not readily liquid.

***Recommendation:** Montana should revise its statutes to accept only secure and readily liquid financial assurance in the form of cash, surety bonds or letters of credit.*

4.2.6.10 Monitoring and Compliance

- Montana's MMRA requires that the department inspect all major mining operations at least annually. Operations that use cyanide or have a requirement to monitor for acid mine drainage or exceed 1000 acres in size must be inspected quarterly.

Montana's statutes in this regard are consistent with the recommended regulatory model. The requirement for quarterly monitoring for large operations, acid mine drainage (AMD) and cyanide should be adopted by other states.

Recommendation: *It is recommended that the inspections pay particular attention to investigating groundwater contamination issues, toxic chemical containment and the occurrence or evidence of the potential for AMD.*

4.2.6.11 Bond Review Period

- The MMRA requires that the bond be reviewed at least every three years to determine whether it still represents the costs of compliance with the Act.

Montana's statutes in this regard are consistent with the recommended regulatory model. As provided in the model discussion, bond review is a crucial aspect of bonding practices. Bond review allows the regulatory agency to review the reclamation and closure plan in detail and to compare it to site-specific information derived from inspections. In order to be effective, bond review must incorporate adjustment of the bond based on the most current and accurate information. While past bond reviews in Montana did not adequately address this matter, more diligent efforts by the state are obvious in recent bond adjustments. Adjustments made for changed circumstances, such as the discovery of acid mine drainage are often significant. These changes demonstrate a potential for bonds that are 150 to 1000 percent less than what may be required to perform reclamation.

4.2.6.12 Closure Regulations

- Closure requirements are not specifically addressed in the MMRA. MDEQ has developed closure policies with respect to the state's water quality statutes for heap leach detoxification.

Recommendation: *Montana must develop and promulgate specific and substantive closure and post-closure criteria and standards as in the recommended regulatory model, and they should be incorporated into the MMRA.*

4.2.6.13 Noncompliance and Bond Forfeiture

- Montana's statutes allow for forfeiture if reclamation is not pursued in accordance with the reclamation plan within 30 days of notification. Forfeiture also occurs if reclamation is not completed within two years of abandonment or completion or within three years of temporary closure. Finally, forfeiture occurs if the surety either refuses or fails to perform the work.

Montana's statutes in this regard are consistent with the recommended regulatory model and the practice of most states.

4.2.6.14 Bond Release

- Montana's MMRA allows for the incremental release of bonding as areas of reclamation are performed.

Montana's bond release statutes do not address the liability of the operator or surety provider with respect to bond release. No provisions allow the state to modify or extend the surety agreement to fulfill closure/post-closure requirements.

***Recommendation:** The state should modify its statutes similar to that suggested in the recommended regulatory model.*

4.2.6.15 Reclamation Fund or Pools

- The MMRA establishes a hard-rock mining and reclamation account available for use by the Department to conduct research, reclamation, revegetation of land and rehabilitation of water affected by mining operations.

Montana has a large (over \$600,000,000) fund established from coal severance taxes. The fund is held in trust for potential coal mine reclamation needs. The interest from the fund can also be used at the Department's discretion for other mining-related reclamation needs. This has enabled the State to launch an aggressive abandoned mine reclamation program. However, appropriations at existing operations would require legislative approval.

***Recommendation:** Montana should establish an emergency response fund to allow the agencies to conduct emergency response activities at mining operations in a manner that is unencumbered by immediate financial constraints.*

4.2.6.16 Public Participation

- No specific provisions for public participation are provided in the Montana MMRA except for bond review and release. However, Montana has a unique provision allowing for citizen complaints.

Montana emulates most of the western states by limiting public participation in the planning and bonding process. The analysis typically conducted by the state in approving new mining operations contains limited discussion and information relevant to bonding.

Montana's provision allowing for citizen complaints is unique. It is highly recommended as a means of allowing public participation in enforcement and compliance matters. The statute has been utilized by the public and has played a key role in ensuring that the Department addresses public concerns. It is a facet of the MMRA that is recommended for emulation by all other state and federal agencies.

***Recommendation:** Montana must provide for public participation by including the aspects recommended in the regulatory model.*

4.2.6.17 Conclusion

In its present form, Montana's Mined Land Reclamation Act does not adequately protect the public from the potential costs of current or future reclamation. Groundwater contamination caused by mining pollution has not been adequately addressed. Bond amounts do not reflect the state's cost to conduct reclamation in the event a mining company fails to fulfill its obligations. The wide discretion and loose interpretation afforded by a lack of specific standards in the MMRA has resulted in the obvious dissatisfaction of state residents. This dissatisfaction led to the passage of I-137, which bans future open pit mines using cyanide leach operations in the state. Significant reform of the Montana Metal Mine Reclamation Act should be a priority to encourage responsible mining practices and protect against public liability.

4.2.7 NEVADA

- 73 major hardrock metals mining operations are currently permitted in the state. There are 70 gold and silver mines (52 operating and 17 either suspended or closed) and three copper mining operations (one operating and two closed).
- Existing bonding covers 86,631 total disturbed acres in the state, with a total reclamation and closure bond amount of \$438,122,196. The state's average bond amount of \$5,057 per acre ranks around the middle of the western states' mid-range.
- 13 major mines are currently in foreclosure or bankruptcy in the state. With gold prices at a 20-year historic low and many countries planning to dispose of significant portions of their gold reserves, additional suspensions, closures and foreclosures are likely to occur over the next several years.

4.2.7.1 State Reclamation Statutes, Regulations and Guidelines

- Nevada's Mined Land Reclamation Act was enacted in 1989, and was followed by the promulgation of rules in 1990.

Since Nevada's Mined Land Reclamation Act (MLRA) was enacted relatively recently it should contain most of the desirable characteristics of reclamation statutes found in other states. Instead, provisions in the Act indicate that the legislature appeared to favor industry at the risk of exposing the public to higher liability.

***Recommendation:** Major revisions are needed to the Nevada MLRA as suggested further in this section. In particular, changes to protect Nevada's public and environment from the mining industry's pollution of rare and extremely precious water resources are necessary. As it stands, there remains a potential for enormous public liability and an inadequacy to address future reclamation and closure issues.*

4.2.7.2 Lead State Agency

- The Nevada Division of Environmental Protection, Department of Conservation and Natural Resources administers reclamation and closure regulations.

The organization of Nevada's regulatory agency, which combines reclamation and environmental protection of water quality into a common department or division, is consistent with the recommended regulatory model.

4.2.7.3 Lands Bonded by State

- Bonding is required under the Nevada Mined Land Reclamation Act on private, state and federal lands. However, the ability to bond for closure on private lands is limited (see Closure Regulations in this section).

Nevada's statutes in this regard are consistent with the recommended regulatory model.

- Despite a large area of tribal lands in the state, Nevada has no formal relationship with the various tribal organizations with respect to mining and reclamation issues.

Recommendation: *Given the tremendous conflict with respect to tribal issues in the state, Nevada must consider entering into formal agreements to provide for cooperation on reclamation and closure issues, and in the decision making process, with the various tribal entities.*

4.2.7.4 Relationship with Federal Agencies

- Nevada has a statewide Memorandum of Understanding (MOU) with the Division of Environmental Protection, Bureau of Land Management and U.S. Forest Service. Either the state or the federal agency may hold the surety.

Nevada's statutes in this regard are for the most part consistent with the recommended regulatory model and the practice of most states.

4.2.7.5 Exemptions to Bonding

- The Nevada Mined Land Reclamation Act does not apply to lands affected by operations conducted prior to January 1, 1981. Any land disturbed between January 1, 1981 and October 1, 1990, if that disturbance was caused by the current operator, is required to be regulated in accordance with the effective standards at that time. If the current operator was not the one to disturb the land prior to October 1, 1990, no reclamation is required.

The majority of the existing major hardrock metallic mines in the state were proposed and operated after 1981. Many of the operations continued to be operated when the existing statutes came into effect in 1990. As a result, nearly all of the hardrock mines in the state are subject in their entirety to the reclamation and closure planning and bonding provisions of the Nevada MLRA.

- Nevada statutes allow for the exemption of operations of five acres or less that do not remove more than 36,500 tons per year of material from bonding requirements. No provisions are made for site-specific features or the consideration of whether exemptions should apply.

Nevada's existing exemption for operations of less than five acres essentially allows small mining operations in the state to be conducted without adequate regard for reclamation and closure issues. Historical evidence indicates that Nevada has a serious concern in this regard, with numerous small mines littering the landscape. The state lacks any substantial means to address impacts on the environment and potential liability to the public. Nevada's provisions are particularly arcane in that they do not recognize the potential for even small operations to seriously impact the environment depending on site-specific considerations.

Recommendation: *Nevada must develop a specific small mine reclamation and bonding scheme that establishes a reasonable minimum amount (\$5000 per acre) to adequately reclaim surface features. The scheme should evaluate and bond for additional site-specific features to ensure reclamation and against public liability.*

4.2.7.6 Reclamation Plan Requirements

- Nevada's Mined Land Reclamation Act contains limited provisions that address topsoil, revegetation and stability. The Act does not include provisions for recontouring, hydrology, water quality, geochemical-AMD, public safety, wildlife habitat and aesthetics.

The Nevada MLRA lacks substance in terms of comprehensive and specific performance standards and fails to address many key issues relative to the requirements of most other western states. Reclamation planning in Nevada fails to adequately address recontouring, hydrology, water quality and geochemical-AMD considerations, and fails to consider public safety, wildlife habitat, and aesthetic considerations. The limitation on reclamation provided in the state, which states that “Reclamation activities must be economically and technologically practicable in achieving a safe and stable conditions suitable for the use of the land,” essentially prohibits the state from requiring any measures which the company determines “economically” impractical. This compromises and essentially limits the ability of the state to require responsible mine reclamation and closure practices.

The NDEP, along with the BLM and U.S. Forest Service, have developed general guidelines and policies with respect to topsoil, revegetation and stability, calling them “Interim Standards.” However, because these policies have not been promulgated into rules, they are open to challenge from industry. In fact, the policies essentially recognize this inadequacy in allowing the mining operation to determine bond release criteria.

Recommendation: *The Nevada MLRA should be extensively modified to emulate the statutes of more progressive states and to provide for a more comprehensive and specific treatment of critical planning issues. As currently written, the existing Nevada MLRA fails to provide for the necessary reclamation and closure plan requirements to affect the purposes of modern and responsible mine planning and bonding practice.*

4.2.7.7 Bonding Requirements

- The Nevada Mined Land Reclamation Act requires that financial assurance be provided before a permit is issued.

Nevada’s statutes in this regard are consistent with the recommended regulatory model.

- Nevada does not require additional bonding for mining operations that employ cyanide leaching or other toxic chemicals, except for detoxification of heap leach pads (on state and federal land, private land excluded—see Closure Regulations).

Recommendation: *Nevada should develop and institute specific standards for the detoxification of leach dumps and remediation in the event of an accident. The authority to bond for the full potential cost of reclamation and closure relative to the use of chemical extraction methods should also be included.*

4.2.7.8 Reclamation Bond Calculation

- Nevada, under the provisions of the MLRA, allows the amount of the bond to be determined by the company. The MLRA requires that, in most cases, the bond be determined as if the agency will perform the required reclamation and closure activities.

Although it is an undesirable practice, most states allow the company to take the lead in suggesting reclamation and closure costs. The company submits an initial estimate of those costs in accordance with the reclamation and closure plan. To varying degrees, the states then review those costs and either make corrections or require the company to do so. In practice, Nevada’s agencies usually accept the company’s original cost estimate, in most cases lacking the expertise or initiative to question the submittal.

The matter of allowing the company to determine the bond amount is a key provision of Nevada's MLRA that prevents the state's reclamation and closure scheme from fulfilling the purpose of modern reclamation and closure. The result is evident in bond amounts that are typical of other states that allow this unacceptable practice. The existing method of cost estimation is likely to underestimate the agency's potential cost of performing reclamation by 20 to 100 percent.

Recommendation: *Nevada's statutes must be revised to require that the NDEP determine and set the bond amount, and that the bond amount be determined on the basis of the agency performing the activities necessary to achieve compliance with (otherwise modified) state statutes.*

- This report's Nevada case studies show that cost estimates are largely based on information provided either by the company or by a third-party engineering estimate conducted for the company. Only limited information is based on reliable sources.

Recommendation: *Nevada's statutes should require that NDEP use verifiable sources in determining reclamation and closure costs, as recommended in the regulatory model.*

- Nevada's MLRA does not specifically address overhead (indirect costs), except to provide that the amount of surety must be based on the cost of reclamation as if performed by the state or federal agency.

This report's case studies indicate inconsistencies with regard to including indirect costs in the estimates. While two of the three case studies included insurance, contract administration, bond and profit in the estimate, at approximately 23 percent of the direct costs, one case study (Twin Creeks) provided no line item estimate, and estimated the total indirect costs at approximately 12 percent of the direct costs.

Because the Nevada MLRA requires that the reclamation and closure costs be based on the agency's costs to perform the necessary tasks, the inclusion of indirect costs could be assumed. However, as demonstrated by the inconsistencies in this report's case studies, assumptions in regulation often lead to significant shortfalls in the insurance of the regulations' intended mandates.

Recommendation: *The Nevada MLRA must be revised to ensure that reclamation and closure costs estimates be determined, under all circumstances, on the basis of the performance of necessary activities by the responsible agency or agencies, including indirect costs, on a site-specific basis.*

- No provisions for financial assurance to fund interim operations are provided in Nevada's MLRA.

Recommendation: *Nevada should adopt statutes to provide for funding interim operations as a part of the bond, as recommended in the recommended regulatory model.*

- Nevada bases the cost of reclamation and closure over the expected project life, with the amount of financial assurance based on reclamation and closure at the end of project life. Bonding is allowed on an incremental basis for planned surface disturbances described in the reclamation plan.

Nevada's statutes in this regard are consistent with the recommended regulatory model and the practice of most states, but are compromised by other shortcomings in the regulatory scheme. Given the other limitations on Nevada's reclamation and closure statutes as noted elsewhere in this section, it does not appear that a phased approach would result in sufficient bonding during some period of the

project lifetime. This situation might make the state particularly vulnerable to outstanding liabilities. If water quality concerns are discovered at an existing mine, for example, the state could be left without adequate bonding.

Recommendation: Nevada should revise the statutes to delete the provision for incremental bonding.

4.2.7.9 Forms of Financial Assurance

- Nevada allows for most forms of financial assurance, including corporate guarantees (self-bonding).

The broad discretion afforded to Nevada's regulatory agencies in terms of the acceptable forms of bonding represents perhaps the greatest shortcoming in the state's entire scheme, particularly with respect to self-bonding. As a result of this shortcoming, up to 75 percent of Nevada's financial assurance is represented by non-liquid and essentially unenforceable guarantees. In the event of foreclosure, these assurances would most probably not enable the state to perform the necessary activities without taxpayer funding.

Recommendation: Nevada must revise its statutes to accept only secure and readily liquid financial assurance in the form of cash, surety bonds or letters of credit.

4.2.7.10 Monitoring and Compliance

- Nevada can conduct mine inspections as necessary to determine compliance with the statutes.

Nevada's statutes in this regard are consistent with the recommended regulatory model and the practice of most states.

Recommendation: It is recommended that the inspections pay particular attention to investigating groundwater contamination issues, toxic chemical containment and the occurrence or evidence of the potential for acid mine drainage (AMD).

4.2.7.11 Bond Review Period

- Nevada statutes require that the operator adjust the amount of financial assurance at least every three years, taking inflation into consideration, so that it remains adequate to execute the approved plan for reclamation.

Nevada's statutes in this regard are inconsistent with the recommended regulatory model and the practice of most states. As provided in the model discussion, bond review is a crucial aspect of bonding practices. The review allows the regulatory agency to review the reclamation plan in detail and compare it to the site-specific information derived from inspections. In order to be effective, bond review must incorporate adjustment of the bond based on the most current and accurate information.

Recommendation: Nevada must change the MLRA to incorporate an effective bond review practice by the agency as in the recommended regulatory model.

4.2.7.12 Closure Regulations

- Closure requirements are not addressed in the MLRA. NDEP has developed closure policies with respect to the state's water quality statutes for heap leach detoxification.

As discussed in the regulatory model, although Nevada has the authority to require bonding on private land, it does not have the authority to bond for closure requirements on private land. This loophole in state law, which was apparently intended to allow private land owners to determine the end land-use, has resulted in a lack of bonding for heap leach dump rinsing and closure, as well as other closure practices, although surface reclamation is still required.

One of Nevada's unique attributes is the extensive private land holdings on every other section in many areas of the Carlin trend gold deposits and other gold rich areas of the state. As a result of the state's statutes, many of the operations locate their heap leach and tailings pond operations on private land in order to avoid the requirements and cost of closure regulations required on state and federal land. As a result, the bonding of operations located on private land is seriously in question with regard to closure and long-term water quality issues.

***Recommendation:** Nevada must develop specific and substantive closure and post-closure criteria and standards as in the recommended regulatory model, which should be incorporated into the Act. The exclusion of closure requirements on private land must be eliminated.*

4.2.7.13 Noncompliance and Bond Forfeiture

- Nevada's statutes allow for forfeiture if reclamation is not initiated within two years of abandonment or completion, or within three years of temporary closure. Forfeiture also occurs if the permit is suspended or revoked or if the operator ceases to conduct business in the state without transferring the permit to a new operator.

Nevada's statutes in this regard are consistent with the recommended regulatory model and the practice of most states. However, as a practical matter the statutes do not address how the forfeiture would occur if only a corporate guarantee (self-bonding) is held as financial assurance.

4.2.7.14 Bond Release

- Nevada's MLRA allows for the incremental release of bonding as specific portions of reclamation are performed. For revegetation, 60 percent of the surety is released upon completion of earthwork, 25 percent is released upon completion of revegetation and 15 percent is retained until all requirements of the permit have been satisfied.

Nevada's bond release statutes do not address the liability of the operator or surety provider with respect to bond release. No provisions are included allowing the state to modify or extend the surety agreement to fulfill closure/post-closure requirements. Inspections are required to approve the reclamation and closure activities, and substantive and specific vegetative growth performance standards have been developed to measure revegetation efficacy.

***Recommendation:** The state should modify its statutes similar to those suggested in the recommended regulatory model.*

4.2.7.15 Reclamation Fund or Pools

- Nevada's statutes include a reclamation pool, but do not include emergency response or reclamation funds.

Nevada has not established a reclamation fund in order to address potentially unbonded liabilities, particularly those associated with potential groundwater contamination from AMD and other water-degrading impacts.

Recommendation: *Nevada, like all states, should establish an emergency response fund to allow the agencies to conduct emergency response activities at permitted or illegal mining operations in a manner that is unencumbered by immediate financial constraints.*

The fund could be established based on a levy against gold and copper production. A substantial account (\$100,000,000) could be established and used to finance cleanup associated with mining operations in the state.

4.2.7.16 Public Participation

- No specific provisions for public participation are provided in the Nevada MLRA.

Nevada emulates most of the western states by limiting public participation in the reclamation planning and bonding process. The analysis typically conducted by the state in approving new mining operations contains limited discussion relevant to bonding.

Recommendation: *Nevada must provide for public participation by including the aspects recommended in the regulatory model. These aspects include the critical right to request an investigation of potential violations and the right to request an adjustment of the bond amount.*

4.2.7.17 Conclusion

The precious metals mining industry frequently cites Nevada's Mine and Land Reclamation Act and associated policies as stringent statutes that provide for reasonable protection of the environment. This study, however, provides strong evidence that disputes those claims. In fact, the mining industry's accolades for Nevada's regulation scheme is most likely due to the many advantages that it affords industry (at the expense of the environment and potential public liability).

In its present form, Nevada's Mined Land Reclamation Act is not adequate to protect the public from the potential costs associated with reclamation of the state's numerous active major mines. Groundwater contamination issues are not being currently addressed. Existing bond amounts do not reflect the state's cost of conducting reclamation in the event a mining company fails to fulfill its obligations. Most financial assurances are based on the companies' self-guarantees rather than a readily liquid mechanism.

Significant reform of the Nevada Mined Land Reclamation Act should be a priority to encourage responsible mining practices in the state and protect the public's liability. Then Nevada can be touted as having an exemplary mining regulation scheme.

4.2.8 NEW MEXICO

- Eight mining operations in New Mexico probably qualify as major mines, as defined elsewhere in this study. There are five mines that primarily produce copper (two operating and three suspended), one gold and silver mine (operation suspended), one mine that primarily produces molybdenum (operating) and one lead, zinc and copper milling operation (being reclaimed).
- Reclamation and closure planning and bonding has been an on-going process since New Mexico's Mining Act was established in 1996. While all plans and bonds were to have been established by the end of 1999, recent information indicates that final approval may require additional time. The state is considering a process that will establish interim bonds until the final planning and bonding process is completed.
- The current disturbed acreage in the state is unknown, but is estimated at 10,000 acres. Preliminary information indicates that the total bond amount that will be established for New Mexico's major metallic hardrock mines should exceed \$200,000,000 (or greater than \$20,000 per acre). This amount is due to the substantive requirements contained in New Mexico's Mining Act and the realization of acid mine drainage-related issues at several major sites.
- The owner of one major mine is currently in bankruptcy (Alta Gold, owner of the Copper Flat mine).

4.2.8.1 State Reclamation Statutes, Regulations and Guidelines

- New Mexico's Mining Act was originally enacted in 1978, and was significantly and extensively amended in 1993.

New Mexico's Mining Act is the most recent Act to be established. It contains most of the desirable characteristics of reclamation statutes found in other progressive states. However, it is not possible to critique the Act as it pertains to actual regulatory practice in New Mexico at this time. One reason for the inability to critique is that reclamation and closure plans and bonds have yet to be established for the state's mines. Another is because it is unknown how New Mexico's regulatory authorities will interpret the Act, especially given the tremendous pressure on the state to compromise key provisions by the mining industry.

***Recommendation:** Extensive involvement of both the public and environmental organizations is needed to ensure that the apparent intent of the New Mexico Mining Act is carried out by the Mining and Minerals Division and other responsible state agencies.*

4.2.8.2 Lead State Agency

- The Mining and Minerals Division, of the Energy, Minerals and Natural Resources Department, is the lead state agency responsible for administering the New Mexico Mining Act. The New Mexico Environment Department is responsible for the regulation of any discharges from the mine and other water quality considerations.

The separate administration of the New Mexico Mining Act and water quality statutes by the New Mexico Environment Department in New Mexico's regulatory scheme has the potential to result in inadequacies with respect to water quality issues. However, unlike most other states with separate

authority, the Environment Department has authority to require bonding relevant to water treatment and other water quality issues.

***Recommendation:** New Mexico needs to ensure coordination between the Mining and Minerals Division's activities with respect to the Mining Act and the Environment Department's programs with respect to water quality.*

4.2.8.3 Lands Bonded by State

- Bonding is required under the New Mexico Mining Act on private, state and federal lands.

New Mexico's statutes in this regard are consistent with the recommended regulatory model and the practice of most states.

Despite a large area of tribal lands in the state, the state has no formal relationship with the various tribal organizations with respect to mining and reclamation issues.

***Recommendation:** Given the tremendous conflict over tribal issues in the state, New Mexico must consider entering into formal agreements to provide for cooperation on and joint decision making on reclamation and closure issues with the various tribal organizations.*

4.2.8.4 Relationship with Federal Agencies

- New Mexico typically enters into MOU's with the Bureau of Land Management and U.S. Forest Service.

New Mexico's statutes in this regard are for the most part consistent with the recommended regulatory model and the practice of most states.

4.2.8.5 Exemptions to Bonding

- The New Mexico Mining Act requires that all existing operations apply for a permit by December 31, 1994.

Although many of New Mexico's major mines were in operation as early as the 1970's, the Act makes any operations still active after 1994 subject, in their entirety, to the planning and bonding provisions of the Act.

- The New Mexico Mining Act allows operations not occurring in streams or bodies of water to apply for a general permit as long as no more than 200 cubic yards and no more than 2 acres of unreclaimed surface are excavated per year. General permit provisions do not require financial assurance. No other provisions are made for site-specific features in the consideration of whether exemptions should apply.

New Mexico's existing exemption for operations of under two acres and less than 200 cubic yards essentially allows "hobby" mining operations in the state to be conducted without regard for reclamation and closure issues. Historical evidence indicates that New Mexico should have serious

concern in this regard. Numerous small mines litter the landscape, and the state lacks any substantial means to address impacts on the environment or potential public liability. New Mexico's provisions do not adequately recognize the potential for small operations to seriously impact the environment, even on a site-specific basis.

Recommendation: *New Mexico should develop a specific small mine reclamation scheme that establishes a reasonable minimum amount (\$5000 per acre) to adequately reclaim surface features. The scheme should evaluate and bond for additional site-specific features to ensure reclamation and to protect against public liability.*

4.2.8.6 Reclamation Plan Requirements

- The New Mexico Mining Act contains specific provisions addressing revegetation and hydrology. General provisions on recontouring, stability, water quality, geochemical-AMD, public safety and wildlife habitat are also included. The Act does not include provisions for aesthetics.

The New Mexico Mining Act contains comprehensive and specific performance standards and other requirements. The Act's provisions for revegetation and hydrology are recommended as examples of modern regulation intended to ensure proper reclamation and closure.

Of particular note is the stipulation that reclamation plans require that "operation(s) will be designed to meet without perpetual care all the applicable environmental requirements of the Act, ...and other laws following closure." With the significant and mostly unanswered concerns about "treatment in perpetuity" in many states, this unique provision of New Mexico's Mining Act deserves consideration by other states faced with this issue.

A potential weakness of the New Mexico Mining Act could be the provision that enforcement of non-point surface releases of toxic substances shall be performed by the Environment Department. This leaves the potential for AMD-geochemical considerations to be inadequately evaluated during the permitting process, and might result in a general lack of geochemical-AMD prediction at New Mexico mines.

Recommendation: *The New Mexico Mining Act should be modified to more specifically and substantively address recontouring, stability, water quality, geochemical-AMD, public safety and wildlife habitat, and consideration should be given to provisions for aesthetics.*

4.2.8.7 Bonding Requirements

- The New Mexico Mining Act requires that financial assurance be provided prior to permit issuance.

New Mexico's statutes in this regard are consistent with the recommended regulatory model and the practice of most states. However, as a practical matter, the existing lack of bonding pending reclamation and closure plan approval exposes the state and public to significant liability.

Recommendation: *New Mexico must establish, with urgency, adequate interim bond amounts of sufficient monetary value so as to ensure against the state and public's potential liability.*

- New Mexico does not require additional financial assurance for mining operations that employ cyanide leaching or other toxic chemicals.

Recommendation: *New Mexico should develop and institute specific standards for the detoxification of both copper and precious metal leach dumps and remediation in the event of an accident. Also, the full potential cost of reclamation and closure relative to the use of chemical extraction methods should be realized.*

4.2.8.8 Reclamation Bond Calculation

- The New Mexico Mining Act requires that the Mining and Minerals Division determine the bond, and that it not be limited to the estimated costs submitted by the company.

New Mexico's Mining Act, like that of most states, allows the company to take the lead in suggesting reclamation and closure costs by submitting an initial estimate of those costs in accordance with the reclamation and closure plan. At this time, it is unknown whether the New Mexico Mining and Minerals Division will accept the original reclamation and closure cost estimate by the company, or whether the Division has expertise and initiative to question the company's submittal.

- The New Mexico Mining Act specifically addresses overhead (indirect costs), requiring that the costs include mobilization/demobilization, engineering redesign, profit and overhead, procurement costs, reclamation or closeout plan management and contingencies.

New Mexico's statutes in this regard are consistent with the recommended regulatory model and the practice of most states.

- No provisions for bonding to fund interim operations are provided in the New Mexico Mining Act.

Recommendation: *New Mexico should adopt statutes to provide for funding of interim operations as a part of the bond, as recommended in the regulatory model.*

- At this time it is unknown if New Mexico will base the cost of reclamation and closure over the expected project life, with bonding based on reclamation and closure at the end of project life. Financial assurance is allowed on an incremental basis for planned surface disturbances described in the reclamation plan.

New Mexico's statutes in this regard are consistent with the recommended regulatory model and the practice of most states, but may be compromised by other shortcomings in the state's regulatory scheme pertaining to geochemical-AMD prediction and bond cost calculation. As a result, a phased approach might not result in sufficient bonding during some period of the project lifetime.

Recommendation: *New Mexico should revise the statutes to delete the provision for incremental bonding.*

4.2.8.9 Forms of Financial Assurance

- New Mexico allows for most forms of financial assurance, but explicitly disallows any form of corporate guarantee or self-insurance as financial assurance.

New Mexico's statutes in this regard are consistent with the recommended regulatory model. However, New Mexico does accept "third party guarantees," which have recently been attempted by some mining companies. Third party guarantees infer parent company corporate guarantees (i.e.

Phelps Dodge Corp. guaranteeing Chino Mines). It is certain that the intention of the Act is not to allow self-guarantees, and this should extend to third party guarantees. If New Mexico were to allow such guarantees, the New Mexico Mining Act's ability to ensure the purposes of reclamation and closure planning and bonding would be seriously compromised.

4.2.8.10 Monitoring and Compliance

- The New Mexico Mining Act requires the Mining and Minerals Division to conduct at least one mine inspection per year.

The state's responsible regulatory agencies should be encouraged to exercise this authority and make routine on-site inspections of mining operations. These inspections should ensure compliance with the terms of the operating permit and the approved reclamation and closure plan, and should be made more frequently and irregularly during active reclamation activities.

***Recommendation:** The inspections need to pay particular attention to investigating groundwater contamination issues, toxic chemical containment and the occurrence or evidence of the potential for AMD.*

4.2.8.11 Bond Review Period

- The New Mexico Mining Act allows the bond amount to be adjusted from time to time as the area requiring financial assurance changes or when future reclamation or closeout costs change.

New Mexico's statutes in this regard are consistent with the recommended regulatory model except that a specific time period for bond review is not mandated.

***Recommendation:** The Mining and Minerals Division should establish a policy to mandate bond review at least every three years.*

4.2.8.12 Closure Regulations

- New Mexico has general closure regulations contained in the Mining Act and in water quality provisions under the authority of the Environment Department.

***Recommendation:** New Mexico must develop and promulgate specific and substantive closure and post-closure criteria and standards as in the recommended regulatory model. Those criteria should be incorporated into the Act.*

4.2.8.13 Noncompliance and Bond Forfeiture

- New Mexico's Mining Act allows for forfeiture if the permittee refuses or is unable to perform reclamation and closure. Forfeiture also occurs if the terms of the permit are not met or if the permittee defaults on the conditions under which the financial assurance was accepted.

New Mexico's statutes in this regard are mostly consistent with the recommended regulatory model. However, the statutes fail to provide a time period following closure during which reclamation activities should be commenced and completed.

Recommendation: *The New Mexico Mining Act should be modified to include a time period following closure for reclamation activities to be commenced and completed, similar to the recommended regulatory model.*

4.2.8.14 Bond Release

- The New Mexico Mining Act requires that the bonding provisions remain in effect until released by the Division. For revegetation, the amount of financial assurance is withheld for a period of 12 years following revegetation (not including interseeding to establish vegetative diversity).

New Mexico's statutes in this regard are generally consistent with the recommended regulatory model. New Mexico's requirement that financial assurance be withheld for 12 years is unique, and is recommended for consideration by other states as it more accurately reflects the actual time necessary to ensure revegetation efficacy.

4.2.8.15 Reclamation Fund or Pools

- New Mexico's Mining Act establishes a "mining act fund" and "inactive or abandoned non-coal mine reclamation fund" intended to carry out the purposes of the Act. These funds are also intended to conduct reclamation on abandoned or inactive non-coal mining areas.

New Mexico's funds are based on fees and penalties, and for practical purposes are inadequate to address unbonded reclamation and closure liabilities. In particular, liabilities associated with groundwater contamination will be under-insured.

Recommendation: *New Mexico should establish a substantial account that could be used to finance water quality issues and cleanup activities resulting from mining operations in the state.*

4.2.8.16 Public Participation

- New Mexico is the only state with substantial and explicit provisions for public participation in bonding, including when bonds are established, renewed, and released.

New Mexico's statutes in this regard are generally consistent with the recommended regulatory model.

Recommendation: *New Mexico's statutes must be revised to include the critical right to request an investigation of potential violations, and to request the adjustment of the required performance bond amount.*

4.2.8.17 Conclusion

In most respects, New Mexico's Mining Act appears to serve as an excellent example of modern mining reclamation and closure statutes. However, the example has yet to be proven in practice and may be subject to serious efforts by mining interests to undermine the implementation of the state statutes. The primary weakness of the New Mexico Mining Act is the generality of its statutes with respect to water quality and geochemical-AMD. This lack of specificity leaves the state potentially susceptible to water quality concerns. In addition, bond calculations by the company may be accepted at face value. Minor reform of the New Mexico Mining Act, or possibly refinement of policies under the existing Act, would realize its potential to promote responsible mining practices in the state and to protect against public liability.

4.2.9 OREGON

- There are presently no major hardrock metals mining operations in Oregon.

4.2.9.1 State Reclamation Statutes, Regulations and Guidelines

- Oregon's Mined Land Reclamation Act was originally established in 1971. It has been significantly and extensively amended since that time.

Oregon's Mined Land Reclamation Act (MLRA) is representative of statutes that have been promulgated in the 1980's and 1990's. These statutes were established in specific response to proposed mining operations where, prior to the gold and silver mining boom of the 1980's, no mining industry existed. Because of this, Oregon's Act contains most of the desirable characteristics found in those of other progressive states. However, because reclamation and closure plans and bonds have yet to be established under the Oregon MLRA, it is not possible to critique the Act as it pertains to actual regulatory practice in Oregon.

4.2.9.2 Lead State Agency

- The Department of Geology and Mineral Industries is the lead state agency responsible for administering the Oregon MLRA. The Department of Environmental Quality is responsible for the regulation of solid waste disposal and wastewater discharges.

The separate administration of the Oregon MLRA and water quality and solid waste statutes in Oregon's regulatory scheme has the potential to result in inadequacies with respect to water quality issues. However, unlike most other states with separate authority, the Department of Environmental Quality has authority to require bonding for solid waste disposal, water treatment and other water quality issues.

***Recommendation:** Oregon needs to ensure coordination between Department of Geology and Mineral Industries and the Department of Environmental Quality.*

4.2.9.3 Lands Bonded by State

- Bonding is required under the Oregon MLRA on private, state and federal lands.

Oregon's statutes in this regard are consistent with the recommended regulatory model and the practice of most states.

4.2.9.4 Relationship with Federal Agencies

- Oregon can enter into Memorandum of Understanding with the Bureau of Land Management and US Forest Service.

Oregon's statutes in this regard are consistent with the recommended regulatory model..

4.2.9.5 Exemptions to Bonding

- The Oregon MLRA applies to surface mining operations conducted as of July 1, 1972.

- The Oregon MLRA exempts mining operations that produce less than 5,000 cubic yards of material per year and disturb less than one acre of land. Those operations may still require a permit from the Department of Environmental Quality.

Oregon's small mine exemption essentially allows "hobby" mining operations to be conducted without regard for reclamation and closure issues (although the DEQ may still require bonding to address waste disposal and water quality issues). Historical evidence indicates that Oregon should have serious concern in this regard. Numerous small mines litter the landscape, and the State lacks any substantial means to address environmental impacts or potential public liability. Oregon's provisions do not adequately recognize the potential for small operations to seriously impact the environment, even on a site-specific basis.

Recommendation: *Oregon should develop a specific small miner bonding scheme that establishes a reasonable minimum amount (\$5000 per acre) to adequately reclaim surface features. The scheme should evaluate and bond for additional site-specific features to ensure reclamation and against public liability.*

4.2.9.6 Reclamation Plan Requirements

- The Oregon MLRA contains specific provisions addressing recontouring. General provisions on topsoil, revegetation, stability, hydrology, water quality, geochemical-AMD and public safety are included, as are limited provisions on aesthetics. The Act does not include provisions for wildlife habitat.

The Oregon Mined Land Reclamation Act does not contain comprehensive and specific performance standards or other requirements. This leaves the potential for key issues, particularly geochemical-AMD considerations, to be inadequately addressed during the permitting, planning and bonding processes.

Recommendation: *The Oregon MLRA should be modified to specifically address geochemical-AMD issues and to more specifically address other key issues. Consideration should be given to standards to address wildlife habitat.*

4.2.9.7 Bonding Requirements

- The Oregon MLRA requires that financial assurance be provided prior to surface disturbance.

Oregon's statutes in this regard are consistent with the recommended regulatory model and the practice of most states.

- Oregon requires additional financial assurance for mining operations that employ cyanide leaching or other toxic chemicals.

Oregon's statutes in this regard are consistent with the recommended regulatory model.

4.2.9.8 Reclamation Bond Calculation

- The Oregon MLRA requires that the Department determine the amount of the bond by estimating the cost of reclamation as if the Department were to perform the reclamation.

Oregon's statutes in this regard are consistent with the recommended regulatory model. Oregon's statutes in this regard are recommended for emulation by other states.

- The Oregon MLRA specifically addresses overhead (indirect costs), requiring that the costs include mobilization/demobilization, supervision, testing, liability insurance, engineering design and other costs that could be incurred by the department in performing reclamation.

Oregon's statutes in this regard are consistent with the recommended regulatory model and the practice of most states.

- No provisions for bonding to fund interim operations is provided in the Oregon MLRA.

***Recommendation:** Oregon should adopt statutes to provide for funding interim operations as a part of the bond, as recommended in the regulatory model.*

- It appears that Oregon would base the cost of reclamation and closure over the expected project life, with the bond based on reclamation and closure at the end of project life. There are no specific provisions for phased bonding.

Oregon's statutes in this regard are consistent with the recommended regulatory model.

4.2.9.9 Forms of Financial Assurance

- The Oregon MLRA allows for surety bonds, cash or other security in a form acceptable to the department.

Oregon's statutes in this regard are consistent with the recommended regulatory model and the practice of most states.

4.2.9.10 Monitoring and Compliance

- The Oregon MLRA allows the Department to conduct inspections as necessary.

The State's responsible regulatory agencies should be encouraged to exercise this authority and to make routine on-site inspections to ensure compliance with the operating permit and the reclamation and closure plan. More frequent, but irregular, inspections should occur during active reclamation.

***Recommendation:** It is recommended that the inspections pay particular attention to investigating groundwater contamination issues, toxic chemical containment and the occurrence or evidence of the potential for AMD.*

4.2.9.11 Bond Review Period

- No specific provisions for bond review are included in the Oregon MLRA.

***Recommendation:** Oregon should add a provision to the MLRA establishing a policy to mandate bond review at least every three years, and as otherwise recommended in the regulatory model.*

4.2.9.12 Closure Regulations

- No specific closure regulations are included in the Oregon MLRA.

***Recommendation:** Oregon must develop and promulgate specific and substantive closure and post-closure criteria and standards, as in the recommended regulatory model. These criteria should be incorporated into the MLRA.*

4.2.9.13 Noncompliance and Bond Forfeiture

- Oregon's MLRA allows for forfeiture of the bond if the operator fails to comply with a Department notice or to complete approved reclamation within three years of the operation's termination. Forfeiture also occurs if the operator fails to complete the approved reclamation and the Department determines that the site has been abandoned.

Oregon's statutes in this regard are for the most part consistent with the recommended regulatory model and the practice of most states.

4.2.9.14 Bond Release

- After inspection of the mine site, the bond shall be released. The Department may authorize partial release of the bond for partial completion of reclamation.

Oregon's bond release policies do not address the liability of the operator or surety provider with respect to bond release. No provisions allow the State to modify or extend the surety agreement to fulfill closure/post-closure requirements. No substantive or specific vegetative growth performance standards have been developed to measure revegetation success.

***Recommendation:** The Oregon MLRA should be modified to include bond release provisions similar to those suggested in the recommended regulatory model.*

4.2.9.15 Reclamation Fund or Pools

- No provisions for reclamation funds are provided in the Oregon MLRA.

***Recommendation:** Oregon should establish an account that could be used to finance research and development with respect to water quality issues and cleanup activities resulting from either modern or historic mining operations.*

4.2.9.16 Public Participation

- No specific provision for public participation are included in the Oregon MLRA, although public participation is inferred to a limited extent.

Oregon emulates most of the western states by limiting public participation in the reclamation planning and bonding process.

***Recommendation:** The Oregon MLRA must provide for public participation by including the requirements for public participation recommended in the regulatory model.*

4.2.9.17 Conclusion

In many respects, particularly the calculation of bond amounts, Oregon's Mine Land Reclamation Act appears to serve as an excellent example of modern mining statutes, although they have yet to be proven in practice. The primary weakness of the Oregon MLRA is its general provisions on reclamation and closure planning issues. This generality could lead to broad interpretation of the Act's requirements. Minor reform or refinement of policies of the Oregon MLRA would allow the Act to realize its potential for promoting responsible mining practices and protecting against public liability.

4.2.10 SOUTH DAKOTA

- Six major gold and silver mining operations are currently permitted in the State. There are two operating mines, two mines under temporary cessation or closure, one mine in final reclamation and closure and one proposed mine.
- Existing operations disturb a total of 2,186 acres in the state, with a total bond amount of \$30,949,000. The State's average bond amount of \$14,158 per acre is among the highest of the western states.
- The Gilt Edge mine operated by Brohm Mining Co. and owned by Dakota Mining Co. is in bankruptcy.

4.2.10.1 State Reclamation Statutes, Regulations and Guidelines

- South Dakota's Mined Land Reclamation Act was established in 1971. The Act was subsequently revised in 1982, and significant additional changes were passed in 1986. Rules under the Act were promulgated in 1988.

South Dakota's Mined Land Reclamation Act (MLRA) was one of the first reclamation Acts in the 1970's. Revisions to the Act came in response to a rapidly growing mining industry in the Black Hills region during the 1980's. Those revisions in themselves are an intriguing example of regulation established in response to new issues. The need for revisions was realized when open pit heap leach mines were introduced in a region that previously had only a single major underground mining operation. The need was exacerbated by a tourism industry that depended largely upon preservation of the area's natural characteristics.

In its evolved form, the South Dakota MLRA contains many of the desirable characteristics of other state's Acts. However, the South Dakota MLRA may still be inadequate to ensure bond amounts. This potential inadequacy is due in part to the broad incidence of acid mine drainage (which requires greater diligence in prediction and mitigation) in the region. Another potential cause of inadequacy is that the statutes fail to require proper calculation of the bond.

Recommendation: Revisions are needed to South Dakota MLRA as suggested further in this section, particularly in the areas of geochemical-acid mine drainage requirements in reclamation planning, bond calculation and bond review. Most importantly, the South Dakota Department of Environment and Natural Resources, Minerals and Mining Program must be more pro-active in predicting acid mine drainage (AMD) and enforcing the provisions of the MLRA.

4.2.10.2 Lead State Agency

- The South Dakota Department of Environment and Natural Resources, Minerals and Mining Program administers reclamation and closure regulations.

The South Dakota Department of Environment and Natural Resources combines the Minerals and Mining Program responsible for mine reclamation with that of environmental protection in the same Department, consistent with the recommended regulatory model.

4.2.10.3 Lands Bonded by State

- South Dakota requires bonding on private, state and federal lands.

South Dakota's statutes in this regard are consistent with the recommended regulatory model and the practice of most states.

- The Black Hills region is subject to treaty rights with various tribal organizations. There has been a history of significant issues between tribal entities and mining operations in the region. The state has no formal relationship with the various tribal organizations with respect to mining and reclamation issues affecting tribal treaty right areas and tribal lands.

***Recommendation:** Given the tremendous conflict with respect to tribal issues in the Black Hills region, the state must enter into formal agreements with the various tribal organizations. These agreements should provide for cooperation on reclamation and closure issues and for inclusion in the decision making process.*

4.2.10.4 Relationship with Federal Agencies

- South Dakota has a Memorandum of Understanding with the U.S. Forest Service for mining operations in the Black Hills region.

South Dakota's statutes in this regard are consistent with the recommended regulatory model and the practice of most states.

4.2.10.5 Exemptions to Bonding

- The South Dakota MLRA applies to lands affected by surface mining operations conducted after July 1, 1971 and to lands affected by underground mining operations after July 1, 1980.

With the exception of the Homestake underground mining operations, which have been on going since the 1870's, all of the existing major hardrock mines were permitted after 1980. The Homestake operations are, for the most part, exempt from the Act. Reclamation and closure of those areas is an issue that has not been adequately addressed by either the mining company or the State.

- The South Dakota MLRA allows for a bond limit of \$2,500 per acre on operations if they are ten acres or less and they remove no more than 25,000 tons of ore or overburden per year. No provisions are made for site-specific features in the consideration of whether the limit should apply.

The aforementioned bonding limit allows small mining operations to be potentially conducted without adequate regard for reclamation and closure issues. Historical evidence indicates that South Dakota should have significant concern in this regard, and that the State lacks any substantial means to address environmental impacts or potential public liability. South Dakota's provisions do not recognize the potential for small operations to seriously impact the environment, even on a site-specific basis.

Recommendation: *South Dakota should develop a specific small mine bonding scheme that establishes a reasonable minimum amount (\$5000 per acre) to adequately reclaim surface features. The scheme should evaluate and bond for additional site-specific features to ensure reclamation and against public liability.*

4.2.10.6 Reclamation Plan Requirements

- South Dakota's MLRA contains specific provisions that address topsoil, revegetation, hydrology, water quality and wildlife habitat. The Act has general provisions on recontouring and stability and limited provisions to address geochemical-AMD. The MLRA does not include provisions for public safety or aesthetics.

The South Dakota MLRA contains comprehensive and specific performance standards and other requirements. The MLRA provisions for topsoil, revegetation, hydrology, water quality and wildlife habitat are recommended as examples of modern regulation intended to ensure proper reclamation and closure.

A weakness of the South Dakota MLRA—one which is partially responsible for a lack of pro-active treatment of water quality issues—is the lack of specific geochemical-AMD considerations. This gap has resulted in a general inadequacy of geochemical-AMD prediction at South Dakota mines. The Richmond Hill and Gilt Edge mine acid mine drainage issues are an example of what can result from a lack of specific requirements or standards.

The MLRA does not address public safety or aesthetics. It is probable that public safety is assumed by its incorporation in other statutes, but it should be included as a specific reclamation and closure requirement. Aesthetic considerations have been a key issue in addressing open pit heap leach mines adjacent to tourism areas that depend upon unspoiled natural resources in the Black Hills region. Development and implementation of aesthetic standards should also be undertaken to ensure that mining impacts do not compromise the longer-term economic viability of the region.

Recommendation: *The South Dakota MLRA should be modified to specifically address geochemical-AMD issues, including requiring adequate prediction and mitigation during the permitting process. The statute must be applied to all mines—operating and in reclamation—so that failure to previously address AMD issues does not eventually result in public liability. Consideration should be given to additional standards to address public safety and aesthetics.*

4.2.10.7 Bonding Requirements

- The South Dakota MLRA requires that bonding be provided before the issuance of a mining permit.

South Dakota's statutes in this regard are consistent with the recommended regulatory model and the practice of most states.

- South Dakota does require additional bonding for mining operations that employ cyanide leaching or other toxic chemicals.

Under the provisions of the South Dakota MLRA, additional bonding for leach pads and/or tailings ponds detoxification is required, in addition to bonding for potential accidents and some indirect water quality related costs. The additional bond amount can range from \$25,000 to \$500,000.

4.2.10.8 Reclamation Bond Calculation

- The South Dakota MLRA allows the amount of the bond to be estimated by the company. The estimate is not specifically required to be based on the lead agencies costs or costs for third party contracting.

South Dakota allows the company to take the lead in suggesting reclamation and closure costs. The company submits an initial estimate of those costs in accordance with the reclamation and closure plan. The State then reviews those costs and makes corrections or requires the company to do so. In practice, South Dakota does appear to carefully consider the company's cost estimate in most cases. The bond amount, however, reflects the company's cost to perform reclamation.

Allowing the company to suggest the bond amount is a key provision of the South Dakota MLRA that can prevent the State's bonding scheme from fulfilling its purpose. The existing method of cost estimation is likely to underestimate the agency's cost of performing reclamation by 20 to 50 percent.

Recommendation: *South Dakota's MLRA must be revised to require that the lead agency set the bond amount. The bond should be based on the agency performing the reclamation and closure activities necessary to achieve compliance with the MLRA.*

- The reclamation and closure costs examined in this report's South Dakota case studies show the cost estimate was partially based on information provided by the company and that not all information was based on reliable sources.

Recommendation: *South Dakota's statutes should require that only verifiable sources be used in determining reclamation and closure costs, as recommended in the regulatory model.*

- South Dakota's MLRA does not specifically address overhead (indirect costs). This report's case studies include indirect costs for mobilization/demobilization, contract administration, state tax and contingency. Indirect costs range from 19 percent to 27 percent of direct costs.

The Minerals and Mining Program's BONDALC - Reclamation Bond Calculation Program - suggests that charges be added for mobilization, contract administration, state taxes and contingencies.

Recommendation: *The South Dakota MLRA should be revised to ensure that cost estimates be determined, under all circumstances, on the basis of the performance of necessary activities by the responsible agency or agencies, including all potential indirect costs.*

- No provisions for bonding to fund interim operations are provided in the MLRA.

Recommendation: *South Dakota should adopt new policies to provide for funding interim operations as a part of the bond, as recommended in the regulatory model.*

- South Dakota bases the cost of reclamation and closure over the expected project life, with the bond based on reclamation and closure at the end of project life. Financial assurance is allowed on an incremental basis for planned surface disturbances described in the reclamation plan.

South Dakota's statutes in this regard are consistent with the recommended regulatory model and the practice of most states, but are compromised by other shortcomings in the state's regulatory scheme. Given the limitations on South Dakota's statutes pertaining to geochemical-AMD prediction and bond cost calculation, a phased approach might yield insufficient bonding at some period of the project lifetime.

***Recommendation:** South Dakota should revise the statutes to delete the provision for phased bonding.*

4.2.10.9 Forms of Financial Assurance

- South Dakota's MLRA is not specific with respect to surety forms. Although it states that surety bonds and cash or securities are acceptable, it also infers that the operator might assume financial responsibility with sufficient assets.

***Recommendation:** South Dakota must revise its statutes to accept only secure and readily liquid financial assurance up-front in the form of cash, surety bonds or letters of credit.*

4.2.10.10 Monitoring and Compliance

- South Dakota can conduct mine inspections as necessary to determine compliance with the statutes.

South Dakota's regulatory history does not indicate that inspections have always been routinely conducted with the intent of determining regulatory compliance. The Mining and Minerals Program should be encouraged to more aggressively exercise this authority and make routine on-site inspections to ensure compliance with the operating permit and the reclamation and closure plan. More frequent, but irregular, inspections should occur during active reclamation.

***Recommendation:** It is recommended that the inspections pay particular attention to investigating groundwater contamination issues, toxic chemical containment and the occurrence or evidence of the potential for AMD.*

4.2.10.11 Bond Review Period

- The South Dakota MLRA requires that the amount of the bond be revised periodically to reflect any changes in the cost of the State performing the reclamation.

South Dakota's statutes in this regard are inconsistent with the recommended regulatory model and the practice of most states. As provided in the model discussion, bond review is a crucial aspect of bonding practices. Review allows the regulatory agency to review the reclamation and closure plan in detail and to compare it with existing site-specific information derived from inspections. In order to be effective, bond review must incorporate adjustment of the bond based on the most current and accurate information.

The bonding history of the Gilt Edge described in the case study is a good case in point. The bond has typically lagged significantly behind the actual costs that might be incurred by the agency if the company were to declare bankruptcy. Now that the parent company has declared bankruptcy, the significant bond shortfall is apparent. The current potential shortfall in the bond amount compromises the state's position.

Recommendation: *The South Dakota MLRA must be changed to incorporate an effective bond review practice, as in the recommended regulatory model.*

4.2.10.12 Closure Regulations

- South Dakota's MLRA specifically incorporates post-closure requirements.

South Dakota is the only State to incorporate post-closure requirements into its statutes. South Dakota's statutes in this regard are for the most part consistent with the recommended regulatory model, and are highly recommended for emulation by other states.

4.2.10.13 Noncompliance and Bond Forfeiture

- South Dakota's MLRA does not specifically address the events which might lead to forfeiture of the bond.

South Dakota's statutes in this regard are not consistent with the recommended regulatory model and the practice of most states.

Recommendation: *The MLRA should be modified as suggested in the recommended regulatory model.*

4.2.10.14 Bond Release

- The surety may not be held more than twelve months after completion of reclamation.

The MLRA's bond release provisions address the liability of the operator and surety provider with respect to bond release. No provisions are included allowing the state to modify or extend the surety agreement to fulfill closure/post-closure requirements.

Recommendation: *The South Dakota MLRA should be modified to include bond release provisions similar to those suggested in the recommended regulatory model.*

4.2.10.15 Reclamation Fund or Pools

- South Dakota does have an established reclamation fund. The extent of this fund, however, is inadequate to perform significant reclamation or to address issues such as emergency response.

Recommendation: *South Dakota should establish a more substantial fund to allow the state to conduct emergency response activities in a manner that is unencumbered by immediate financial constraints.*

The fund could be established based on a levy against metals production. A substantial account could be established and used to finance research and development with respect to water quality issues and cleanup activities.

4.2.10.16 Public Participation

- South Dakota's MLRA does not contain specific provisions for public participation in bonding.

South Dakota emulates most of the western states by limiting public participation in the planning and bonding process. The analysis typically conducted by the State in approving new mining operations contains limited discussion and information relevant to bonding.

***Recommendation:** South Dakota must provide for public participation by including the aspects recommended in the regulatory model. These aspects include the critical right to request an investigation of potential violations and the right to request adjustment of the bond amount.*

4.2.10.17 Conclusion

In many respects, South Dakota's Mined Land Reclamation Act (MLRA) serves as an excellent example of modern mining statutes. In some critical many respects, however, it fails to ensure responsible mining and to protect the public from potential liability. The primary weakness of MLRA is its inability to ensure adequate monitoring, investigation and inspection with respect to geochemical-AMD issues. This weakness leaves the state potentially susceptible to water quality concerns. In addition, bond review is not performed on a regular schedule and does not necessarily incorporate the most current changes to the reclamation plan or adjustments to the bond. Reform of the South Dakota Mined Land Reclamation Act should be encouraged to address these shortcomings and to realize the MLRA's potential to promote responsible mining practices in the state and protect against public liability.

4.2.11 UTAH

- Seven major hardrock mining operations are currently permitted in Utah. There are four gold and silver mines (two operating and two closed and being reclaimed), two operations primarily producing copper (one operating and one permitted but suspended from start-up) and one primarily producing silver (closed and being reclaimed).
- Existing bonding covers 29,843 disturbed acres with a total bond amount of \$50,898,471. The state's average bond amount per acre of \$1,706 per acre ranks among the lowest of all the western states. It should be noted, however, that 23,000 acres of the total are for the Bingham Pit, which is exempt from modern statutes as an "historic site," although it is still an active mining operation. Eliminating this discrepancy revises the state's average bond amount to \$7,438, which is in the mid-range of reclamation bonding values in the western states.
- No major mines are currently in foreclosure or bankruptcy in Utah.

4.2.11.1 State Reclamation Statutes, Regulations and Guidelines

- Utah's Mined Land Reclamation Act was enacted in 1975. The promulgation of rules followed in 1988.

Utah's Mined Land Reclamation Act (MLRA) was one of the early Acts promulgated in the 1970's. It is general in scope and does not contain the specific requirements which other states have since incorporated in their more modern statutes.

Recommendation: *Major revisions are needed to the Utah MLRA, as is suggested further in this section. Changes are particularly necessary to protect Utah's environment and public from the mining industry's pollution of rare and precious water resources and the enormous public liability associated with mine reclamation and closure issues.*

4.2.11.2 Lead State Agency

- The Division of Oil, Gas and Mining of the Department of Natural Resources, is the lead state agency responsible for administering the Utah Mined Land Reclamation Act. The Utah Department of Environmental Quality is responsible for water quality consideration under its Ground Water Quality Protection Rules.

The separate administration of the mining Act and water quality programs in Utah's regulatory scheme has resulted in an apparent gap with respect to water quality issues. The Department of Environmental Quality program lacks authority to require bonding relevant to water treatment and other water quality issues. Utah's situation in this regard is typical of most states with separate state agencies responsible for reclamation and water quality protection. This scenario results in the ability to bond for reclamation, but an inability to provide for environmental protection.

Recommendation: *Utah's Division of Oil, Gas, and Mining must ensure coordination with the Department of Environmental Quality and authority must be established to require bonding for environmental protection, including for long-term water treatment.*

4.2.11.3 Lands Bonded by State

- Bonding is required under the Utah Mined Land Reclamation Act on private, state and federal lands.

Utah's statutes in this regard are consistent with the recommended regulatory model.

- Despite a large area of tribal lands in the state, Utah has no formal relationship with the various tribal organizations with respect to mining and reclamation issues affecting those lands.

Recommendation: *Given the potential conflict with respect to tribal issues, the state must consider entering into formal agreements to provide for decision making and cooperation on reclamation and closure issues with the various tribal entities.*

4.2.11.4 Relationship with Federal Agencies

- Utah has a statewide MOU with the Bureau of Land Management and U.S. Forest Service for mining projects conducted on federal lands within the state.

Utah's statutes in this regard are for the most part consistent with the recommended regulatory model.

4.2.11.5 Exemptions to Bonding

- The Utah Mined Land Reclamation Act applies to operations active in 1975. The rules in the Mineral Regulatory Program apply to operations previously exempted or to operations commencing after November 1, 1988. The rules also apply to revisions of existing operations.

Most of the existing mines in the state were proposed and operated after 1975, but a number of existing operations were active prior to 1988. The most significant operation in the state by far, however—the Bingham Canyon copper operation—contains a special exemption. The Bingham Pit, which covers an area of 23,000 acres, is excluded from modern reclamation and closure statutes. Although from the standpoint of surface disturbance and water quality impact the pit is the most significant feature in the entire country, it remains unbonded.

In effect, this means the world’s largest open pit is exempted from the modern reclamation and closure statutes of the state of Utah. Surface reclamation and closure is largely dictated at the will of the operating company. Continued operations that might lead to additional contamination are similarly exempted from consideration under the new regulations. With respect to the Bingham Pit, Utah’s reclamation and closure scheme is seriously compromised and is unable to provide for the purposes of modern reclamation and closure practice and, in general, does not contribute towards responsible mining practices.

- Utah’s MLRA allows for the exemption of operations of five acres or less.

Utah’s existing exemption for operations of less than five acres essentially allows small mining operations in the state to be conducted without adequate regard for reclamation and closure issues. Historical evidence indicates that Utah should have serious concern in this regard. Numerous small mines litter the landscape and the state lacks any substantial means to address impacts on the environment or potential liability to the public. Utah’s provisions are particularly arcane in that they do not recognize the potential for small operations to seriously impact the environment, even on a site-specific basis.

***Recommendation:** Utah must develop a specific small mine planning and bonding scheme that establishes a reasonable minimum amount (\$5000 per acre) to adequately reclaim surface features. The scheme should bond for additional site-specific features to the extent necessary to ensure reclamation and against public liability.*

4.2.11.6 Reclamation Plan Requirements

- Utah’s Mined Land Reclamation Act contains general provisions that address topsoil, recontouring, revegetation, stability, hydrology, water quality, geochemical-ARD and public safety. The MLRA does not include provisions for wildlife habitat and aesthetics.

The Utah MLRA lacks substance in terms of comprehensive and specific performance standards and other requirements. It also fails to substantively address many key issues relative to the reclamation and closure requirements of most other western states.

***Recommendation:** The Utah MLRA should be extensively modified to emulate the statutes of more progressive states that provide comprehensive and specific treatment of critical reclamation and closure planning. As currently written, the Utah MLRA fails to provide for the necessary reclamation and closure plan requirements to affect the purposes of responsible mine planning and bonding practice.*

4.2.11.7 Bonding Requirements

- The Utah Mined Land Reclamation Act requires that financial assurance be provided before operations are commenced.

Utah's statutes in this regard are consistent with the recommended regulatory model.

- Utah does not require additional financial assurance for mining operations that employ cyanide leaching or other toxic chemicals, except for detoxification of heap leach pads.

Recommendation: *Utah should develop and institute specific standards for the detoxification of leach dumps and remediation in the event of an accident. The full potential cost of reclamation and closure relative to the use of chemical extraction methods should be realized.*

4.2.11.8 Reclamation Bond Calculation

- Utah's MLRA allows the amount of the bond to be determined by the company. The MLRA requires that the estimate be made as if the agency will perform the required reclamation and closure activities.

Although it is an undesirable practice, most states allow the company to take the lead in suggesting reclamation and closure costs. The company submits an initial cost estimate that the state reviews. The state then makes changes to those costs or requires that the industry make the changes. In practice however, Utah's agencies usually accept the company's original cost estimate, lacking the expertise or initiative to question the submittal.

The matter of allowing the company to determine the bond amount prevents Utah's reclamation and closure scheme from fulfilling the purpose of modern reclamation and closure practices. The result is evident in bond amounts that are typical of other states allowing this unacceptable practice. The existing method of cost estimation is likely to underestimate the agencies' potential cost of performing reclamation by 20 to 100 percent.

Recommendation: *Utah's statutes must be revised to require that the Division of Oil, Gas and Mining determine and set the bond amount. The Division should calculate the bond amount based on the costs of the agency performing the necessary activities.*

- The reclamation and closure costs examined in this report's Utah case study shows a cost estimate largely based on information provided by the company. Only limited information is based on reliable sources.

Recommendation: *Modified statutes should require that the Division of Oil, Gas and Mining use verifiable sources in determining reclamation and closure costs, as recommended in the regulatory model.*

- Utah's MLRA does not specifically address overhead (indirect costs), except to provide that the amount of surety must be based on the Division's cost to reclaim the site.

This report's Utah case study indicates that only mobilization, supervision (at five percent) and inflation (two percent per year) were included in the cost estimate. Because the Utah MLRA requires that the reclamation and closure costs be based on the agency's costs to perform the necessary tasks,

additional indirect costs should be included in the estimate, as discussed in the recommended regulatory model.

Recommendation: *The Utah MLRA must be revised to ensure that reclamation and closure costs estimates are determined, under all circumstances, on the basis of the performance of necessary activities by the responsible agency or agencies, including indirect costs, on a site-specific basis.*

- No provisions for bonding to fund interim operations are provided in the MLRA.

Recommendation: *Utah should provide for funding interim operations as a part of the bond, as recommended in the regulatory model.*

- Utah bases the cost of reclamation and closure on the acreage to be disturbed over a five-year period. Financial assurance is allowed on an incremental basis for planned surface disturbances described in the reclamation plan.

Utah's statutes in this regard are inconsistent with the recommended regulatory model and the practice of most states, and are further compromised by other shortcomings in the state's regulatory scheme. Given the other limitations on Utah's statutes as noted elsewhere in this section, it does not appear that a phased approach will result in sufficient bonding during some period of the project lifetime. This might make the state particularly vulnerable if water quality concerns are discovered.

Recommendation: *Utah should revise the statutes to delete the provision for incremental bonding, and base bonding costs on reclamation and closure costs over the life of the project.*

4.2.11.9 Forms of Financial Assurance

- Utah allows most forms of financial assurance, including corporate guarantees (self-bonding).

The broad discretion in terms of the form of financial assurance given by Utah's Division of Oil, Gas and Mining represents a significant shortcoming in the state's entire bonding scheme—particularly with respect to self-bonding. In the event of foreclosure, these guarantees will probably not enable the state to perform reclamation and closure activities without taxpayer funding.

Recommendation: *Utah must revise its statutes to accept only secure and readily liquid financial assurance in the form of cash, surety bonds or letters of credit.*

4.2.11.10 Monitoring and Compliance

- Monitoring and compliance inspections are not specifically addressed in the Utah MLRA or Minerals Rules.

It has been the practice of the Division to conduct periodic inspections of on-going operations and to monitor sites for a period of three years after the completion of reclamation.

Recommendation: *Utah must revise the Act or rules to include the authority to conduct inspections on a regular or as-needed basis as in the recommended regulatory model. The inspections should pay particular attention to investigating groundwater contamination issues, toxic chemical containment and the occurrence or evidence of the potential for AMD.*

4.2.11.11 Bond Review Period

- A bond review period is not specifically addressed in the Utah MLRA or Minerals Rules.

It has been the policy of the Division to routinely review bonds on a five-year basis. The bond review is typically limited to changes in acreage disturbed and inflationary adjustments.

Utah's statutes in this regard are inconsistent with the recommended regulatory model and the practice of most states. As provided in the model discussion, bond review is a crucial aspect of bonding practices. The review allows the responsible agency to review the reclamation and closure plan in detail and to compare it with site-specific information derived from inspections. In order to be effective, bond review must incorporate adjustment of the bond as necessary to ensure the most current and accurate information.

***Recommendation:** Utah must change the MLRA to incorporate an effective bond review practice, as in the recommended regulatory model.*

4.2.11.12 Closure Regulations

- Closure requirements are not addressed in the Utah MLRA or Minerals Rules.

***Recommendation:** Utah must develop and promulgate specific and substantive closure and post-closure criteria and standards. Those criteria should be incorporated into the Act.*

4.2.11.13 Noncompliance and Bond Forfeiture

- Utah's statutes allow for forfeiture if the operator refuses to carry out the necessary reclamation.

Utah's statutes in this regard are for the most part consistent with the recommended regulatory model and the practice of most states. However, the statutes fail to provide for a time period following closure for reclamation activities to be commenced and completed, and they lack the specificity of the noncompliance and bond forfeiture regulations of most other states.

***Recommendation:** The Utah MLRA should be modified to include a time period following closure in which reclamation activities must commence and be completed, as in the recommended regulatory model.*

4.2.11.14 Bond Release

- Bond release is not addressed in the Utah MLRA or Minerals Rules.

It is the policy of the Division to hold the surety until such time as the Division deems reclamation complete.

***Recommendation:** The state should promulgate statutes for bond release similar to those suggested in the recommended regulatory model.*

4.2.11.15 Reclamation Fund or Pools

- Utah's statutes do not include emergency response or reclamation funds.

Utah has not established a reclamation fund to address potentially unbonded liabilities—particularly those associated with potential groundwater contamination from AMD and other water-degrading impacts.

***Recommendation:** Utah, like all states, should establish an emergency response fund to allow the agencies to conduct emergency response activities at permitted or illegal mining operations in a manner that is unencumbered by immediate financial constraints.*

The fund could be established based on a levy against gold and copper production. A substantial account (\$100,000,000) could be established and used to finance research and development on water quality issues and cleanup activities as they pertain to copper and precious metals mining operations in the state.

4.2.11.16 Public Participation

- No specific provisions for public participation are provided in the Utah MLRA.

Utah emulates most of the western states by limiting public participation in the reclamation planning and bonding process. The analysis typically conducted by the state in approving new mining operations contains limited discussion or information relevant to bonding.

***Recommendation:** Utah must provide for public participation by including the aspects recommended in the regulatory model. These aspects include the critical right to request an investigation of potential violations and the right to request adjustment of the bond amount.*

4.2.11.17 Conclusion

Utah's Mined Land Reclamation Act does not adequately protect the public from the potential costs associated with reclamation of the major mines active in the state. Groundwater contamination issues are not being addressed currently. Existing bond amounts do not reflect the state's cost to conduct reclamation and closure in the event a mining company fails to fulfill its obligations. Financial assurances can be based on a company's self-guarantee rather than a readily liquid mechanism. Significant reform of the Utah Mined Land Reclamation Act should be a priority to encourage responsible mining practices in the state and to protect against public liability.

4.2.12 WASHINGTON

- Four major gold and silver mining operations are currently permitted in the state (three operating and one in final reclamation). One additional mine (Crown Jewel) is proposed and in the final stages of permitting.
- It is unknown at this time how many total acres are disturbed in the State, as figures for the Lamefoot/K2 mine are not available. Total bonding for the state, excluding the aforementioned mine is \$3,346,451. The state's average bond amount per acre per acre ranks in the upper mid-range of the western states.
- No major mines in the State are currently in foreclosure or bankruptcy.

4.2.12.1 State Reclamation Statutes, Regulations and Guidelines

- Washington's Surface Mining Act was enacted in 1970. The Act was subsequently amended in 1993. The Metal Mining and Milling Act was enacted in 1994.

Washington's Surface Mining Act (SMA) was one of the first Acts promulgated in the 1970's. It was significantly revised in 1993 and contains many of the desirable characteristics of reclamation statutes found in other states. The Metal Mining and Milling Act (MMMA), established in 1994, also contains many desirable characteristics of environmental protection statutes—unfortunately, this is uncommon in other states. However, the two Acts are typically general in scope and do not contain many of the specific requirements which other states have since incorporated in modern regulations.

***Recommendation:** Revisions are needed to Washington's acts, particularly in the areas of geochemical-acid mine drainage (AMD) requirements, bond calculation, and bond review, as suggested further in this section.*

4.2.12.2 Lead State Agency

- The Department of Natural Resources is the lead state agency responsible for administering the reclamation requirements of the Surface Mining Act. The Washington Department of Ecology is responsible for administering the environmental protection requirements of the Metal Mining and Milling Act.

The separate administration of the Surface Mining Act and Metal Mining and Milling Act in Washington's regulatory scheme benefits from coordination of the activities of the two departments. Washington's situation in this regard is not typical of other states with separate agencies responsible for reclamation and environmental protection. By providing for bonding authority and coordination in both departments, Washington has resolved many of the problems that frequently result from separate agency administration. It is recommended that states with separate authorities emulate Washington's statutes and policies in this regard.

4.2.12.3 Lands Bonded by State

- Bonding is required under Washington's SMA and MMMA on private, state and federal lands.

Washington's statutes in this regard are consistent with the recommended regulatory model and the practice of most states.

4.2.12.4 Relationship with Federal Agencies

- The State typically enters into MOU's with the U.S. Forest Service and BLM. Either the State or federal agencies may hold the bond.

Washington's statutes in this regard are consistent with the recommended regulatory model and the practice of most states. However, there appears to be a lack of coordination and oversight where the bond is held by the federal agency (i.e. BLM on Kettle River Lamefoot Expansion).

4.2.12.5 Exemptions to Bonding

- The SMA applies to lands affected by surface mining operations conducted after January 1, 1971. The MMMA applies to all metal mining and milling operations conducted after July 1, 1997.

With the exception of the Republic Unit underground mining operations, which are exempt from the Acts, all of the current major mining operations were conducted after 1971.

- The Washington SMA allows operations of three acres or less to be exempt from reclamation and bonding requirements. No provisions for exemptions of small operations are apparent in the MMMA.

The Washington SMA's small mine exemption has the potential to allow small mining operations to be conducted without regard for reclamation and closure issues. Historical evidence indicates that Washington should have serious concern in this regard. Numerous small mines are located throughout the state and Washington lacks any substantial means to address environmental impacts or potential public liability. However, the lack of exemptions under the MMMA should allow the Department of Ecology to recognize the potential for even small operations to seriously impact the environment, depending on site-specific considerations.

***Recommendation:** Washington should develop a specific small miner bonding scheme that establishes a reasonable minimum amount (\$5000 per acre) to adequately reclaim surface features. The scheme should evaluate and bond for additional site-specific features to ensure reclamation and against public liability.*

4.2.12.6 Reclamation Plan Requirements

- Washington's Surface Mining Act contains specific provisions addressing recontouring and revegetation. General provisions address topsoil, stability, hydrology, water quality, geochemical-AMD and public safety. The Act does not include provisions for wildlife habitat or aesthetics.
- Under the Metals Mining and Milling Act, Washington addresses provisions for wildlife habitat. In addition, Washington is able to address water rights mitigation in bonding as a consequence of hydrologic impacts through the MMMA.

The Washington SMA contains some comprehensive and specific performance standards and other requirements. The SMA's provisions for recontouring and revegetation are recommended as examples of modern regulation intended to ensure proper reclamation and closure.

The generality of some provisions in the SMA are potential weaknesses of the act. Provisions for topsoil, stability, hydrology, water quality and geochemical-AMD are not specific enough. This generality leaves bonding relative to these issues (particularly geochemical-AMD considerations) inadequately addressed during the permitting, planning and bonding processes.

The Act does not directly address aesthetics, although some consideration is demonstrated in planning for newer projects, like the proposed Crown Jewel mine.

***Recommendation:** The Washington SMA and MMMA should be modified to specifically address geochemical-AMD issues and to more specifically address topsoil, stability, hydrology, water quality, public safety and wildlife habitat. Consideration should be given to standards to address aesthetics.*

4.2.12.7 Bonding Requirements

- The Washington SMA and MMMA require that financial assurance be provided before permits are issued.

Washington's statutes in this regard are consistent with the recommended regulatory model and the practice of most states.

- Washington requires additional financial assurance for mining operations that employ cyanide leaching or other toxic chemicals.

Under the provisions of the MMRA, the Department of Ecology can require additional bonding for leach pads and/or tailings ponds detoxification as well as bonding for potential accidents and other water quality related costs.

4.2.12.8 Reclamation Bond Calculation

- The Washington SMA and MMRA give the departments the authority to determine the bond amount.

Washington's statutes in this regard are consistent with the recommended regulatory model.

- The reclamation and closure costs examined in this report's Washington case studies show that the cost estimate was mostly based on information from reliable sources.

Washington's statutes in this regard are consistent with the recommended regulatory model.

- Washington's SMA and MMRA allow for related administrative costs to be included in the bond amount. The reclamation bond estimate for the Crown Jewel project included indirect costs equaling approximately 36 percent of direct costs.

Washington's statutes in this regard are consistent with the recommended regulatory model and the practice of most states.

- No specific provisions for bonding to fund interim operations are provided in the SMA or MMMA. However, the language in both Acts infers that funding for interim operations could be included in the bond amounts.

Recommendation: *Washington should adopt specific statutes to provide for funding interim operations as a part of the bond, as recommended in the recommended regulatory model. Bond calculations should include such funding.*

- The Washington SMA requires that the bond amount not exceed the estimated cost of fully reclaiming all lands to be affected in the following two years. The MMRA infers that environmental protection bonding be calculated for the end-of-project life.

Although the statutes allow incremental bonding, in the Washington case studies, reclamation and closure costs were based over the expected project life, with the amount of financial assurance based on reclamation and closure at the end of project life.

Washington's statutes in this regard are not consistent with the recommended regulatory model, and might not result in sufficient bonding during some period of the project lifetime if the provisions for incremental bonding were misused.

***Recommendation:** Washington should revise the statutes to delete the provision for incremental bonding.*

4.2.12.9 Forms of Financial Assurance

- Washington allows for surety bonds, cash, letters of credit, securities and other forms of readily liquid financial assurance. Washington also allows for the assignment of interests in real property within the state.

Washington's statutes in this regard are for the most part consistent with the recommended regulatory model and the practice of most states. However, the provision for real property is not recommended as the valuation of such property is difficult and subject to variation, and is not readily liquid.

***Recommendation:** Washington must revise its statutes to eliminate the provision for real property as a form of financial assurance.*

4.2.12.10 Monitoring and Compliance

- Washington can conduct mine inspections as necessary to determine compliance with the statutes.

Washington's statutes in this regard are consistent with the recommended regulatory model and the practice of most states.

***Recommendation:** It is recommended that the inspections pay particular attention to investigating groundwater contamination issues, toxic chemical containment and the occurrence or evidence of the potential for AMD.*

4.2.12.11 Bond Review Period

- The Washington SMA and MMRA allow for the bond to be adjusted at any time to compensate for any alteration in conditions which might affect cost of reclamation and closure. The MMRA requires that the bond be reviewed a minimum of every two years.

Washington's statutes in this regard are consistent with the recommended regulatory model and the practice of most states, except that a specific time period for bond review is not mandated in the SMA.

***Recommendation:** Washington should change the SMA to mandate bond review at least every two years.*

4.2.12.12 Closure Regulations

- Washington has general but substantive closure regulations contained in the MMRA.

Under the MMRA, Washington does require bonding for closure, and in practice requires bonding for post-mining water quality treatment and reclamation operation, maintenance and monitoring. It is

recommended that other states consider emulation of Washington's statutes in this regard to ensure closure and post-closure bonding for environmental protection.

Recommendation: *Washington should develop and promulgate more specific and substantive closure and post-closure criteria and standards as in the recommended regulatory model.*

4.2.12.13 Noncompliance and Bond Forfeiture

- Washington's Acts allow for bond forfeiture in the event the operator has failed to comply with relevant statutes, rules or permits, or has failed to take adequate or timely action to rectify these impacts.

Washington's statutes in this regard are for the most part consistent with the recommended regulatory model and the practice of most states. However, the Acts do not specify a minimum time for reclamation and closure activities to occur.

Recommendation: *The Washington SMA and MMMA should be modified to ensure reclamation activities are commenced and completed similarly to the recommended regulatory model.*

4.2.12.14 Bond Release

- The bond release provisions of the Acts address the liability of the operator and surety provider with respect to bond release.

No provisions allowing the State to modify or extend the surety agreement to fulfill closure/post-closure requirements are necessary, as the MMRA directly addresses those requirements. However, there are no provisions requiring inspections to approve the reclamation and closure activities, and substantive and specific vegetative growth performance standards have not been developed to measure revegetation efficacy.

Recommendation: *Washington should modify its statutes similar to those suggested in the recommended regulatory model.*

4.2.12.15 Reclamation Fund or Pools

- No specific provisions for a reclamation fund are included in the Acts.

Washington has not established a reclamation fund to address potentially unbonded liabilities, particularly those associated with potential groundwater contamination from AMD and other water-degrading impacts.

Recommendation: *Washington should establish a substantial account that could be used to finance research and development with respect to water quality issues and cleanup activities resulting from mining operations in the state.*

4.2.12.16 Public Participation

- Washington's Acts do not contain specific provisions for public participation in bonding.

Washington emulates most of the western states by limiting public participation in the reclamation planning and bonding process. The analysis typically conducted by the state in approving new mining operations contains limited discussion and information relevant to bonding.

***Recommendation:** Washington must provide for public participation by including the aspects recommended in the regulatory model. These aspects include the critical right to request an investigation of potential violations and to request adjustment of the bond amount.*

4.2.12.17 Conclusion

In most respects, Washington's Surface Mining Act (SMA) and Metal Mining and Milling Act (MMMA) serve as good examples of modern mining reclamation and closure statutes. The SMA alone would fall short in its provisions to ensure responsible mining and to protect the public from potential liability. However, by providing for environmental protection both during operations and at closure and post-closure, the recently enacted MMMA reasonably ensures that proper reclamation and closure should take place without undue public liability. The primary weakness of planning and bonding practice in Washington is with respect to geochemical-AMD concerns that leave the state potentially susceptible to liability for water quality issues. Minor changes to the Washington Acts, along with diligence by the responsible agencies, should be encouraged to promote responsible mining practices in the state and protect against public liability.

4.2.13 WYOMING

- There are presently no major hardrock metals mining operations in Wyoming.

4.2.13.1 State Reclamation Statutes, Regulations and Guidelines

- Wyoming's Environmental Quality Act was originally enacted in 1970, and was last significantly revised in 1995.

Wyoming's Environmental Quality Act (EQA) is representative of statutes enacted in the 1970's and subsequently revised. Because the State lacks an active major hardrock metals mining industry, the changes in the EQA are primarily reflective of other mining activities in the state— particularly coal, uranium and industrial minerals mining. Due to this emulation, the Act does not contain all of the desirable characteristics of statutes found in progressive states with more experience. In addition, because the plans and bonds for metals mining have not been established under the Wyoming EQA, it is impossible to effectively critique the Act as it pertains to actual regulatory practice in the state.

***Recommendation:** Involvement by environmental organizations and other concerned public is needed to ensure that the Wyoming EQA is adequate to promote responsible mining practice if major metals mining becomes active in the state.*

4.2.13.2 Lead State Agency

- The Division of Land Quality in the Department of Environmental Quality is the lead state agency responsible for administering the Wyoming EQA. The Department of Environmental Quality is also responsible for administering water quality and other environmental protection statutes in Wyoming.

Wyoming's administration of reclamation and environmental protection in this regard is consistent with the recommended regulatory model.

4.2.13.3 Lands Bonded by State

- Bonding is required under the Wyoming EQA on private, state and federal lands.

Wyoming's statutes in this regard are consistent with the recommended regulatory model and the practice of most states.

4.2.13.4 Relationship with Federal Agencies

- Wyoming can enter into MOU's addressing hardrock metals mining reclamation and closure with federal agencies

Wyoming's statutes in this regard are consistent with the recommended regulatory model and the practice of most states. As Wyoming has no major hardrock metals mining operations, no Memorandum of Understanding currently exist between the state and federal agencies.

4.2.13.5 Exemptions to Bonding

- The Wyoming EQA applies to operations conducted after promulgation of the Act.
- The Wyoming EQA exempts mining operations that disturb less than ten acres of land.

Wyoming's exemption for operations of fewer than ten acres allows small mining to be conducted without regard for reclamation and closure issues. Wyoming's provisions do not adequately recognize the potential for small operations to seriously impact the environment, even depending on site-specific considerations.

Recommendation: *Wyoming should develop a specific small miner bonding scheme that establishes a reasonable minimum amount (\$5000 per acre) to adequately reclaim surface features. The scheme should evaluate and bond for additional site-specific features to ensure reclamation and against public liability.*

4.2.13.6 Reclamation Plan Requirements

- The Wyoming EQA contains specific provisions addressing topsoil, revegetation and hydrology. There are general provisions on recontouring, stability, water quality and geochemical-acid mine drainage (AMD) and limited provisions addressing wildlife habitat. The EQA does not include provisions for public safety or aesthetics.

The Wyoming Act does not contain comprehensive or specific performance standards for water quality or geochemical-AMD issues. This leaves the key issues of reclamation planning and bonding—particularly geochemical-AMD considerations—inadequately addressed during the permitting, planning and bonding processes.

Recommendation: *The Wyoming EQA should be modified to specifically address geochemical-AMD issues and to more specifically address other key issues. Consideration should be given to standards addressing public safety and aesthetics.*

4.2.13.7 Bonding Requirements

- The Wyoming EQA requires that the operator of a hardrock metal mine provide financial assurance.

Wyoming's statutes in this regard are for the most part consistent with the recommended regulatory model and the practice of most states.

- The Wyoming EQA does not specifically require additional bonding for mining operations that employ cyanide leaching or other toxic chemicals.

Recommendation: *If hardrock metal mining occurs, Wyoming must develop and institute specific standards for the detoxification of leach dumps and remediation in the event of an accident. The State must also include the authority to bond for the full potential cost of reclamation and closure relative to the use of chemical extraction methods.*

4.2.13.8 Reclamation Bond Calculation

- The Wyoming EQA allows the amount of the bond to be based on the operator's cost estimate plus the Department's estimate of what additional costs to the State would be to perform reclamation.

Wyoming's statutes in this regard are not consistent with the recommended regulatory model.

Recommendation: *Wyoming's statutes must be revised to require that the Department determine and set the bond amount. The bond amount should be based on the agency performing the necessary reclamation and closure activities.*

- The Wyoming EQA does not specifically address overhead (indirect costs) except for mobilization/demobilization.

Recommendation: *The Wyoming EQA must be revised to ensure that reclamation and closure cost estimates be determined, under all circumstances, on the basis of the necessary activities as conducted by the responsible agencies. The estimate should include indirect costs as provided for in the recommended regulatory model.*

- No provisions for bonding to fund interim operations are provided in the Wyoming EQA.

Recommendation: *Wyoming should adopt statutes to provide for funding interim operations as a part of the bond, as recommended in the recommended regulatory model.*

4.2.13.9 Forms of Financial Assurance

- The Wyoming EQA allows for surety bonds, CD's, treasury bills, cash, letters of credit and self-bonding.

Recommendation: *Wyoming must revise its statutes to accept only secure and readily liquid financial assurance in the form of cash, surety bonds or letters of credit.*

4.2.13.10 Monitoring and Compliance

- Monitoring and compliance provisions are not included in the Wyoming EQA.

Recommendation: Wyoming must revise its statutes to include monitoring and compliance provisions.

4.2.13.11 Bond Review Period

- No specific provisions for bond review are included in the Wyoming EQA.

Recommendation: Wyoming should add a provision to the EQA establishing a policy to mandate bond review at least every three years, and as otherwise recommended in the regulatory model.

4.2.13.12 Closure Regulations

- No specific closure regulations are included in the Wyoming EQA.

Recommendation: Wyoming must develop and promulgate specific and substantive closure and post-closure criteria and standards, as in the recommended regulatory model. Those criteria should be incorporated into the EQA.

4.2.13.13 Noncompliance and Bond Forfeiture

- Wyoming allows for forfeiture of the bond for a violation of the EQA.

Wyoming's statutes in this regard are for the most part consistent with the recommended regulatory model and the practice of most states.

4.2.13.14 Bond Release

- The Wyoming EQA requires that up to 75 percent of the bond be released upon completion of reclamation. The remaining portion of the bond shall be held for a period of at least five years after the date of reduction to assure proper revegetation and restoration of groundwater.

Wyoming's statutes in this regard are generally consistent with the recommended regulatory model.

4.2.13.15 Reclamation Fund or Pools

- No provisions for reclamation funds are provided in the Wyoming EQA.

Recommendation: Wyoming should establish an account that could be used to finance research and development with respect to water quality issues and cleanup activities resulting from mining operations in the state.

4.2.13.16 Public Participation

- No specific provision for public participation are included in the Wyoming EQA.

Wyoming emulates most of the western states by limiting public participation in the reclamation planning and bonding process

***Recommendation:** The Wyoming EQA must provide for public participation by including the aspects recommended in the regulatory model.*

4.2.13.17 Conclusion

Wyoming's EQA is difficult to analyze because it has yet to be proven in practice. The primary apparent weakness of the Wyoming EQA is its general statutes on water quality and geochemical-AMD issues, which could lead to water quality concerns. In the event hardrock metals mining were to become active in the State, it would be necessary to significantly revise the existing Act to promote responsible mining practices and protect against public liability.

4.2.14 U.S. FOREST SERVICE

4.2.14.1 Reclamation Statutes, Regulations and Guidelines

- The U.S. Forest Service mining regulations are found in the Code of Federal Regulations (CFR) Title 36, Part 228 regulations). These regulations were promulgated in 1974 and have not been substantially revised since that time. In addition, the Forest Service has established rules governing surface management and mineral management activities in Forest Service Manual (FSM) 2801.

The 36 CFR 228 regulations and rules in FSM 2801 are not comprehensive or specific. These general regulations contain provisions for reclamation, bonding, monitoring and cooperative agreements.

***Recommendation:** Major revisions are needed to the 36 CFR 228 regulations and FSM 2801, as suggested further in this section. These revisions should be sought with a sense of urgency in order to ensure the objectives of reclamation bonding. Changes are particularly necessary to protect the public and environment from mining industry pollution of surface and water resources.*

4.2.14.2 Relationship with Other Governments

- FSM 2841 includes provisions for entering into cooperative agreements or Memorandum of Understanding (MOU's) where other federal and/or state agencies have jurisdiction.

The National Forests enters into site-specific MOU's with other federal and state agencies on mining projects conducted, in whole or in part, on land administered by the Forest Service. With the exception of Arizona (see Arizona critique), National Forests in all other states routinely are part of statewide or site-specific MOU's. The Forest Service's statutes in this regard are consistent with the recommended regulatory model and the practice of most states,

Significant areas of tribal lands are adjacent to some National Forests. Tribal treaty rights may pertain to some National Forests. The Forest Service typically has no formal relationship with the various tribal organizations with respect to mining and reclamation issues that affect those lands.

***Recommendation:** The U.S. Forest Service must establish a policy requiring it to enter into formal agreements with various tribal organizations. These agreements should provide for cooperation on mine permitting, reclamation and closure issues, and for inclusion in the decision making process. The*

Forest Service must ensure that tribal governments are recognized as sovereign nations by establishing both the resources and authority for tribal groups to meaningfully participate in reclamation processes.

4.2.14.3 Exemptions to Bonding

- No provisions for exemptions to bonding are contained in the 36 CFR 228 regulations or FSM 2841.

In some cases, the National Forests accept the provisions of some states' small mine programs. In other cases, where the small mine programs provide exemptions to planning and bonding requirements, the National Forests may require both plans and bonding. However, numerous small mining operations are routinely conducted on National Forest lands without reclamation plans or bonds.

Recommendation: *The Forest Service must develop a specific small mine planning and bonding scheme that establishes a reasonable minimum amount (\$5000 per acre) to adequately reclaim surface features. The scheme should evaluate and bond for additional site-specific features to ensure reclamation and against public liability.*

4.2.14.4 Reclamation Plan Requirements

- The 36 CFR 228 regulations and FSM 2801 contain general provisions for topsoil (soil conservation), recontouring, revegetation, stability, hydrology/water quality (water conservation), toxic materials, fisheries and wildlife habitat.

The 36 CFR 228 regulations and FSM 2801 entirely lack substance in terms of comprehensive and specific performance standards and other requirements. They fail to substantially address any of the key issues relative to the requirements established by statute in most western states. As a result, reclamation planning by the Forest Service often fails to adequately address topsoil, recontouring, revegetation, hydrology, water quality, geochemical-acid mine drainage (AMD), public safety, wildlife habitat or aesthetic considerations. The limitation on reclamation provided in the existing statute (which provides for reclamation "where practical"), has often been interpreted by the U.S. Forest Service as requiring measures that the company determines to be "practical." This essentially limits the ability of the Forest Service to require responsible mine reclamation and closure practices.

In some cases, the Forest Service and other federal agencies have developed general guidelines and policies with respect to reclamation requirements. However, they tend to be too general, and because the policies have not been promulgated into rules, they are routinely challenged by industry.

Recommendation: *The 36 CFR 228 regulations and FSM 2801 should be extensively modified to emulate the statutes of more progressive states and to provide for more comprehensive and specific treatment of critical planning issues than currently exists. As currently written, the Forest Service regulations fail to provide for the necessary reclamation and closure plan requirements to affect the purposes of modern and responsible planning and bonding practices.*

4.2.14.5 Bonding Requirements

- The Forest Service requires that financial assurance be provided before a permit is issued for any plan of operations.

The Forest Service's policies in this regard are consistent with the recommended regulatory model and the practice of most states.

- The Forest Service does not require additional financial assurance for mining operations that employ cyanide leaching or other toxic chemicals.

The Forest Service regulations and policies fail to address water quality issues, in most cases depending upon state regulations to ensure protection of water resources. By administering only surface manifestations of mining operations, the Forest Service essentially avoids the responsibility for impacts to both surface and groundwater resources. In some cases, this avoidance seriously compromises the ability of the states to address impacts on those resources.

***Recommendation:** The Forest Service, in cooperation with individual states, should develop and institute specific standards for the detoxification of leach dumps and remediation in the event of an accident. Also, the full potential cost of reclamation and closure relative to the use of chemical extraction methods should be realized.*

4.2.14.6 Reclamation Bond Calculation

- The Forest Service allows the amount of the bond to be determined by the company. No provisions are contained in the 36 CFR 228 regulations or FSM 2801 that require the bond to be calculated as if the agency were responsible for the reclamation.

The Forest Service, like most states, allows the company to take the lead in suggesting reclamation and closure costs. The company submits an initial cost estimate, which the Forest Service then reviews. The Forest Service can make corrections or requires the company to do so. In practice, the Forest Service usually accepts the company's original cost estimate, in most cases lacking the expertise or initiative to question the submittal.

Allowing the company to both determine the bond amount and to assume it will conduct the required activities severely deters the agency's reclamation and closure scheme from fulfilling the purpose of modern reclamation practices. The existing method of cost estimation is likely to underestimate the potential cost of performing reclamation by 120 to 200 percent.

***Recommendation:** Forest Service regulations must be revised to require that the agency set the bond amount. The bond should be based on the agency performing the necessary activities to achieve compliance with (otherwise modified) Forest Service regulations.*

- The costs examined in this report's Idaho case studies (which included land administered by the Forest Service), show the cost estimate was largely based on information provided by either the company or a third-party engineering estimate conducted for the company. This approach is typical for the Forest Service elsewhere as well. Only limited information was based on reliable sources.

***Recommendation:** Forest Service regulations should require the use of verifiable sources in determining reclamation and closure costs, as recommended in the regulatory model.*

- The Forest Service bonding policy does not address overhead (indirect costs).

As mentioned in the Idaho section, this report's case studies (which include land administered by the Forest Service) indicate inconsistencies with regard to indirect costs in the bonding estimates. While one of the two case studies included indirect costs totaling approximately 35 percent of direct costs, the other case study included no indirect costs. This is typical of other National Forests as well.

Recommendation: *The Forest Service regulations should be revised to ensure that cost estimates be determined, under all circumstances, on the basis of the responsible agencies performing the necessary activities, including indirect costs, on a site-specific basis.*

- No provisions for financial assurance to fund interim operations are provided in the Forest Service policy.

Recommendation: *The Forest Service should include provisions for funding interim operations as a part of the bond, as recommended in the regulatory model.*

- The Forest Service typically bases the cost of reclamation and closure over the expected project life. The bond is usually based on reclamation and closure at the end of project life. Financial assurance is allowed on an incremental basis for planned surface disturbances described in the reclamation plan.

The Forest Service's policies in this regard are consistent with the recommended regulatory model and the practice of most states, but are compromised by other shortcomings in the Forest Service's regulatory scheme. Given the other limitations on the Forest Service's statutes, as noted elsewhere in this section, a phased approach will probably yield insufficient bonding at some period of the project lifetime, particularly if unpredicted water quality issues arise.

Recommendation: *The Forest Service's policies should be revised to eliminate any provisions for incremental bonding.*

4.2.14.7 Forms of Financial Assurance

- No specific provisions for forms of financial assurance are provided in the regulations or rules.

Typically, Forest Service's policies in this regard are consistent with the recommended regulatory model and the practice of most states. The Forest Service only allows readily liquid forms of financial assurance.

Recommendation: *The Forest Service's regulations must allow only secure and readily liquid financial assurance in the form of cash, surety bonds or letters of credit.*

4.2.14.8 Monitoring and Compliance

- The Forest Service can conduct mine inspections as necessary to determine compliance with the statutes.

The Forest Service regulations in this regard are consistent with the recommended regulatory model and the practice of most states. The FSM 2801 manual suggests that the National Forests base monitoring practices on the degree of risk to human health and safety or on long-term environmental effects.

Recommendation: *It is recommended that inspections pay particular attention to investigating groundwater contamination issues, toxic chemical containment and the occurrence or evidence of the potential for AMD.*

4.2.14.9 Bond Review Period

- The Forest Service regulations and policies do not specify a bond review period.

The Forest Service's regulations and policies in this regard are inconsistent with the recommended regulatory model and the practice of most states. As provided in the model discussion, bond review is a crucial aspect of bonding practices. Bond review allows the responsible agency to review the reclamation and closure plan in detail and to compare it with site-specific information derived from inspections. In order to be effective, bond review must incorporate adjustment of the bond based on the most current and accurate information.

Recommendation: *The Forest Service must modify its bonding policy to incorporate an effective bond review practice by the Forest Service, as in the recommended regulatory model.*

4.2.14.10 Closure Regulations

- Closure requirements are not addressed in the Forest Service regulations or the FS 2801 manual.

Recommendation: *The Forest Service must develop and promulgate specific and substantive closure and post-closure criteria and standards, as in the recommended regulatory model. These criteria should be incorporated into the regulations.*

4.2.14.11 Noncompliance and Bond Forfeiture

- No specific provisions for noncompliance and bond forfeiture are included in the 36 CFR 228 regulations or FSM 2801.

Recommendation: *The Forest Service should promulgate regulations to address noncompliance and bond forfeiture for operations conducted on land administered by the Forest Service.*

4.2.14.12 Bond Release

- The FSM 2801 allows bond values to be tied to specific reclamation activities or standards to facilitate full or partial release of the instruments. Bonds are to be released when satisfactory reclamation is performed and completed, and the area stabilized.

The Forest Service's bond release policy does not address the liability of the operator or surety provider with respect to bond release. No specific provisions are included that allow the Forest Service to modify or extend the surety agreement to fulfill closure/post-closure requirements.

Recommendation: *The Forest Service should modify its policies similar to those suggested in the recommended regulatory model.*

4.2.14.13 Reclamation Fund or Pools

- The Forest Service's policy does not include emergency response or reclamation funds.

The Forest Service has not established a reclamation fund in order to address potentially unbonded liabilities, particularly those associated with potential groundwater contamination from AMD and other water-degrading impacts.

***Recommendation:** The Forest Service, in cooperation with the states, should establish an emergency response fund that allows the agency to conduct emergency response activities in a manner that is unencumbered by immediate financial constraints.*

4.2.14.14 Public Participation

- No specific provisions for public participation are provided in the Forest Service's regulations.

The Forest Service emulates most of the western states by limiting public participation in the planning and bonding process. The analysis typically conducted by the Forest Service in approving new mining operations contains limited information relevant to bonding.

***Recommendation:** The Forest Service must provide for public participation by including the changes recommended in the regulatory model, including the critical right to request an investigation of potential violations and the right to request adjustment of the bond amount.*

4.2.14.15 Conclusion

In its present form, the Forest Service's regulations and policies do not adequately protect the public against the potential costs associated with reclamation of the numerous mines on public lands administered by the Forest Service. Groundwater contamination caused by mining pollution is not currently being addressed. Existing bond amounts do not reflect the Forest Service's cost of conducting reclamation and closure in the event a mining company fails to fulfill its obligations. Urgent and significant reform of the Forest Service's regulations and policies should be a priority to encourage responsible mining practices on public land administered by the Forest Service and to protect against public liability.

4.2.15 BUREAU OF LAND MANAGEMENT

- The total number of major hardrock mines on lands administered by the Bureau of Land Management is unknown.
- 65 of the 73 major hardrock mining operations currently permitted in Nevada are located, at least partially, on public land administered by the Nevada State Office of the Bureau of Land Management (BLM).

4.2.15.1 Reclamation Statutes, Regulations and Guidelines

- The BLM's mining regulation scheme is based on the Code of Federal Regulations (CFR) Title 43, Subpart 3809. The "3809" regulations have been subject to minor modifications over the last decade, and are currently the subject of consideration for additional modifications proposed by the BLM in the past two years.

The BLM 3809 regulations are neither comprehensive nor specific. The primary guide to the BLM's policies on mine reclamation and closure is contained in Sec. 3809.0-6 Policy, which states:

“Consistent with section 2 of the Mining and Mineral Policy Act of 1970 and section 102(a) (7), (8), and (12) of the Federal Land Policy and Management Act, it is the policy of the Department of the Interior to encourage the development of Federal mineral resources and reclamation of disturbed lands. Under the mining laws, a person has a statutory right, consistent with Departmental regulations, to go upon the open (unappropriated and unreserved) Federal lands for the purpose of mineral prospecting, exploration, development, extraction and other uses reasonably incident thereto. This statutory right carries with it the responsibility to assure that operations include adequate and responsible measures to prevent unnecessary or undue degradation of the Federal lands and to provide for reasonable reclamation.” (Emphasis added)

The vague mandate to “prevent unnecessary or undue degradation of the Federal lands and to provide for reasonable reclamation” has been the subject of incessant debate by both industry and environmental concerns. Examination of the BLM’s policies and practices indicates the agency has chosen to use the broad discretion afforded by the regulation to maintain policies that favor industry. This favoritism comes at the risk of exposing the environment to pollution at a level inconsistent with modern statutes and responsible mining practices and results in significant liability to the public.

Recommendation: *Major revisions are needed to the BLM 3809 regulations and BLM policies as suggested further in this section. These revisions should be sought with a sense of urgency in order to ensure the objectives of mine reclamation and closure bonding as suggested in this study. The potential for enormous public liability must be guarded against.*

4.2.15.2 Relationship with Other Governments

- Despite a mandate to provide for a Trust Responsibility to Native American Tribes, in nearly all cases the BLM does not have formal relationships established with tribal groups. There are no Memoranda of Understanding or other agreements addressing cooperation in reclamation planning and bonding issues.

Despite on-going disputes concerning rights on the large area of BLM lands adjacent to tribal lands, the BLM has failed to establish formal relationship with the various tribal organizations. The BLM has been the subject of numerous civil actions by tribal organizations that have attempted to require the BLM to live up to its mandate to protect tribal rights. As is evidenced by several recent findings of the Interior Board of Land Appeals and other legal bodies, the BLM has consistently failed to ensure such responsibilities.

Recommendation: *The BLM must establish a policy requiring it to enter into formal agreements to provide for cooperation on mine permitting and reclamation and closure issues, and inclusion in the decision making process, of the various tribal entities. The BLM must ensure that tribal governments are recognized as sovereign nations, and are included in the decision-making process. This process includes the establishment of the resources and authority for tribal groups to meaningfully participate in such processes.*

4.2.15.3 Exemptions to Bonding

- Overall, the BLM does not have a policy for bonding of smaller mines, known as “notice level” mines.

However, BLM's policy in Nevada is to require that "notice level operations" (five acres or less of proposed disturbance) provide financial guarantees sufficient to cover 100 percent of the cost of reclaiming the proposed disturbance. Each acre of disturbance, or fraction thereof, shall require not less than \$1,000 per acre in bond coverage. All reclamation costs are to be calculated as if third party contractors were performing the reclamation after the site has been vacated by the operator.

The BLM does not have an agreement with Nevada concerning bonding of notice level operations because the state does not regulate notice level (less than five acre) operations. The BLM policy does not require a site-specific reclamation plan, and does not require inspection of notice level operations to provide for site-specific considerations and ensure the adequacy of the bond. The existing minimum amount of \$1,000 per acre is applied in most cases. Given the high cost of performing small-scale reclamation projects (which lack the economy of scale examined in this report's case studies), that amount is most likely inadequate to enable the BLM to perform reclamation should it become necessary.

Recommendation: *The BLM must develop a specific small mine planning and bonding scheme that establishes a reasonable minimum amount (\$5000 per acre) to adequately reclaim surface features for all mines on public lands in all states. The scheme should evaluate and bond for additional site-specific features to ensure reclamation and against public liability.*

4.2.15.4 Reclamation Plan Requirements

- The BLM 3809 regulations require the agency to assure that operations include adequate and responsible measures to prevent unnecessary or undue degradation of the federal lands and to provide for reasonable reclamation.

The BLM "3809" regulations entirely lack substance in terms of comprehensive and specific performance standards and other requirements. The regulations also fail to substantially address any of the key issues relative to the requirements established in most western states. As a result, reclamation planning by the BLM typically fails to adequately address topsoil, recontouring, revegetation, hydrology, water quality, geochemical-AMD, public safety, wildlife habitat and aesthetic considerations. The limitation on reclamation provided in the existing regulations, which provides for "reasonable" reclamation has, in most cases, been determined to require only those measures which the company determines to be "reasonable." This compromises and essentially limits the ability of the BLM to require responsible mine reclamation and closure practices to protect the public interest in the public lands.

At the local level, Nevada State Office of BLM and the U.S. Forest Service, along with the Nevada Division of Environmental Protection, have developed general guidelines and policies with respect to topsoil, revegetation and stability, calling them "Interim Standards." However, because these policies have not been promulgated into formal rules, they are not binding on the industry.

Recommendation: *The BLM "3809" regulations should be extensively modified to emulate the statutes of more progressive states which provide for comprehensive and specific treatment of critical planning issues. As currently written, the existing BLM "3809" regulations fail to provide the necessary requirements to affect the purposes of modern and responsible reclamation planning and bonding practice.*

4.2.15.5 Bonding Requirements

- The BLM requires that financial assurance be provided before a permit is issued.

The BLM's policies in this regard are consistent with the recommended regulatory model.

- The BLM does not require additional financial assurance for mining operations that employ cyanide leaching or other toxic chemicals.

The BLM "3809" regulations and BLM policies fail to ensure protection of water resources. By administering only surface manifestations of mining operations, the BLM essentially avoids the responsibility for impacts to surface and groundwater resources. In some cases, this seriously compromises the ability of the states to address impacts on those resources.

***Recommendation:** The BLM, in cooperation with individual states, should develop and institute specific standards for the detoxification of leach dumps, remediation in the event of an accident and the full potential cost of reclamation and closure relative to the use of chemical extraction methods.*

4.2.15.6 Reclamation Bond Calculation

- BLM allows the amount of the bond to be determined by the company. The BLM requires that the amount of financial assurance be determined as if the agency will perform the required reclamation and closure activities.

Although it is an undesirable practice, the BLM, like most states, allows the company to take the lead in suggesting reclamation and closure costs. The company submits an initial cost estimate, which the BLM then reviews. The BLM then makes corrections or requires the company to do so. In practice, BLM accepts the original reclamation and closure cost estimate by the company in most cases, lacking the expertise or initiative to question the company's submittal.

The matter of allowing the company to determine the bond amount and allowing them to assume they will conduct the required activities is another key provision of BLM 3809 regulations that prevents its scheme from fulfilling the purpose modern reclamation and closure practices. The existing method of cost estimation is likely to underestimate the agency's potential cost of performing reclamation by 20 to 100 percent.

***Recommendation:** BLM "3809" regulations must be revised to require that the BLM determine and set the bond amount. The BLM should determine the bond amount on the basis of the agency performing the activities necessary to achieve compliance with (the otherwise modified) "3809" regulations.*

- The reclamation and closure costs examined in this report's Nevada case studies, which include BLM administered public lands, show that cost estimates are largely based on information provided by the company or a third-party engineering estimate conducted for the company. Only limited information was based on reliable independent sources.

***Recommendation:** Modified statutes should require that BLM use verifiable sources in determining reclamation and closure costs, as recommended in the regulatory model.*

- Some state offices of BLM have a bonding policy that specifically addresses overhead (indirect costs), providing that the bond calculation include the cost of insurance (on-site liability), contract administration, bond (performance and payment) and profit.

For example, the Nevada BLM requires that insurance is calculated at 1.5 percent of labor costs. Contract administration is calculated at 18 percent of project costs for estimates up to \$1,000,000 and 10 percent for cost estimates over \$1,000,000. The bond is calculated at 1.5 percent of total project costs and profit is calculated at 10 percent of project costs. As mentioned in the Nevada case studies in this report, there are inconsistencies with regard to indirect costs in the various cost estimates. While two of the three case studies included insurance, contract administration, bond and profit in the estimate (at approximately 23 percent of the direct costs), one case study (Twin Creeks) provided no line item estimate, and estimated the total indirect costs at approximately 12 percent of the direct costs.

Recommendation: *The “3809” regulations should be revised to ensure that reclamation and closure costs estimates be determined, under all circumstances, on the basis of the responsible agencies performing reclamation. The estimate should include indirect costs on a site-specific basis.*

- No provisions for financial assurance to fund interim operations is provided in the BLM “3809” regulations.

Recommendation: *BLM should adopt statutes to provide for funding interim operations as a part of the financial assurance, as recommended in the recommended regulatory model.*

- BLM bases the cost of reclamation and closure over the expected project life, with the amount of financial assurance based on reclamation and closure at the end of project life. Bonding is allowed on an incremental basis for planned surface disturbances described in the reclamation plan on request.

BLM’s policy in this regard is consistent with the recommended regulatory model and the practice of most states, but are compromised by other shortcomings in the BLM’s regulatory scheme. Given the other limitations on the BLM’s laws and regulations noted elsewhere in this section, it does not appear that a phased approach would always result in sufficient bonding. This might make the BLM particularly vulnerable, as the present outlook for precious metals prices is likely to lead to additional foreclosures in the near future. If water quality concerns are discovered, the BLM will be left without adequate bonding.

Recommendation: *The BLM “3809” regulations should be revised to eliminate any provisions for incremental bonding.*

4.2.15.7 Forms of Financial Assurance

- BLM allows for most forms of financial assurance, including corporate guarantees (self-bonding) through existing state bonding programs.

The broad discretion of the states (and accepted by BLM) in allowing different forms of bonding represents perhaps the greatest shortcoming in the BLM’s entire bonding scheme, particularly with respect to self-bonding. In the event of foreclosure the agency will probably not be able to perform the necessary reclamation and closure activities without taxpayer funding.

Recommendation: *The 3809 regulations must allow only secure and readily-liquid financial assurance in the form of cash, surety bonds or letters of credit.*

4.2.15.8 Monitoring and Compliance

- BLM can conduct mine inspections as necessary to determine compliance with the regulations.

BLM's regulations in this regard are consistent with the recommended regulatory model and the practice of most states.

***Recommendation:** It is recommended that the inspections pay particular attention to investigating groundwater contamination issues, toxic chemical containment and the occurrence or evidence of the potential for AMD.*

4.2.15.9 Bond Review Period

- BLM's "3809" regulations do not specify a bond review period.

BLM's policy in this regard is inconsistent with the recommended regulatory model and the practice of most states. As provided in the model discussion, bond review is a crucial aspect of bonding practices. The review allows the responsible agency to review the reclamation and closure plan in detail and to compare it to site-specific information derived from inspections. In order to be effective, bond review must incorporate adjustment of the bond based on the most current and accurate information.

***Recommendation:** BLM must modify the "3809" bonding regulations to incorporate an effective bond review practice by the BLM, as in the recommended regulatory model.*

4.2.15.10 Closure Regulations

- Closure requirements are not addressed in the 3809 regulations or BLM's policies.

***Recommendation:** BLM must develop and promulgate specific and substantive closure and post-closure criteria and standards as in the recommended regulatory model. These criteria should be incorporated into the regulations.*

4.2.15.11 Noncompliance and Bond Forfeiture

- BLM's "3809" bonding policy does not address noncompliance and bond forfeiture.

***Recommendation:** The BLM should promulgate regulations to address noncompliance and bond forfeiture for operations conducted on BLM administered public lands.*

4.2.15.12 Bond Release

- BLM's policy allows for the incremental release of bonding as specific parts of reclamation are performed. For revegetation, 60 percent of the surety is released upon completion of earthwork and stabilization. The remaining 40 percent will not be released until the disturbed area has been revegetated to establish a diverse, effective, and permanent vegetative cover and any effluent discharge from the operation meets, without violations water quality standards for at least a full year.

BLM's bond release policy does not address the liability of the operator and surety provider with respect to bond release. No provisions are included to allow the BLM to modify or extend the surety agreement to fulfill closure/post-closure requirements.

Inspections are required to approve the reclamation and closure activities, and substantive and specific vegetative growth performance standards have been developed to measure revegetation efficacy. This is also the only provision of BLM policy that directly addresses effluents and water quality.

Recommendation: *The BLM should modify its policies similar to those suggested in the recommended regulatory model.*

4.2.15.13 Reclamation Fund or Pools

- BLM's "3809" regulations do not include emergency response or reclamation funds.

BLM has not established a reclamation fund to address potentially unbonded liabilities, particularly those associated with potential groundwater contamination from AMD and other impacts.

Recommendation: *BLM, in cooperation with the state, should establish an emergency response fund to allow the agency to conduct emergency response activities at permitted or illegal mining operations in a manner unencumbered by immediate financial constraints.*

The fund could be established based on a levy against gold and copper production. A substantial account (\$100,000,000) could be established and used to address water quality issues and cleanup activities of mining operations on BLM administered public lands.

4.2.15.14 Public Participation

- No specific provisions for public participation in bonding activities are provided in the BLM "3809" policy.

BLM emulates most of the western states by limiting public participation in the reclamation planning and bonding process. The analysis typically conducted by the BLM in approving new mining operations contains limited discussion and information relevant to bonding.

Recommendation: *BLM must provide for public participation by including the critical right to request an investigation of potential violations and the right to request the adjustment of the required performance bond amount.*

4.2.15.15 Conclusion

In their present form, the BLM "3809" regulations do not adequately protect the public from the potential costs of reclaiming the numerous active mines on BLM administered public lands. Groundwater contamination caused by mining is not being currently addressed. Existing bond amounts do not reflect the BLM's cost to conduct reclamation in the event a mining company fails to fulfill its obligations. Estimates are typically based on the company's information rather than an independent regulatory review. Urgent and significant reform of the 3809 regulations should be a priority to encourage responsible mining practices on public land administered by the BLM. In their present form, the BLM 3809 regulations and policies only serve to undermine the existing regulations in those states that promote responsible mining practices and adequately address planning and bonding practices.

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