

REPORT ON

**INTERNATIONAL PRACTICE IN THE
DETERMINATION OF THE QUANTUM OF
FINANCIAL PROVISION FOR MINE
REHABILITATION AND CLOSURE**

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EXECUTIVE SUMMARY

The Department of Minerals and Energy (DME) will promulgate and implement the new Minerals and Petroleum Resources Development Act, No. 28 of 2002. This Act will replace the Minerals Act of 1991 (No. 50 of 1991). The financial provision for the rehabilitation of mine sites will form an integral part of the new Act (as was the case with the old Act). Golder Associates Africa (Golder) have been commissioned to develop a new, universal guideline for these financial provisions, to be used by the regional personnel of the DME in assessing the financial provisions put forward by mining operations.

This document outlines a brief review of the international practice with regard to financial provisions, conducted as part of the background research for developing the guidelines, particularly the methods employed to determine the relevant provisions in countries such as the USA, Canada and Australia.

The approach that was used in this review was to find and analyse the relevant legislation and regulations in the target countries and to discuss financial provisions with experts within the Golder group in the target countries.

The practices for determining the quantum of the financial provision for rehabilitation that exist in the target countries were found to be mainly of two types:

1. Area-based, that is the quantum of financial provision is calculated by multiplying the area of operations by standardised unit rehabilitation costs; and
2. Project-based, where the costs of each aspect of rehabilitation of the site are analysed and totalled over the lifetime of the project.

The table below summarises the pertinent methodologies for calculating the quantum for financial provisions in the countries assessed.

Country	State	Method used to determine the quantum
USA	Federal/Colorado	<ul style="list-style-type: none"> • Direct costs for rehabilitation (based on equipment hours * rate per hour) • Indirect costs added (contingency, mobilisation, etc) • Lump sum costs excluded unless specifically required
Canada	British Columbia	<ul style="list-style-type: none"> • Area disturbance category (as for USA) • Lump sum category • Post closure category (capital and operating costs)
	Northern Districts	<ul style="list-style-type: none"> • Spreadsheet (RECLAIM) used to calculate costs
Australia	Queensland	<ul style="list-style-type: none"> • Standard projects: Lump sum of \$2,500 to \$40,000 depending on area and risk • Non-standard projects: Costs estimated from area disturbed and unit rates for activities • Up to 75% discount on financial provisions offered; performance-related
	Western Australia	<ul style="list-style-type: none"> • Sliding scale of \$ 5,000 per hectare for sites with low mobilisation costs to \$15,000 per hectare for more remote areas

APPENDIX C1

INTERNATIONAL PRACTICE IN THE DETERMINATION OF THE QUANTUM OF FINANCIAL PROVISION FOR MINE REHABILITATION AND CLOSURE

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1 INTRODUCTION

The Department of Minerals and Energy (DME) will promulgate and implement the new Minerals and Petroleum Resources Development Act, No. 28 of 2002 (MPRDA) during the course of 2003. This Act will replace the Minerals Act of 1991 (No. 50 of 1991). The financial provision for the rehabilitation of mine sites forms an integral part of the new Act (as was the case in the old Act). The requirements for financial provisions for mines are aimed at managing the risk of placing the Government in a position where it, and consequently the taxpayer, inherits the environmental responsibility and liability for mines that have not been closed or rehabilitated correctly and are polluting the environment after the owner/operator has departed.

Golder Associates Africa (Golder) were commissioned to develop a new, universal guideline for these financial provisions, to be used by the regional personnel of the DME in assessing the financial provisions put forward by mining operations. A brief review of the international practice with regard to financial provisions was conducted, as part of the background research for developing the guidelines.

The approach that was used in this review is:

1. Through an internet search, to find and analyse the relevant legislation and regulations in the target countries; and
2. To discuss financial provisions with experts within the Golder group in the target countries, and to analyse any information which they may provide.

The document reviews the legislation and describes how the quantum is determined in each of the target countries. This is followed by a summary.

Note that the following definitions are used in this report:

- **Financial provisions** covers the full gambit of a) the costs for rehabilitation and closure, b) the financial instruments used to ensure that funds are available and c) investment strategies to ensure that the funds invested achieve a risk-related return,
- The **quantum** is a sub-set of financial provisions and covers the methodologies used to estimate the costs for rehabilitation and closure.

The international review focussed on the methodologies to determine the quantum.

2 SELECTION OF TARGET COUNTRIES

The United States of America (USA), Canada and Australia were chosen as target countries for the review of international practice, as these represent (besides South Africa) the largest and most sophisticated mining jurisdictions, and potentially provide us with useful information and direction in the determination of an approach to establishing suitable guidelines.

Some investigation was conducted into other developing countries, but it proved difficult to find useful information on these. Exceptions were Ghana, whose legislation and regulations are copied virtually word-for-word from the South African MRPDA, and Chile, which is briefly discussed.

3 LEGISLATION AND PRACTISE IN THE USA, CANADA, AUSTRALIA AND CHILE

The USA, Canada and Australia are all federal countries. The review thus focuses on the federal legislation where it exists, and the application of this legislation in the mining-oriented states/provinces within those countries. For practical purposes, it was not deemed necessary to review the almost 70 jurisdictions contained in the countries under review.

3.1 The USA

3.1.1 Federal Law

The USA federal law governing the rehabilitation of mines is the Surface Mining Control and Reclamation Act of 1977. This legislation is enforced by the Office of Surface Mining, a section of the Department of the Interior. In terms of the legislation, operators are required to apply for a permit to mine. The permit must contain, amongst other things, a detailed reclamation plan, the requirements of which are listed in Section 508 of the Act. Section 509 specifies requirements of the performance bond (along with the accompanying regulations, Subchapter J - Bonding And Insurance Requirements For Surface Coal Mining And Reclamation Operations: **30 CFR Part 800** - Bond And Insurance Requirements For Surface Coal Mining And Reclamation Operations Under Regulatory Programs) which must be furnished with the Office of Surface Mining. As to the amount of the bond, the legislation states:

The amount of the bond required for each bonded area shall depend upon the reclamation requirements of the approved permit; shall reflect the probable difficulty of reclamation giving consideration to such factors as topography, geology of the site, hydrology, and revegetation potential, and shall be determined by the regulatory authority. The amount of the bond shall be sufficient to assure the completion of the reclamation plan if the work had to be performed by the regulatory authority in the event of forfeiture and in no case shall the bond for the entire area under one permit be less than \$10 000.

The regulatory authority establishes the minimum amount of bond required, based upon the permittee's estimate of reclamation costs and the regulatory authority's independent analysis of the amount that would be necessary for a third party to complete the reclamation plan in the event of bond forfeiture. The bond amount generally reflects reclamation costs at the projected point of maximum reclamation liability (usually the point of maximum disturbance) within the permit area or an initial increment of that area. Prior to disturbing new acreage, the permittee must post additional bond. In addition, the regulatory authority requires that the permittee posts

additional bond whenever the cost of future reclamation increases. As the permittee completes phases of reclamation, the permittee may apply for partial bond release.

The Office of Surface Mining has compiled a "[Handbook for Calculation of Reclamation Bond Amounts](#)", a 34-page manual which describes in detail a bond quantum calculation methodology. This document was drafted in 1987 and has been revised in 1993. The methodology in the handbook is used by other federal agencies, the States in the USA that have coal-mining operations, other States and some private companies in calculating the quantum of financial provision required. The methodology reflects standard construction industry and engineering cost-estimation procedures for determining demolition, earthmoving and revegetation costs (the most significant elements) so as to develop site-specific costs for each reclamation activity, and requires familiarity with standard engineering principles, equipment productivity handbooks and construction costing. The handbook is to be used in all situations involving the calculation or recalculation of reclamation costs, including initial calculation for permit issuance, incremental or cumulative bonding as operations progress, increase/decrease in bond as a result of permit revision, permit renewal, and others.

The **assumptions informing the methodology** are:

- The bond amount assumes the use of 3rd party contractors;
- The bond amount reflects the worst case scenario, i.e. the point of maximum cost of reclamation;
- The reclamation and operation plans submitted as part of the permit application will be used as the basis for determining the amount of the bond. The amount will be independently calculated by the regulator;
- The permittee will be in full compliance with plans and permit terms at all times;
- The regulatory authority will routinely re-evaluate bond adequacy and require bond adjustments;
- Unanticipated events (eg. acid mine drainage) will not be included in the initial calculations, but if they occur, the bond amount may be adjusted to include additional reclamation costs.

There are **four major sources of data** needed to calculate the bond amounts:

1. The reclamation and operational plans in the permit or permit application;
2. Equipment productivity and performance handbooks;
3. Construction cost reference manuals; and
4. Contract and cost data from many State and Federal sources, such as abandoned land reclamation programs, the Tennessee Valley Authority and the Department of Labor.

There are **five major steps** in the bond calculation process, as follows:

1. Determine the point of maximum reclamation cost liability;

2. Estimate *direct* reclamation costs such as earthmoving, revegetation, and the demolition and removal of structures not to be retained;
3. Adjust direct costs for inflation;
4. Estimate *indirect* costs such as mobilisation/demobilisation costs, contingency allowances, redesign expenses and contract management fees; and
5. Calculate the total bond amount.

The handbook covers each of these points in detail. Appendix A contains worksheets which cover each step, while Appendix B provides some worked examples of bond amount calculations in real-world situations. The handbook describes how to perform the calculation for different types of bond, namely where the **entire bond** is posted at the commencement of operations; **incremental bonds**, where separate bonds are posted for each incremental mining area; **cumulative bonds**, where costs are calculated for the cumulative project at each point; and **phase bonds**, where bonds are posted for each phase of *reclamation*, such as backfilling, regrading and structure demolition (Phase I) or topsoil replacement, removal of temporary erosion and revegetation (Phase II). The handbook also discusses the release of bond requirements under certain circumstances such as the completion of reclamation work. A bond calculation program may be downloaded from the OSM website to assist in performing calculations. A sample screenshot is shown in **Figure 1**.

The screenshot displays the 'Bonding Calculator -- Version: 2.4.8' window. The main title is 'Reclamation Estimate Summary for Mine Projects'. The interface includes a menu bar (File, Databases, Tools, Help) and a tabbed interface with 'Reclamation Estimate for Mine' selected. The summary table is as follows:

Item	Description	Value	Notes
1.	Total Facility and Structure Removal Cost	R 0.00	
2.	Total Earthmoving Costs:	R 215,293.49	
3.	Total Revegetation Cost	R 0.00	
4.	Total Other Reclamation Cost:	R 0.00	
5.	Total -- Direct Cost:	R 215,293.49	
6.	Inflated Direct Cost: item 5 X 1.130 Inflation factor	R 243,281.64	
7.	Mobilization and Demobilization at 6 % of item 6 (1% to 10%)	R 12,164.08	<input type="checkbox"/> Override
8.	Contingencies at 4 % of item 6 (3% to 5%)	R 9,731.27	<input type="checkbox"/> Override
9.	Engineering Redesign Fee at 4.25 % of item 6	R 10,339.47	<input type="checkbox"/> Override
10.	Contractor profit and overhead at 27 % of item 6	R 65,686.04	<input type="checkbox"/> Override
11.	Project management fee at 5.25 % of item 6	R 12,772.29	<input type="checkbox"/> Override
12.	Total -- Indirect Cost:	R 110,693.15	
13.	Total Cost:	R 353,974.79	

Buttons at the bottom include 'Post' and 'Re-calculate After a Change'. The status bar at the bottom left reads 'Mine/Project: Haulback Example'.

Figure 1: OSM Bond Calculator screenshot

3.1.2 Colorado

The legislation in Colorado, **Rules And Regulations Of The Colorado Mined Land Reclamation Board Pursuant To The Colorado Surface Coal Mining Reclamation Act**, is informed by the OSM regulations, and reads as follows:

3.02.2 Determination of Bond Amount

- (1) The amount of the bond shall be sufficient to assure the completion of the reclamation plan if the work had to be performed by the Board, through independent contractors, in the event of forfeiture. The amount required for each bonded area shall depend upon the reclamation requirements of the approved permit and shall reflect the probable difficulty of reclamation, giving consideration to such factors as topography, geology of the site, hydrology, and revegetation potential. The amount of the performance bond shall be determined by the Division as part of the decision on permit approval as described in 2.07 and shall be subject to review by the Board as described in 2.07 (113(1), 113(1) and 114).
- (2) In order to assure sufficiency, the amount shall be based on, but not be limited to:
 - (a) The estimated costs submitted by the applicant in accordance with 2.05.4 (113(1)).
 - (b) The additional estimated costs to the Board which may arise from applicable public contracting requirements or the need to bring personnel and equipment to the permit area after its abandonment by the permittee to complete the reclamation plan (113(1)).
 - (c) All additional estimated costs necessary, expedient, and incident to the satisfactory completion of the requirements identified in 3.02 (113(1)).
 - (d) Such other cost information as may be required by or available to the Division (113(1)).
- (3) In no case shall the bond for the entire area under one permit be less than \$10,000 (113(1)).
- (4) The amount of the performance bond required shall be adjusted for good cause as affected land acreages are increased or decreased or when the cost of future reclamation changes including the cost of abating any violation for which a notice of violation has been issued. The Division shall review the amount of bond required for a permit area and the terms of acceptance of the bond at the time permit reviews are conducted under 2.08.3 or every two and one-half years, whichever is more frequent. The procedures for any adjustment shall include (113(5)):
 - (a) Notification of the permittee of any proposed bond adjustment and provide the permittee with an opportunity for an informal conference on the adjustment;

- (b) Issuance of a written proposed decision by the Division to adjust the bond amount, publication of notice of the proposed decision in a newspaper of general circulation in the locality of the mining operation once a week for two weeks following issuance of the decision, and notification of the permittee, the surety and any person with a property interest in the collateral who has requested notification;
 - (c) An opportunity for a formal hearing pursuant to Rule 2.07.4(3);
- (5) A permittee may request reduction of the required performance bond amount upon submission of evidence to the Division proving to the Division that the permittee's method of operation or other circumstances will reduce the maximum estimated cost to the Division to complete the reclamation responsibilities and therefore warrant a reduction of the bond amount. The request and demonstration shall be in the form of a permit revision application, or technical revision application, as appropriate. Bond adjustments which involve undisturbed land or revision of the cost estimate of reclamation are not considered bond release subject to procedures of 3.03.
- (6) The amount of bond, as determined under this Rule and as adjusted from time to time, is an estimate of the cost of completing the relevant reclamation plan. It does not operate to any extent as a limitation upon the obligation of the permittee to complete the reclamation plan, the cost of which may exceed or be less than the amount of bond.

The handbook would clearly be applied here, given that the Colorado State Legislation is the same as the Federal Surface Mining Control and Reclamation Act.

3.2 Canada

3.2.1 Ontario

The **Mining Act R.S.O. 1990, Chapter M.14** deals with the issue of financial provision for rehabilitation in Ontario, one of the primary mining provinces in Canada. This is specified in Section 145 of the Act:

Form and amount of financial assurance

145. (1) The financial assurance required as part of a closure plan shall be in one of the following forms and shall be in the amount specified in the closure plan filed with the Director or any amendment to it:

1. Cash.
2. A letter of credit from a bank named in Schedule I to the Bank Act (Canada).
3. A bond of an insurer licensed under the Insurance Act to write surety and fidelity insurance.
4. A mining reclamation trust as defined in the Income Tax Act (Canada).
5. Compliance with a corporate financial test in the prescribed manner.

- | | |
|---|--|
| 6. Any other form of security or protection, including a pledge of royalties per tonne, that is acceptable to the Director. | any other guarantee or assets, a sinking fund or |
|---|--|

The closure plan is defined as:

...a plan to rehabilitate a site or mine hazard that has been prepared in the prescribed manner and filed in accordance with this Act and that includes provision in the prescribed manner of financial assurance to the Crown for the performance of the closure plan requirements.

The closure plan must specify the form and amount of the financial assurance to be provided by the proponent in respect of the project. The Director will return the closure plan for re-filing should it not sufficiently address all of the prescribed reporting requirements for a certified closure plan. Clause (5) above is expanded upon in the relevant regulations, Ontario Regulation 240/00. If a company has at least two of the following ratings:

1. A (low) from the Dominion Bond Rating Service Limited.
2. A3 from Moody's Investors Services Inc.
3. A- from Standard and Poor's Inc.

then it is considered to comply with the corporate financial test for the entire life of the mine, and does not have to make a physical provision, provided that it identifies how it will make a provision in the event that it loses its rating status or ceases operation of the mine. Slightly lower ratings allow exemption from physical provision for the first half of the life of the mine.

3.2.2 British Colombia

Section 10 of the British Colombia **The Mines Act, R.S.B.C. 1996**, specifies that, before commencement of any work in, on or about a mine, the owner, agent or manager must apply for and obtain a permit from the chief inspector and must, as part of the application, file with the district inspector a plan outlining the details of the proposed work and a program for the protection and reclamation of the land and watercourses affected by the mine, including the information, particulars and maps established by the regulations or the code. If the chief inspector considers the application for a permit is satisfactory, the chief inspector may issue the permit, and the permit may contain conditions that the chief inspector considers necessary.

Sections 10(4) and 10(5) then discuss financial provisions:

- (4) The chief inspector may, as a condition of issuing a permit under subsection (3), require that the owner, agent or manager give security in the amount, form and subject to conditions specified by the chief inspector
 - (a) for mine reclamation, and
 - (b) to provide for protection of, and mitigation of damage to, watercourses affected by the mine.

- (5) If required by the chief inspector, the owner, agent or manager, in each year, must deposit security in an amount and form satisfactory to the chief inspector so that, together with the deposit under subsection (4) and calculated over the estimated life of the mine, there will be money necessary to perform and carry out properly
- (a) all the conditions of the permit relating to the matters referred to in subsection (4) at the proper time, and
 - (b) all the orders and directions of the chief inspector or an inspector respecting the fulfillment of the conditions relating to the matters referred to in subsection (4).

In terms of Section 12, a fund known as the Mine Reclamation Fund was established, into which is paid security in the form of money, given by the owners, agents or managers of mines under section 10. Such money is credited to a separate account in the fund in the name of the mine. The Minister has the power to requisition money from this fund to pay for the cost of reclamation work, or refund the payer if rehabilitation work has been performed. Mines are also required to submit an annual reclamation report, which outlines reclamation work and research undertaken in the previous year, and reclamation plans for the following five years. The amount of security to be posted is equivalent to the total expected costs of outstanding reclamation obligations over the planned life of the mine and must fully secure all outstanding liabilities related to protection and reclamation of lands and watercourses affected by the mine.

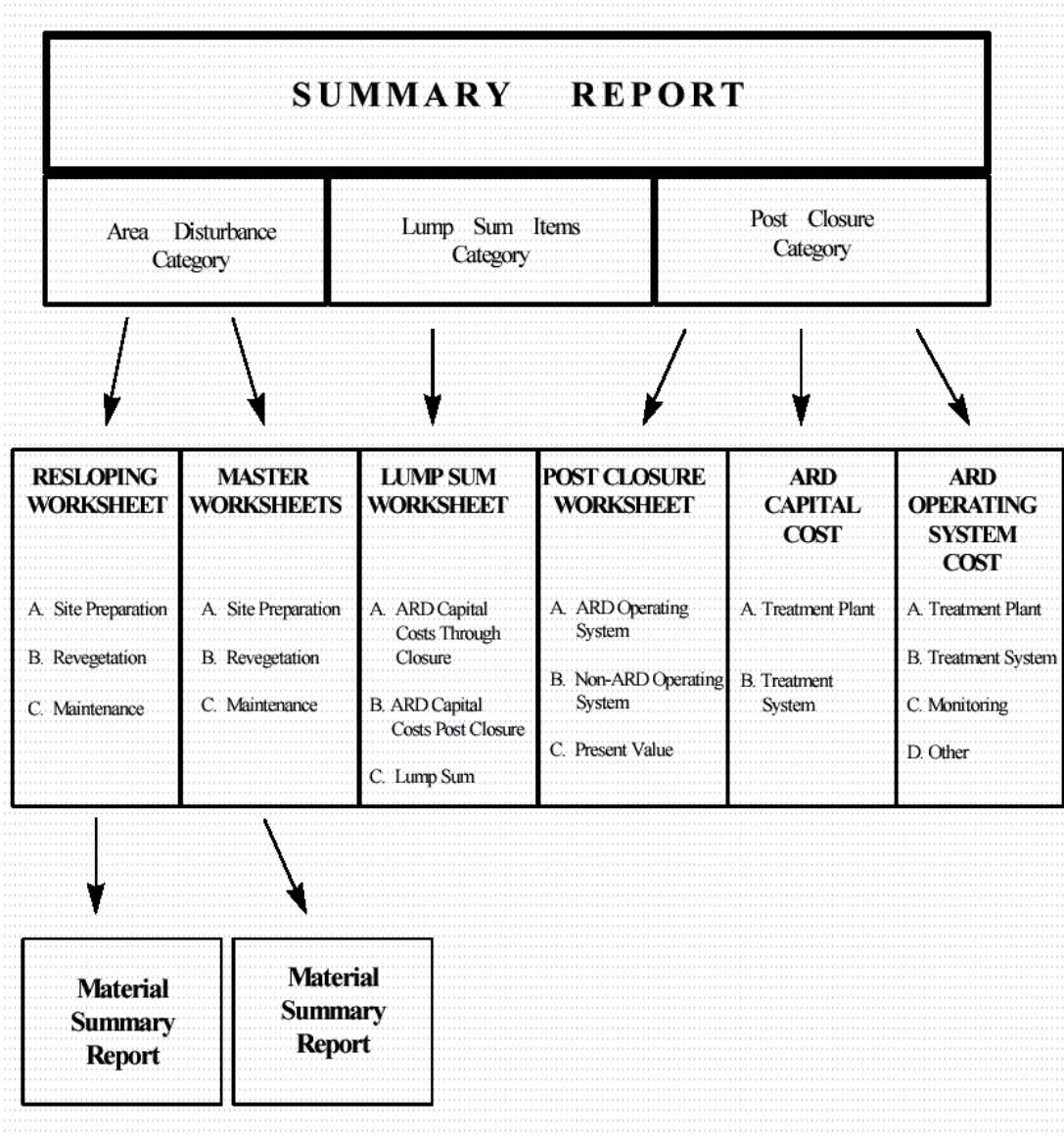
The policy on Reclamation Security Performance Bonds requires “hard” security, defined as cash, irrevocable letter of credit or State (or Province-guaranteed) securities to be posted to cover the next five-year period of expected post-closure costs and periodic capital replacement costs. These costs relate to the operation of a water collection and treatment facility and for the management and disposal of associated secondary wastes, and/or expected post-closure site monitoring and maintenance costs including, but not limited to, dam inspections, maintenance of water diversion structures, waste material monitoring, water quality monitoring and vegetation sampling. The residual amount of the outstanding liability may be covered by a performance bond provided by an approved bonding company.

The methodology focuses on three basic mine activity categories, namely:

- Area Disturbance (all costs which can be estimated on a \$/ha basis)
- Lump Sum Items
- Post Closure Costs

The methodology is shown graphically in **Figure 2** overleaf.

Figure 2: Reclamation Cost Estimating Workbook



3.2.3 Yukon

The Yukon province has two separate Acts governing mining: the Placer Mining Act and the Quartz Mining Act, with their associated regulations. Although they cover different types of mining, they are sufficiently similar to consider only the Placer Mining Act in this report.

In the Yukon, no one may engage in Placer Mining other than in accordance with an operating plan approved by the Chief of Placer Land Use. Section 106 of the Placer Mining Act discusses security:

Security may be required

106(1) Where there is a risk of significant adverse environmental effect from a planned Class 2, Class 3 or Class 4 placer land use operation, the person giving the Class 2 Notification, the applicant for approval of an operating plan, the holder of an approved operating plan, or the prospective assignee of an approved operating plan,

as the case may be, may be required by the Chief to furnish and maintain security with the Minister, in an amount specified in, or determined in accordance with, the regulations made under paragraph 116(m) and in a form prescribed by or pursuant to those regulations or a form satisfactory to the Minister.

The associated Placer Mining Land Use Regulation describes the requirements for the operating plan and approval process. Once again, the plan, including details on reclamation work and costing, is drawn up by the applicant, and approved (or rejected) by the regulator.

3.2.4 Newfoundland and Labrador

The legislation in this province is rather brief. In terms of section 9 of the Mining Act, the lessee of a mining site must submit to the Minister a rehabilitation and closure plan setting out the measures the lessee proposes to take to progressively rehabilitate a site and upon closure of a project. The plan is accepted at the discretion of the Minister. Section 10 specifies that financial assurance is required, and that:

...as part of a rehabilitation and closure plan, a lessee shall provide a copy of a statement of a person qualified to make it that the estimate of the cost of completing the work set out in the rehabilitation and closure plan is a reasonable one.

This therefore relies upon the professional judgement and integrity of the person making the pronouncement.

Section 8 of the associated regulations further specify:

Financial assurance

8. (1) Financial assurance shall be based on the rehabilitation and closure plan.
- (2) The financial assurance proposal shall be included with the development plan and the rehabilitation and closure plan, and shall include costs for ongoing monitoring and site maintenance.

3.2.5 Northwest Territories

The Northwest Territories is administered by the federal government, and is subject to federal legislation. The Northwest Territories utilise a spreadsheet called RECLAIM, a product of Brodie Consulting Ltd. This model uses detailed estimates of costs in the following categories:

- Underground/Open Pit Mine
- Tailings
- Buildings And Equipment
- Project Management
- Engineering
- Contingency

- Chemicals And Soil Management
- Water Management
- Mobilization/Demobilization
- Post-Closure One-Time-Only Costs
- Landfill Tipping Fees
- Post-Closure Monitoring
- Post-Closure Water Treatment
- Post-Closure Contingency 10%
- Total - Annual Ongoing Costs

to calculate the total exposure over the lifetime of the project.

3.3 Australia

In Australia, each State has its own mining legislation, environmental protection legislation and regulatory bodies.

3.3.1 Queensland

The Environmental Protection and Other Legislation Amendment Act 2000 (EPOLA) was created to transfer the environmental regulation of mining from the DME to the EPA. Hence, provisions in the Mineral Resources Act 1989 relating to environmental management of mines were transferred, with amendments, to the Environmental Protection Act 1994 (EP Act).

The EPA requires the holder of an environmental authority (granted to entities conducting mining activities) to lodge or amend the required amount of financial assurance and the EPA may discharge and use a financial assurance under **sections 364-367 of the EP Act**. Section 364 states:

364 When financial assurance may be required

- (1) The administering authority may, by condition of an environmental authority, other than a level 1 or 2 approval, or approval of an environmental management program or site management plan, require the holder of the environmental authority or approval to give the administering authority financial assurance as security for—
 - (a) compliance with the environmental authority, environmental management program or site management plan and any conditions of the authority, program or plan; and
 - (b) costs or expenses, or likely costs or expenses, mentioned in section 367.
- (2) However, the administering authority may impose a condition requiring a financial assurance to be given only if it is satisfied the condition is justified having regard to—
 - (a) for an environmental authority, other than a level 1 or 2 approval, or an approval of an environmental management program—
 - (i) the degree of risk of environmental harm being caused, or that might reasonably be expected to be caused, by the

- activity carried out, or to be carried out, under the environmental authority or program; and
- (ii) the likelihood of action being required to rehabilitate or restore and protect the environment because of environmental harm being caused by the activity; and
- (iii) the environmental record of the holder; and
- (b) for an approval of a site management plan—
- (i) the degree of risk of serious environmental harm being caused as a result of the hazardous contaminant contaminating the land; and
- (ii) the likelihood of action being required to rehabilitate or restore the land because of serious environmental harm being caused by the hazardous contaminant; and
- (iii) the environmental record of the holder.
- (3) The administering authority must decide the form and amount of the financial assurance.
- (4) However, the administering authority must not require financial assurance of an amount more than the amount that, in the authority's opinion, represents the total of likely costs and expenses that may be incurred taking action to rehabilitate or restore and protect the environment because of environmental harm being caused by the activity.
- (5) The administering authority may require a financial assurance to remain in force until it is satisfied no claim is likely to be made on the assurance.

The Department of Natural Resources & Mines (NRM) administers financial assurance on behalf of the Queensland State Government, while the level of financial assurance is determined by the EPA.

The amount of financial assurance may be reviewed at any time, but should be reviewed when amending or replacing:

- the plan of operations and/or environmental authority for mining projects (EP Act s234(2)); or
- the environmental management plan and/or environmental authority for non-standard exploration or mineral development projects (EP Act s253); or
- the environmental authority for standard exploration or mineral development projects (EP Act s242); or when assessing:
 - the final rehabilitation report and application for surrender; or
 - an environmental management program (EP Act s367(1)(a)); or
- a site management plan (EP Act s367(1)(b)).

In determining the quantum of financial assurance, distinction is made between:

- i. Standard Exploration and Mineral Development projects; and
- ii. Non-standard Exploration and Mineral Development projects and Mining Lease projects.

In the case of (i), **the quantum is dependent upon the area of the project and the perceived risk**, shown in the following table:

Total area of disturbance	Low risk: Simple straight forward rehabilitation or Successful rehabilitation of analogous sites has previously been achieved.	High risk: Difficult rehabilitation eg dispersive soils, steep topography, remoteness, sensitive areas etc.
Less than 1 hectare	\$2,500	\$5,000
1 to 4 hectares	\$10,000	\$20,000
4 to 10 hectares	\$20,000	\$40,000

Table 1: Financial assurance for standard exploration and mineral development projects in Queensland

In the case of (ii), **the amount is calculated on a project-specific basis**, based on the estimates for the work to be completed by third party contractors, ensuring that the total cost of rehabilitation is specific to the site and is a realistic estimate of the cost expected to be incurred by the government should it be required to rehabilitate the mine site. Estimates must cover the full extent of work necessary to meet EPA standards. The estimates are based on the schedules of disturbance and rehabilitation contained in the environmental management plan for non-standard exploration and mineral development projects; or the plan of operations, accompanied by an audit statement for mining lease projects.

The main components of the schedule of disturbance and rehabilitation that contribute to the annual rehabilitation costs are:

- **The total rehabilitation cost** - which is the sum of the rehabilitation costs **[R]** for each type of disturbance (such as infrastructure, tailings, pit) and

partly rehabilitated areas for each year. The costs are calculated using the formula below and:

- the unit rehabilitation cost **[C]**, ie. the cost per unit area to complete rehabilitation for each type of disturbed or partially rehabilitated area; and
- an estimation for each year of the area **[A]** of each type of disturbance and areas proposed to be, or currently partly rehabilitated:

Rehabilitation Cost [R] = Unit Area [A]

Rehabilitation Cost [C] x Disturbed

- If the project produces hazardous contaminants or includes notifiable activities (in relation to contaminated land), the cost of completing a site investigation report to verify that the conditions of the environmental authority have been met must be included
- **Contingency** - a rate of 10 percent of the total rehabilitation cost is to be applied
- **CPI** is incorporated into the estimate of financial assurance to cover inflation where the term of the EM Plan or plan of operations exceeds one year. Financial assurance calculations for future years are increased to cover inflation.
- Goods and services tax (**GST**) where applicable.
- **Maintenance and monitoring costs** - calculated from the rates shown in the following table:

<i>Mining activity</i>	<i>Maintenance and monitoring rates</i>
non-standard ML	2% of total rehabilitation cost
non-standard EP, MDL	10% of total rehabilitation cost
standard ML	10% of total rehabilitation cost

Table 2: Maintenance and monitoring costs as a percentage of total rehabilitation costs

The annual rehabilitation cost includes the components as described above. The amount of financial assurance required is equal to the maximum annual rehabilitation cost within the period covered by the EM Plan or the plan of operations.

For mining lease projects, an economic incentive for progressive improvement of environmental performance is provided through the **performance discount system**, shown in Table 3. The level of discount is determined by evaluating the

environmental performance of a company against specific criteria, which is shown in the following table. To be eligible to move to a category that provides a greater discount, evidence must be provided to demonstrate that all criteria in that category, and the preceding categories have been met. The percentage of the full rehabilitation cost required in each category ranges from 100% (in the case of basic requirements only in place) to 25% for a full ISO14000 EMS plan and implementation.

Category/ % Security required	Performance criteria
<i>Basic operational requirements in place</i>	

5 (100%)	Code of environmental compliance (CoEC) approved Plan of Operations (PoO) approved Landholder and Native Title agreements in place Other relevant licences and permits applied for.
Ability to Comply 4 (90%)	Timeframe for operations submitted Machinery and labour available listed Proof of financial capability submitted Rehabilitation targets set Water management system in place Monitoring systems in place.
Satisfactory performance for two years 3 (70%)	Full compliance with CoEC and environmental authority for the previous two years demonstrated by audit statement Rehabilitation targets met.
Satisfactory performance for five years 2 (40%)	Full compliance with CoEC and environmental authority for the previous five years as demonstrated by audit statement Rehabilitation targets met.
Environmental Management System (EMS) 1 (25%)	EMS based on ISO 14000 approved Implementation of EMS demonstrated by audit.

Table 3: Categories of compliance and performance bond

3.3.2 Western Australia

In Western Australia, mining is regulated by the Department of Industry and Resources, with environmental issues guided by the EPA. The relevant legislation is the Mining Act of 1978, the Environmental Protection Act of 1986 and the national Environmental Protection and Biodiversity Conservation Act 1999. The legislation is not readily available on the Internet.

A description of the legislation pertaining to financial provision for rehabilitation and the methods used to calculate the provision are contained in Western Australia Department of Minerals and Energy (DME) publications titled "Guidelines to Help You Get Environmental Approval for Mining Projects in Western Australia" and "Guidelines for the Preparation of an Annual Environmental Report".

New mining projects require the submission of a Notice of Intent (NOI), which is defined as "a plan of the proposed operations and measures to safeguard the environment". In the NOI the proponent assesses the environmental impacts that may arise from the project, determines which are significant and then describes in detail how the company will manage and/or lessen these impacts. In effect, this NOI

required under the Mining Act is a comprehensive environmental management document embodying all aspects of environmental risk and impact assessment, and environmental planning and management associated with the proposed mining project.

For existing mining operations, the production of an Annual Environmental Report (AER) is a requirement for all mining projects conducted under the Mining Act with an anticipated life-span in excess of 2 years and a condition on the relevant tenements.

The object of the AER is to concisely document the major mining, environmental management and rehabilitation activities for the reporting year and proposed activities for the following year. After submission of the AER, the DME will conduct a site visit in order to carry out an Environmental Performance Review of the operation and re-assess the bond amount current on the site.

The original assessment of the quantum of the environmental performance bond is based simply on the area being disturbed. The bond will be set at a level that reflects the estimated work needed on the tenement in question but will **generally be based on a sliding scale of \$5,000 per hectare for sites with low mobilisation costs and \$15,000 per hectare for more remote areas**. The Bond will cover all land required to be rehabilitated which will normally include waste dumps, tailings disposal facilities, stockpile areas, backfilled pits, hardstand areas, plant sites, haulroads, airstrips, accommodation areas and the safety zone around any abandoned open pit. Open pit floors and walls will not normally be included as land required to be rehabilitated. Where operations are expected to progressively expand over the life of the project, the initial bond will be estimated on the basis of the area of land that will be disturbed in the first year of operation and require rehabilitation. The bonds placed on operations will be reviewed annually and increased or decreased on the basis of the potential rehabilitation work that can be reasonably expected to be needed. This process is designed to encourage progressive rehabilitation. Retirement of the bond will be considered only when the tenement holder has submitted a compliance audit to the Department for assessment. The audit should detail which conditions have been complied with and whether all commitments in the NOI have been carried out. Partial bond release may be recommended if the majority of the rehabilitation earthworks has been completed.

3.4 Chile

A paper titled "Research on Mine Closure Policy" by the International Institute for Environment and Development gives a brief description of the situation in Chile. Other information on the Chilean Government websites is only available in Spanish.

Currently, there is no comprehensive mine closure legislation in Chile. There are several Acts that deal one way or another with the issue of mine closure. Among these pieces of legislation special consideration should be given to the Framework Law for the Environment and its by-laws on Environmental Impact Evaluation. The

system of environmental impact assessment establishes that mining projects should include a reference to mine closure within their Environmental Impact Studies. The requirements are not specific, however, and there is no established system to properly control the execution of the commitments made by the mining operator in the Environmental Impact Study. The Chilean Government is currently engaged in a process that would see different aspects of the mine-closure procedures in order to create a more holistic set of rules and regulations for the mine industry.

4 SUMMARY OF**METHODOLOGIES**

Table 4 provides a summary of the various methodologies used in the counties included in this review to calculate the quantum for financial provisions.

Country	State	Description of methodology
United States of America	Federal/Colorado	Uses information from the reclamation and operational plans to estimate direct reclamation costs such as earthmoving, revegetation, and the demolition and removal of structures not to be retained, and indirect costs such as mobilisation/demobilisation costs, contingency allowances, redesign expenses and contract management fees. A bond calculation software program is available. Incremental, cumulative and phased bonds are provided for.
Canada	Ontario	Submission and annual revision of a closure plan, subject to approval by the Minister according to prescribed reporting requirements. Financial provision is part of the closure plan. Physical provision may be waived for companies with a strong credit rating.
	British Columbia	Application for a mining permit contains a plan outlining the details of the proposed work and a program for the protection and reclamation of the land and watercourses affected by the mine. Methodology according to a workbook, based on Area Disturbance (estimated on a \$/ha basis), Lump Sum Items and Post Closure Costs. Spreadsheet provided.
	Yukon	Quantum based on operating plan which contains details of reclamation work and costing, drawn up by the applicant.
	Newfoundland and Labrador	Estimates of the cost of completing rehabilitation work, produced by qualified persons, are part of a rehabilitation and closure plan.
	Northern Districts	Detailed spreadsheet called RECLAIM calculates costs. Major categories are mine type, Tailings, Buildings & Equipment, Chemicals & Soil Management, Water Management, Mobilization/ Demobilization, Post-Closure One-Time-Only Costs, Landfill Tipping Fees, Project Management, Engineering, Contingency, Post-Closure Monitoring, Post-Closure Water Treatment, Post-Closure Contingency 10%, Total - Annual Ongoing Costs
Australia	Queensland	Flat rate based on area and risk for exploration activities. For mining activities, based on unit cost per area for different types of disturbance multiplied by the area disturbed. Performance incentives for categories of environmental planning and compliance.
	Western Australia	Based on a sliding scale of \$5,000 per hectare for sites with low mobilisation costs and \$15,000 per hectare for more remote areas. Annual review encourages progressive rehabilitation.

Table 4: Summary of methodologies used

5 REFERENCES**US Department of the Interior: Office of Surface Mining:**

Overview: Reclamation Bonds for Coal Mining Operations

<http://www.osmre.gov/bonding.htm>

All Bonding Information:

<http://www.osmre.gov/bondingindex.htm>

Handbook for Calculation of Reclamation Bond Amounts:

<http://www.osmre.gov/directives/directive882a.pdf>

Colorado:

Rules And Regulations Of The Colorado Mined Land Reclamation Board Pursuant To The Colorado Surface Coal Mining Reclamation Act:

<http://www.mining.state.co.us/rulesregs/Coal%20Regulation%206%2026%2002.pdf>

Ontario:

Ontario Mining Act R.S.O. 1990, CHAPTER M.14:

http://www.e-laws.gov.on.ca/DBLaws/Statutes/English/90m14_e.htm

Ontario Regulation 240/00: Mine Development And Closure Under Part Vii Of The Act:

http://www.e-laws.gov.on.ca/DBLaws/Regs/English/000240_e.htm

British Columbia:

The Mines Act:

http://www.qp.gov.bc.ca/statreg/stat/M/96293_01.htm

Reclamation Security Policy Performance Bonds:

<http://www.em.gov.bc.ca/mining/MinePer/PerformanceBondsPolicy/Default.htm>

Reclamation Liability Cost Estimates:

http://www.em.gov.bc.ca/mining/MinePer/Annual_Report_Format/reclamation_liability_cost_estim.htm

Annual Reclamation Report Requirements:

http://www.em.gov.bc.ca/Mining/MinePer/Annual_Report_Format/annual_report_requirements.htm

Yukon:

The Placer Mining Act:

<http://www.gov.yk.ca/legislation/placerminingact/placerminingact.pdf>

Placer Mining Land Use Regulation:

http://www.gov.yk.ca/legislation/placerminingact/oic2003_059.pdf

Newfoundland and Labrador:

Mining Act:

<http://www.gov.nl.ca/HOA/statutes/m15-1.htm>

Mining Regulation

<http://www.gov.nl.ca/HOA/regulations/rc000042.htm>

Queensland:

Environmental Protection Act 1994:

<http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/E/EnvProtA94.pdf>

Queensland EPA: GUIDELINE 17 - Financial assurance for mining activities:

<http://www.epa.qld.gov.au/register/p00447aa.pdf>

Queensland EPA: Fact sheet 10 - Financial assurance:

<http://www.epa.qld.gov.au/register/p00322aa.pdf>

Western Australia:

Government of Western Australia – Department of Minerals and Energy: “*Guidelines to Help You Get Environmental Approval for Mining Projects in Western Australia*”, March 1998

Guidelines for the Preparation of an Annual Environmental Report:

http://www.doir.wa.gov.au/prodserv/pub/pdfs/aer_report.pdf

International Institute for Environment and Development: “*Research on Mine Closure Policy*” January 2002