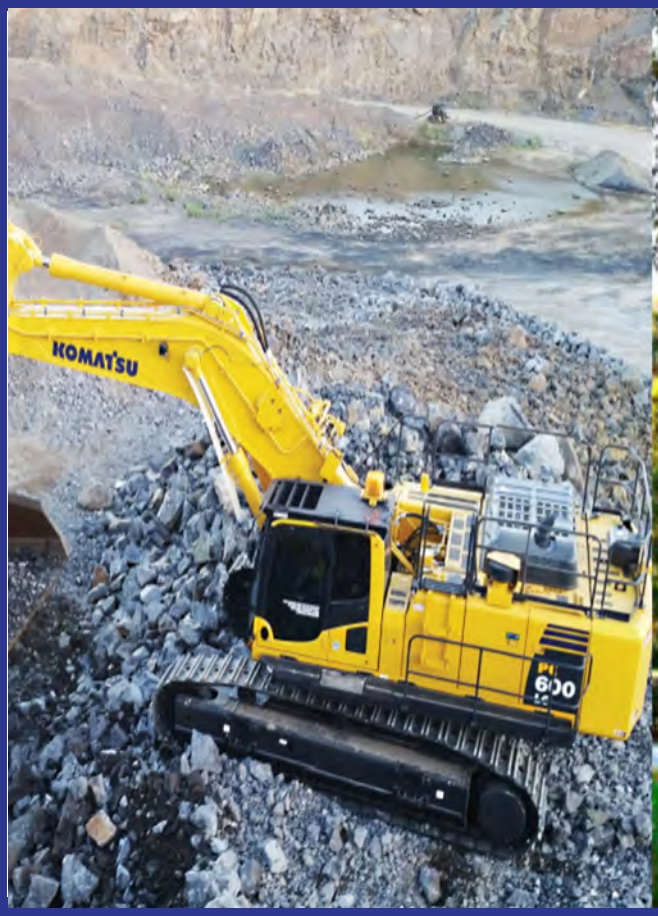
CMPA REHABILITATION PROJECT

REVIEW OF REHABILITATION AND BOND FRAMEWORK FOR QUARRIES IN VICTORIA

MARCH 2022



CMPA

A REPORT PREPARED FOR THE CONSTRUCTION MATERIAL PROCESSORS ASSOCIATION BY EHS SUPPORT

Review of Rehabilitation and Bond Framework for Quarries in Victoria

Prepared for:

Construction Materials Processors Association

Prepared by:

EHS Support

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Client	Construction Materials Processors Association
Client Contact	Dr. Elizabeth Gibson
Project Number	AUS##C03566_2021
Project Manager	Phillip Wilkinson
Technical Director	Kevin Simpson

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Title	Review of Rehabilitation Regulation and Bonds for Quarrying Industry in Victoria
Main Author(s)	Phillip Wilkinson, Kevin Simpson, Matt Russ
Approved By	Kevin Simpson

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Acronyms

CBD	Central Business District
CMPA	Construction Materials Processors Association
CPI	Consumer Price Index
DELWP	Department of Environment, Land, Water and Planning
DES	Department of Environment and Science
DJPR	Department of Jobs, Precincts and Regions
DMIRS	Department of Mines, Industry Regulation and Safety
DNRE	Department of Natural Resources and Environment
EPA	Environment Protection Authority
ERR	Earth Resources Regulation
FPSO	Floating Production Storage and Offtake
IAS	International Accounting Standard
JORC	Joint Ore Reserves Committee
JORC Code	Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves ('the JORC Code').
KDC	Kimberley Diamond Company
km	kilometres
m	metres
ML	Mining Licence
MR(SD)	Mineral Resources (Sustainable Development)
MRSDA	Mineral Resources (Sustainable Development) Act 1990
MRSDEI	Mineral Resources (Sustainable Development)(Extractive Industries)
MRSDMI	Mineral Resources (Sustainable Development)(Mineral Industries)
NOGA	Northern Oil and Gas Australia
NT	Northern Territory
PWC	Price Waterhouse Coopers
QTC	Queensland Treasury Corporation
SA	South Australia
TSOGA	Timor Sea Oil and Gas Australia Pty Ltd
UPS	Upstream Production Solutions Pty Ltd
VAGO	Victorian Auditor Generals' Office
WA	Work Authority

Executive Summary

EHS Support was commissioned by the Construction Materials Processors Association (CMPA) to undertake a review of the rehabilitation and bonding framework for quarries in Victoria.

In summary, the current bond system does not acknowledge that the risk of Government expending significant funds to rehabilitate a quarry site is low. This is because regulation to ensure operational compliance is comprehensive; the ownership of quarried land is most often by private entities with ties to the community and responsibility to rehabilitate; quarry operators have a long history of sound operation in Victoria also with ties to the community; the value of the remaining resource would often mean a new operator would take over a quarry if the current operator was struggling or wanted to exit the industry; and the value of the land in Victoria is high and often the quarried features (e.g. steep walls) add appeal / value that is higher than if the land were returned to grade. The assertion of low risk is supported by the absence of defaults in the quarry industry of Victoria. The increasing costs of regulation and bonds and the financial burden associated with holding security are challenging the viability of some operators and their exit would have negative impacts for the community and State. This report recommends practical and relatively simple steps that can be taken to reduce the burden on quarry operators that will improve financial viability without increasing the risk to the State.

To identify challenges and opportunities associated with the rehabilitation and bonding framework in Victoria, EHS Support undertook a literature review and stakeholder interviews to build a picture of the evolution of the current framework and its administration.

The quarrying industry has a long and proud history providing construction materials to build the City of Melbourne and the State of Victoria. The industry contributes materially to the economy of the State providing significant employment, support to downstream business, and royalty payments to the State and land owners.

The need to rehabilitate quarries and the use of rehabilitation bonds to cover any liability for the State have been a long-term requirement of the legislative framework in Victoria. Generally, EHS Support finds the current regulatory system consistent with those in other jurisdictions and appropriate in terms of reach and what is regulated. Rather, the issues for the industry are the uncertainty associated with long review times and inadequate feedback from the regulator and misuse of the bond calculator.

Anecdotally, these issues are linked to a lack of resources in the regulatory department (Earth Resources Regulation, ERR), high assessment officer turn-over, a move away from experienced inspectors who knew the site and operators, the split of the assessment and compliance functions within ERR, and the use of tools such as Google Earth™ to evaluate disturbance quantities rather than site visits. Based on prior experience, lack of familiarity with the relevant industry leads to risk-averse administrative decision-making and an increasing burden of proof on operators.

The costs associated with regulation and providing bonds have increased for the quarrying industry over the last few decades and are likely to further increase with the new bond calculator and current view of the industry and bond amounts by the regulator. Cost increases challenge the viability of small operators, directly impacting the State. With smaller operators generally being regional, their loss will drive up transport and raw material costs as transport distances to support regional campaigns and developments will increase. The impacts extend beyond direct cost with impacts to

local supply chains (some of which exist only to service the quarry industry), and increased travel distance leading to increased accident risk, wear on infrastructure, and greenhouse gas emissions all of which have indirect costs.

A review of the bond calculator indicates the architecture would benefit from simplification to reduce the risk of error and the burden on the user. Based on the experience of specialist practitioners and bottom-up, first principles calculations undertaken for other calculators, some of the rates are higher than would be realised in practice. These rates should be reviewed and reduced.

A bond estimate should not allow for events that are unknown and that have at least as much chance if not more likelihood of not occurring. There is evidence that such instances are finding their way into bond calculations inflating amounts and resulting in an inaccurate estimate of the true rehabilitation liability. At least one example was found for this report whereby a bond amount has increased over 4000% and the operator confirms they have rehabilitated a similar site for an order of magnitude lower cost.

Rehabilitation bond calculation for quarries in Victoria fails to account for the inherent value of the resource. Where quarries are early in their development with large quantities of certified remaining resources, the value of the resource and the demand for quarry products, means that should a default occur, it is highly likely another operator would take on the site, significantly limiting any liability for the State.

With the expansion of Melbourne and regional centres, land currently used for quarries is often highly valuable for other uses. Late life quarries have 'airspace', topography changes, and high walls which have already been exploited through Victoria for residential developments; parks, gardens, and reserves; and shopping centres. Such uses often also increase the value of surrounding land.

Rehabilitation of quarried land back to grade is often, and in many cases, definitely not, the best (and thereby most sustainable) use of land for the community and State. Such sustainable outcomes should be reflected in the bond assessment process.

Progressive rehabilitation is beneficial for all reducing the liability on the State by removing potential work to be undertaken in the event of a default and reducing the operator's rehabilitation liability at specific points in time. However, the nature of quarrying is that areas of a site may be made inactive until demand for the product increases again. In such cases, the face will be made safe and stable but not fully rehabilitated. There is a rate in the bond calculator that should be more widely used and recognises that while the land is not fully rehabilitated, work has been done that would reduce the cost to the State if they had to step in.

Considering the mitigating factors discussed in this report, actual rehabilitation liability to the State from the quarrying industry is likely significantly lower than that reported by government. Consequently, the assumption that unrehabilitated sites are a burden to the State is challenged within this report. Further, mining and quarrying are treated in an almost identical fashion in the legislation and in the bond calculator, despite there being clear differences in their risk profiles. Quarrying poses a much lower risk of environmental harm and degradation to land being typically significantly smaller in scale.

While definitive information on the nature and extent of any calls on bonds was not obtained for this report, the VAGO report and anecdotal information from the quarry industry indicates calls on bonds for mining and quarrying are rare (and non-existent for the quarry industry) and more importantly, actual defaults by quarries leading to expenditure by the State on rehabilitation are not evident.

Drawing together the factors which affect the State's exposure EHS Support proposes the

use of a risk filter on the bond calculator. The filter would account for environmental risk, resources remaining, remaining life, potential value of the partially rehabilitated land (e.g. made safe but not necessarily backfilled), and the risk of operator default to deliver a weighting that would then be multiplied by the bond amount to arrive at a risk-weighted bond value more accurately reflecting the State's exposure. A risk score on a scale of 0 to 1 would be applied to each category with those sites where the State's exposure is greatest attracting a multiplier of 1 (meaning that the full estimated rehabilitation liability would be applied). Less exposure risk leads to lower risk-scores. This is a similar approach to the one used by the State to assess its overall contingent liability and broadly aligns with the Queensland approach and its pooled system.

Such a risk-assessment tool will:

- assist the government in better understanding the rehabilitation liability from quarrying with this information used to inform the community; and
- deliver bond valuations that account for the inherent value of the site and resource in a state that is not the final rehabilitated landform.

A broader issue with the bonding system is the form of the bond which is currently a bank guarantee-based. The bond provider requires cash or assets of equal or greater value than the bond. Cash security will be drawn from after-tax earnings or future investment capital. Cash or assets used as securities cannot be drawn on for other purposes and working capital is sterilised. For some (especially smaller operators), this represents a significant barrier to market entry, and for others, it constrains their ability to invest in their operations and may impact their overall viability. Other Australian jurisdictions have chosen to move from a bond system to a pooled fund (either partially or in full) in recognition of the financial and administrative impost of a bank guarantee-based system. EHS Support recommends the implementation of a pooled fund to reduce the financial burden on industry and benefit government through the ability to access pooled funds where defaults occur, rather than just the specific bond for a specific site. It is acknowledged such a move would require legislation change and other recommendations are preferred in the short term. Further, industry would need to be consulted and engaged in any process.

1 Introduction

1.1 Context

The Construction Materials Processors Association (CMPA) represents, advocates, and provides services to its members in the Victorian earth resources industry. The CMPA represents and supports a broad spectrum of businesses that extract and process hard rock, gravel, sand, clay, lime, and soil.

The fundamental objective of bonding (also termed *financial assurance*) is to ensure the financial burden of rehabilitation of resource projects is not borne by the State when a company has not or cannot fulfil its obligations, while not unnecessarily burdening industry.

The CMPA is concerned that the Victorian Government is taking an unnecessarily conservative approach to rehabilitation bonds when there is no evidence of need, and that this may be gradually restricting reasonable access to resources and pushing operators out of the industry. CMPA considers such an approach may impact on the immediate viability and longer-term sustainability of the quarrying industry in Victoria. This has the potential to increase the cost of fundamental economic activities such as building roads and structures.

The CMPA in support of its members has commissioned this review of the Victorian rehabilitation and bonding framework to identify alternate approaches that could ease the financial burden and allow the industry to remain viable and sustainable into the long-term.

This report reviews the nature and extent of rehabilitation required at quarrying sites and the associated government policy and bonding requirements and comments on the suitability to the quarrying industry. This report identifies key issues and challenges and makes recommendations designed to lessen the burden on the quarrying industry and government.

This report was prepared by a team of professionals from EHS Support Pty Ltd (EHS Support), Mike Slight and Associates, and ESA2 Pty Ltd. **Appendix A** provides credentials of the team.

1.2 Definitions

A key argument made in this report is that mining and quarrying present different risks from a rehabilitation viewpoint. The term “extractive” is often used to collectively describe mining and quarrying and sometimes just quarrying.

To avoid confusion, the term *extractive* is avoided in this report unless it is used in a referenced document. This report uses the definitions in the *Mineral Resources (Sustainable Development) Act 1990* (MRSDA). *Mining* means the extraction of minerals from land for the purpose of producing them commercially and includes processing and treating ore. Mining is generally of metal ores (including gold, silver, iron, zinc), coal and mineral sands (e.g. zircon). *Quarrying* means the extraction of stone, or any place or operation involving the removal of stone from land. Quarry materials include construction materials, dimension stone, limestone and dolomite and peat. *Stone* includes:

- sandstone, freestone or other building stone; or
- basalt, granite, limestone or rock of any kind ordinarily used for building, manufacturing or construction purposes; or

- quartz (other than quartz crystals); or
- slate or gravel; or
- clay (other than fine clay, bentonite or kaolin); or
- peat; or
- sand, earth or soil; or
- other similar materials.

Construction material[1] defines all low-cost, raw, consolidated, and unconsolidated rocks and sand extracted in large tonnages and used primarily for construction. Construction materials include hard rock (including igneous, metamorphic, and sedimentary rock) which is blasted, crushed, and screened for use in roads, rail, and cement; rippable rock; natural gravel and sands (including sedimentary rocks, colluvial deposits, pyroclastic deposits, alluvial deposits, residual soils, and calcretes); and construction sands (including well graded fine to coarse grained sands used for paving, packing sands and service sands).

Dimension stone refers to natural rock that is cut to specific dimensions for specific uses. Dimension stone includes bluestone, sandstone, granite, slate, and marble. Dimension stone (particularly bluestone) was commonly in early buildings in Melbourne's Central Business District and continues to be used in the construction industry.

Limestone and dolomite are used in cement manufacturing, road construction, and agricultural applications such as stockfeed and agricultural lime. Other uses include for paper manufacture, production of quicklime and metallurgical flux in steel manufacturing where it removes impurities. Limestone and dolomite are common quarry materials in Victoria.

Peat is commonly used in agricultural applications (e.g. fertiliser and filtering material) as it comprises partially decomposed organic matter making it useful to promote soil aeration and water retention.

Rehabilitation (also termed *restoration*) is defined by the regulator (Earth Resources Regulation (ERR)) as return (of disturbed land) to a safe, stable and sustainable landform with an emphasis on progressive rehabilitation.[2] Rehabilitation is not specifically defined in the MRSDA (see below for discussion), rather *rehabilitation hazard* means any rehabilitation activity and circumstance that may pose a risk to the environment, to any member of the public, or to land, property or infrastructure in the vicinity of the rehabilitation activity. The MRSDA defines *safe, stable and sustainable* as:

a. is not likely to cause injury or illness; and
b. structurally, geotechnically and hydrogeologically sound; and
c. non-polluting; and
d. aligns with the principles of sustainable development

Bonding (also termed *financial assurance*[3]) is a form of security that can be held against a regulatory instrument (a Work Authority) or Licence, to be used in the unlikely event the State has to undertake environmental rehabilitation as a result of a company (a Work Authority holder) defaulting on its rehabilitation obligations. Primary reasons for default are insolvency or withdrawal of consent from the land owner to use the land. A less likely reason is the operator / land owner abandoning the site in an unrehabilitated state at the completion of economic extraction.

[1] From Construction materials - Earth Resources.
[2] https://earthresources.vic.gov.au/legislation-and-regulations/guidelines-and-codes-of-practice/rehabilitation-bonds
[3] Queensland uses the term *financial provisioning* which can lead to confusion as the term is typically reserved for financial reporting requirements under the Corporations Act (which are different in key aspects to financial assurance).

1.3 Scope and Objective

This report provides support to CMPA's advocacy efforts on behalf of the quarrying industry. The specific objectives of the report are to:

1. Demonstrate why the likelihood of default is low for the quarrying industry.
2. Demonstrate that the risk of the State having to expend material amounts to rehabilitate a default site is low.
3. Articulate why the overall exposure to the State from rehabilitation liabilities associated with quarrying is low and why the contingent liability is low or nil.
4. Demonstrate that the risk profile with respect to rehabilitation associated with the quarrying industry is significantly lower than that for mining and that the two industries should not be subject to the same regulation and bonding requirements.
5. Explain why the current surety-based bond system places undue burden on industry, stifles investment, and limits government's access to a reliable and adequate fund.
6. Recommend potential changes to the current bond system to deliver a more efficient and robust process.

To fulfil the objective and deliver this report, the team:

- Undertook interviews and informal discussions with quarry operators, consultants to the quarrying industry, CMPA management and committee members, and representatives from ERR.
- Reviewed reports and materials discussing the bond system in relation to the quarrying industry.
- Reviewed government policy materials and legislation, regulation, and guidance documents.
- Reviewed work undertaken by EHS Support for previous projects including a paper outlining the challenges and opportunities associated with financial assurance / bonding systems around Australia.
- Tested assumptions made to formulate our opinions and sought interim feedback on recommendations.

The team is very grateful to those who gave their time for interviews and comment, to the authors of previous reports referenced herein, and to the CMPA management and committee who provided context without asserting their own opinions on the team.

This report runs to over 70 pages. For time-constrained persons who don't need to know the specific details we recommend reading the Executive Summary and first and last (Summary) section of each Chapter.

2 Background and History of Quarrying in Victoria and Rehabilitation

2.1 History of Mining and Quarrying in Victoria

Quarrying in Victoria commenced well before European settlement, with traditional owner quarries common in Victoria and used to obtain different types of stone such as greenstone, silcrete, quartizite, basalt and chert to make tools and pigments.

The first known quarries to occur following European settlement commenced in the 1830's to 1840's in Fitzroy, Carlton, and Clifton Hill. These quarries supplied bluestone for the development of the Melbourne Central Business District. Quarrying activities expanded to the north and west from the 1850's with quarries in Williamstown, Footscray, Brunswick, and Coburg.

Bluestone was the predominate material quarried due to Victoria's vast Western Volcanic Plain which is rich in basalt. Bluestone sourced from quarries in Footscray was commonly used to construct Melbourne's buildings, including the foundations of Parliament House, Old Treasury Building, Melbourne Town Hall, Saint Paul's Cathedral and Flinders Street Station.

Mining also has an extensive history in Victoria, with the gold rush occurring from the 1850's following discoveries in Clunes and Ballarat. The gold rush continued into the early 1900's with mines across Ballarat and Bendigo and slowed during the first half of the 20th century. With rising gold prices, mining increased into the late 20th century with operations in Stawell, Woods Point and Costerfield. Today significant gold mining occurs in Fosterville, Ballarat, Stawell, and Costerfield. Other materials mined across Victoria include precious base metals (copper, antimony), mineral sands, and coal with extensive operations in the Latrobe Valley which feed Melbourne's electricity grid.

2.2 Current Mining and Quarrying Activity in Victoria

Today, there are over 1,300 mines and quarries at various operating stages across Victoria. Key statistics (DJPR, 2021) include:

- Quarries (Extractives):
  - 848 quarries with a current Work Authority
  - 427 quarries reported production
  - 64 million tonnes of material equating to over $1 billion in sales produced
  - The largest product produced was 'hard rock' including basalt, granite and rhyodacite. Approximately 40 million tonnes of hard rock generated.
- Mining (Minerals):
  - 526 licenses were active (including exploration, mining, prospecting, and retention licences)
  - Gold had the highest production values at just over $1.8 billion followed by antinomy, and industrial minerals[4].

Figure 2-1 shows the location of current quarrying WAs.

[4] The potential contingent liability to the State is discussed in Section 6.3. The number of active or previously active and yet to be rehabilitated sites should form the basis of this evaluation.

Legend – red dots are towns, yellow dots are WA tenements.

Figure 2-1 Location of Current Extractive Industries Work Authorities (sourced from GeoVic)

2.3 Economic and Community Benefits of Quarrying in Victoria

The importance of the earth resources sector for Victoria is highlighted in the following section of the second reading speech for the Mineral Resources (Sustainable Development) Amendment Bill 2013:

> *"The earth resources sector…is a valuable part of the Victorian economy and provides an important source of economic growth and stability, particularly in regional Victoria."* (Rivers Economic Consulting, 2017)

A key component of the construction, building and in many cases manufacturing industries is the supply of competitively priced rock, sand, clay, and gravel products which are essential to produce concrete, cement, bricks, tiles, asphalt, crushed rock products and a host of other applications. Stone is primarily used for construction of roads and buildings and has other uses in engineering and manufacturing (Day, National Competition Policy - Review of the Extractive Industries Development Act 1995, Extractive Industries Regulations 1989 and Extractive Industries Development Regulations 1996, 2001).

The construction materials relied upon by Victorians such as concrete, bricks, asphalt, paving, road base and aggregates are made from stone, sand, clay, and other resources extracted from quarries across Victoria. These raw resources are the foundation of our built environment, contributing to Victoria's economic development, liveability, and the wellbeing of our communities. The quarrying

sector underpins Victoria's $23 billion building and construction industry. Maintaining cost competitiveness for construction is critically important for Victoria's future economic growth. In 2018 it was reported that 535 quarries produce around 50 million tonnes of stone, limestone, sand and gravel each year, generating $786 million at the 'quarry gate' (DJPR, Helping Victoria Grow - Extractive Resources Strategy, 2018).

Royalties paid by the quarrying industry have fluctuated slightly from 2015 – 2020 but have remained about $6 million per annum on a financial year basis. Fluctuations in quarrying royalties are likely due to seasonal and campaign-based demand. To put this into context, industries regulated by ERR (quarrying, gold, other minerals, petroleum, and coal) generated a total of $116 million in royalties in 2020, with coal and gold ahead of quarrying – generating $79 million and $25 million of royalties respectively (DJPR, Earth Resources Regulation 2019-20 Annual Statistical Report, 2020). An important difference between mining and quarrying is that royalties from mining go to the State, whereas royalties from quarrying go to the landholder. It is arguably the case the money paid to landowners is more likely to find its way into the local economy.

The Victorian quarrying industry is characterised by relatively few large operators and many medium and small operations (Day, National Competition Policy - Review of the Extractive Industries Development Act 1995, Extractive Industries Regulations 1989 and Extractive Industries Development Regulations 1996, 2001). Many smaller quarries are based in regional Victoria to satisfy local demand, providing a source of employment and income, as well as reducing the cost of raw materials for projects such as upgrading and maintaining local road networks.

Quarrying remains a relatively small employer based on numbers alone, but in regional areas offers prized employment opportunities. Reports indicate quarrying in Victoria employed around 1,500 people in 2001 (Day, 2001) and about 1,800 people in 2020 (WorkSafe Victoria, 2020). However, these datasets are incomplete. **Figure 2-2** shows the response rate from quarry operators on the query of how many people are employed by their operations. This chart shows that only around half of employers responded indicating the total numbers are under-estimated.

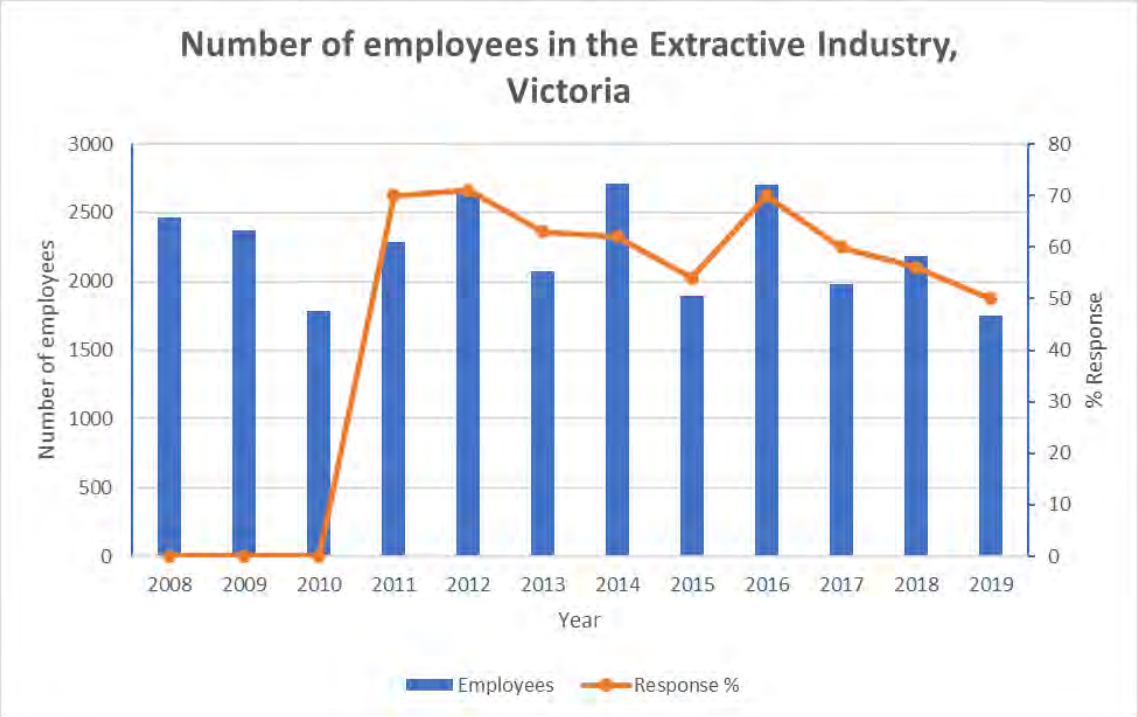


Figure 2-2 Quarrying Employment Numbers

Industry commentary highlights the material and direct impact the quarrying industry has on local economies. Experienced operators with a long history in Victoria indicate that 70% to 80% of money earned by the industry is returned to local economies within 45 days, predominantly through contractor and vendor payments. While a detailed analysis of this is beyond the scope of this report, the assertion seems valid considering the practicalities and necessities of local services and supplies inherent in the industry.

The value of active and rehabilitated quarries is made clear in the Victorian Government's document "The New Lives of Old Quarries – Innovative Development after quarrying ceases" (DJPR, 2022) where this introductory comment is made: " a quarry may be temporary, but it supplies critical materials for our daily lives and the possibility for the future of quarried land is endless".

2.4 Summary

The quarrying industry has a long and proud history providing construction materials to build the city of Melbourne and the State of Victoria. The materials produced by the quarrying industry are widely used in roads, buildings, and agriculture. The industry contributes materially to the State and local economies through significant employment, support to downstream business, and contribution of royalties.

3 Regulatory Framework

Regulation of mining and quarrying in Victoria began with the introduction of the *Extractive Industries Act 1966*. For quarrying, this was repealed and replaced by the *Extractive Industries Development Act 1995* (EID Act) and by the *Mineral Resources (Sustainable Development) Act 1990* (MRSDA) for mining. In 2010 the EID Act was repealed, and the relevant parts (including rehabilitation) rolled into the MRSDA. Currently, the Minister for Resources has portfolio responsibility for Victoria's earth resources sector and the Department of Jobs, Precincts and Regions (DJPR), Earth Resources Regulation (ERR) team administers the MRSDA[5].

ERR is responsible for approving Mining Licences and Work Authorities, authorising Work Plans and Rehabilitation Plans, setting and reviewing rehabilitation bonds, monitoring rehabilitation activities, and returning the bond to the operator post rehabilitation. ERR is the 'lead agency' for regulating mines and quarries and manages referral agencies so that all regulatory objectives can be accommodated (Commissioner for Better Regulation, 2017).

Rehabilitation has always formed part of the legislative framework for mining and quarrying, but with the legislative change over time has come an increased focus on required Work Plan content, rehabilitation, and final land use.

Under the MRSDA, the proponent must hold a Mining Licence (ML) to undertake mining activities or a Work Authority (WA) to undertake quarrying activities. There are minimal differences between the application requirements for MLs and WAs. ML and WA applicants are required to submit a Work Plan in support of their application under sections 40 and 77G of the Act respectively and again there are minimal differences in the requirements for work plans between MLs and WAs. One, notable difference is that because ownership of quarry materials rests with the landholder, landholder consent is required to remove the resource and a commercial agreement between the landholder and operator is required. Importantly, these agreements often contain provisions for rehabilitation.

Small and low-risk quarries[6] are exempt from the Work Plan requirements of the MRSDA but must comply with ERR's Code of Practice for Small Quarries (DPI, 2010), which includes the need to rehabilitate the site post operation and the provision of a rehabilitation bond (which must be agreed to and paid before the WA can be granted). The same applies to licensees of low-impact exploration or prospecting mine sites, although the Code of Practice for Low Risk Mines (ERR, 2014) requires these operators to rehabilitate disturbed land as soon as practicable, and return the site to a safe, stable, and non-polluting state.

For all other mines and quarries, Rehabilitation Plans are required and form part of the Work Plan. Required content for Rehabilitation Plans for mining and quarrying is prescribed in the Mineral Resources (Sustainable Development)(Mining Industries) Regulation and Mineral Resources (Sustainable Development)(Extractive Industries) Regulation respectively, with the slightly different wording in relation to describing and scheduling planned rehabilitation being the only difference between the two (**Table 3-1**).

5 Quarries of less than one hectare in area and less than 2 metres in depth are exempt from regulation under the MRSDA (DPI, 2010).

6 Small and low-risk quarries are defined as those with work authority <5ha and works not involving underground operations, blasting, clearing of native vegetation or chemical treatments

Table 3-1 Differences between Mining and Quarrying Rehabilitation Plan Requirements

MR(SD)(MI) Regulation, section 40(3)(e)	MR(SD)(EI) Regulation, Section 11(e)
a description of, and schedule for, rehabilitation milestones;	a description of, and schedule for, each measurable, significant event or step in the process of rehabilitation

The remaining requirements are identical, and are as follows:

a) Proposed land uses for the affected land after it has been rehabilitated, that considers community views expressed during consultation
b) A land form that will be achieved to complete rehabilitation, which must—
   (i) be safe, stable and sustainable[7]; and
   (ii) be capable of supporting the proposed land uses referred to in paragraph (a)
c) Objectives that set out distinct rehabilitation domains that collectively amount to the land form described in paragraph (b)
d) Criteria for measuring whether the objectives described in paragraph (c) have been met
e) An identification and assessment of relevant risks that the rehabilitated land may pose to the environment, to any member of the public or to land, property or infrastructure in the vicinity of the rehabilitated land, including—
   (i) the type, likelihood and consequence of the risks; and
   (ii) the activities required to manage the risks; and
   (iii) the projected costs to manage the risks; and
   (iv) any other matter that may be relevant to risks arising from the rehabilitated land.

The current assessment approach seeks to gain certainty over the final rehabilitated landform by requiring the proposed end land use to be described in the Rehabilitation Plan. A Variation to the Work Plan is required to propose a different end land use. The process of gaining approval for a Work Plan variation means a bond holder is unlikely to seek a Variation to support an alternate land use if that is the only change. Further, to minimise constraints on working capital, Bond Holders may simply state minimum standards in the Rehabilitation Plan to reduce rehabilitation liability and limit security imposts. In creating a system where working capital and therefore ongoing operational viability is constrained, the adoption of minimum standards to maximise available cash resources and maintain liquidity is unlikely to encourage best practice rehabilitation.

Currently, the typical end land use proposed in the Rehabilitation Plan is return to grade for agricultural use. A consequence is that a bond calculation will over-estimate the actual rehabilitation liability as actual land uses that require the results of quarrying (e.g. an excavation for a landfill) do not require certain activities to be undertaken (e.g. backfill / extensive re-shaping in the landfill example). This is discussed further in **Section 6.5.3**.

3.1 Rehabilitation Bond System

A licensee or an applicant for a quarrying industry WA is required to provide an estimate of rehabilitation liability on application for a WA and the bond must be provided before the WA can be granted. The rehabilitation bond must cover the full estimated cost of the site rehabilitation

[7] The Brundtland Commission (1987) defines sustainable development as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

liabilities based on the works specified in the approved Work Plan and associated Rehabilitation Plan.

The rehabilitation liability for a site is calculated using a standard rate of $4,000 per hectare for small low-risk quarry sites[8]; or is based on the point of maximum disturbance[9] for a defined development stage in the approved Work Plan.

ERR have develop a rehabilitation bond calculator (**Section 4)** and recommend its use to estimate rehabilitation liability (Earth Resources, 2021). Its use is not mandatory and where alternate methods or rates are proposed, third party quotes may be required as supporting evidence.

The estimate of rehabilitation liability forms part of the decision on the value of the rehabilitation bond. However, there are no legislated decision criteria for accepting or approving estimated rehabilitation liability estimates. Instead, in accordance with Section 80(1) of the MRSD Act, the Minister determines the bond amount in consultation with the relevant parties (e.g. the local council and landowner). Anecdotally, this process is suffering from a lack of experienced operators within ERR and fewer site visits to confirm actual conditions.

The authorised form of a rehabilitation bond is a bank guarantee issued by a bank registered by the Australian Prudential Regulatory Authority to operate in Australia. Institutions that offer bonds require security, usually in the form of cash or property, which can impact the financial liquidity of an operator (**Section 5.5**).

The State is allowed to draw on the bond to complete rehabilitation of a site where an Authority Holder has defaulted on their rehabilitation obligations under section 78 or 78A of the Act – noting that under section 78 or 78A of the MRSDA the operator is obliged to rehabilitate the site in accordance with the Rehabilitation Plan. However, before the Minister can access funds from the rehabilitation bonds, they must pursue the authority holder for required funds and it is only in the circumstances where the holder has defaulted that the Minister can draw on the bond (Hurst, 2021). In returning a bond, the Minister may also require that holder to enter a further rehabilitation bond if it has not been rehabilitated or requires further rehabilitation (section 82(3) of the MRSDA) (refer **Section 3.1.3**).

Authority holders must also rehabilitate land in the course of doing work (progressive rehabilitation). The regulatory framework allows for progressively rehabilitated areas to be removed from the rehabilitation liability estimate, but the Minister may require these areas to be certified, leading to an additional burden and limited uptake. Incentivising the use of progressive rehabilitation may have significant implications in terms of reducing overall rehabilitation liability and this is further discussed later in this report.

Separately, market demand often means areas of a site are made safe and stable and left inactive until product demand recurs. The bond calculator seems to allow for this scenario (with the rate '*Reduced rate for rehab Maintenance of the rehabilitated areas that are intended to be part of the ongoing closure of the site*') though it is unclear whether it is used in this manner. This is discussed in **Section 4.2.1.**

[8] Small or low-risk Mine sites also have standard rates that can be applied
[9] See discussion later in this report on recent changes to this point.

3.1.1 Bond Period

Historically, the rehabilitation bond is linked to the maximum disturbance for the phase with details specified in the approved Work Plan. Work Plan application and decision requirements under the MRSDA do not include any reference to the period of the Work Plan, but under section 77L of the MRSDA the period of a WA is tied to the period of the associated planning permit and/or planning scheme, unless:

(a) the work authority is sooner cancelled; or
(b) in the case of Crown land, the Crown land Minister's consent is revoked, lapses or otherwise ceases to have effect; or
(c) it is varied under section 77M.

There is no corresponding limit on the period of a ML.

3.1.2 Bond Review

Rehabilitation bonds may be reviewed against the rehabilitation liability:

- Periodically to ensure that the bonds provide an appropriate level of cover.
- When a WA changes ownership or significant variation to the Work Plan occurs.
- At any time if the Minister is of the view that the rehabilitation bond is insufficient.

Currently DJPR assess the risk of default and the consequence of a default to undertake a risk-based approach to identify sites requiring a review of their rehabilitation bonds (Earth Resources, 2021).

As a result of the VAGO audit (VAGO, 2020), ERR are undertaking an 'orderly and progressive' review of rehabilitation bonds focusing on the following priorities (Krbaleski, 2021) and (Hurst, 2021):

- High risk sites nearing the end of their resource life and/or under administration, including sites where action might be required to protect public safety, land, infrastructure, and the environment.
- Sites subject to applications to transfer the ownership of licences and other authorities, including acquisitions and mergers.
- Sites approved to expand their extraction limits or make other major expansions (e.g. enlarging tailings storage facilities).
- Sites that have self-reported rehabilitation liabilities greater than their current bonds.

ERR has recently stated that authority holders will be given an option to voluntarily self-assess their rehabilitation liability (Krbaleski, 2021) and (Hurst, 2021) with a view to:

- Allowing bond values to track more closely to actual liability at any given time; and
- Recognise any progressive rehabilitation works (Section 81 of the MRSD Act) and reduce operator liability.

Operators can now voluntarily request their rehabilitation liabilities and bond amounts to be reviewed and adjusted annually. This provides the opportunity to increase or decrease bond amounts dependent on the extent of site disturbance at any one time (as opposed to the maximum point of disturbance over the project phase). For example, if an operator takes steps to progressively

rehabilitate sections of a site as activities take place, the liability and therefore bond amount can be reduced to recognise the completed activities.

To avoid unnecessary administrative burden, the proposed annual reviews should be accomplished using a streamlined process to incentivise annual self-assessment of rehabilitation liability (Hurst, 2021) by reducing complexity and increasing the efficiency of assessments.

Two factors lower enthusiasm to undertake an annual review as they increase the temporal and financial burden on the operator:

1. A third-party assessment may be required which incurs additional costs.
2. The bank guarantee must be amended. The result is operators often leave the guarantee 'as is', especially as the bond amount may change again in future. The same could be said for operators in Queensland before the pooled fund came into operation.

In EHS Support's opinion, any streamlined process should not require third-party assessment as a default or even a "most often" position. Confidence in the assessment if undertaken by the operator can be improved by existing mechanisms such as the provision of aerial imagery of operational / rehabilitation areas. The quarry industry comprises many operators with long histories, unmatched experience, and a connection to local community. Consequently, they are generally the experts at earthmoving and rehabilitation and have real motivation to "do the right thing". They should be allowed to complete the calculations themselves without third party review.

Concerns raised by industry include the length of time to review a bond and the appropriateness of the estimate. This is thought to be related to a lack of resources in ERR, high assessment officer turn-over, a move away from experienced inspectors who knew the site and operators, the split of the assessment and compliance functions within ERR, and the use of tools such as Google Earth™ to evaluate disturbance quantities rather than site visits. Based on prior experience, lack of familiarity with the relevant industry leads to risk-averse administrative decision-making and an increasing burden of proof on operators.

3.1.3 Call on and Return of Bond

Under Section 83 of the MRSDA, the Minister may undertake rehabilitation of land in circumstances where the Minister:

> *(a) is not satisfied that the land has been rehabilitated as required by section 78 or 78A (as the case may be); or*
> *(ab) and (ac) relate to mines; or*
> *(b) is satisfied that further rehabilitation of the land is necessary; or*
> *(c) is requested to do so by the owner of the land.*

Where the Minister is satisfied that the land has been rehabilitated appropriately, they must return the rehabilitation bond as soon as possible, although in the case of private land the Minister must not return the bond, until the local council and owner of the land have been consulted.

Despite the above, the Minister, may as a condition of returning a bond / bonds, require the holder to enter into a further rehabilitation bond if –

> *(a) any land or part of the land to which the bond relates has not been rehabilitated, or requires further rehabilitation; or*

(b) [relates to mines].

3.2 2021 Update to Bond Calculator

As detailed in the ERR Rehabilitation Bond calculator pages (ERR, 2021) the bond calculator was updated in March 2021 to include the current estimated costs for common site rehabilitation activities. ERR commissioned a report (Ascent Environmental , 2020) to advise on updating the bond calculator, which included a comparative analysis with the New South Wales and Queensland calculators which are focussed on mining not quarrying.

Key updates included:

- Updating the costing rates for Consumer Price Index changes
- Providing alternative costing rates for some rehabilitation activities where there is a substantive difference between the CPI adjusted rate and current market costs
- Adding common rehabilitation activities, such as monitoring and maintenance (e.g. dust control, water treatment and site security).

ERR claim the new calculator is based on a risk-based approach, with an aim to encourage operators to plan ahead for site rehabilitation at a lower cost (ERR, Rehabilitation Bond Calculator, 2021), but it is not apparent how the calculator itself is risk-based (**Section 4**) and a proposal to add a risk-filter is discussed in **Section 7.5**.

The impact of the updated calculator on bonds for quarrying is discussed in **Section 5**.

3.3 Summary

The estimate of rehabilitation liability forms part of the decision on the value of the rehabilitation bond. However, there are no legislated decision criteria for accepting or approving estimated rehabilitation.

From 1966 to present, the regulatory requirements associated with rehabilitation have increased, particularly in regard to the amount and type of information required to be provided as part of a Rehabilitation Plan. It is recognised that changes were required to deliver rehabilitation outcomes that met departmental and public expectations. However, the effect has been to shift the risk associated with rehabilitation and in particular the approval of Rehabilitation Plan from the regulator to the operators (increased regulatory burden), and further reducing the risk appetite of the regulator. This is evident in the way that despite notable differences in their risk profiles and site-specific assessments from ERR, mining and quarrying activities are essentially treated the same under the current system. This one-size fits all approach unfairly penalises smaller quarry operators.

In the *Regulatory Practice Strategy for Rehabilitation of Earth Resources Sites* (ERR, 2020) ERR state: “a risk-based approach that considers both the likelihood of an operator defaulting on their rehabilitation obligations and the consequence of their default on people, land, the environment and infrastructure”. While a risk-based approach is apparent from the prioritisation of revising quarry bonds and evaluation of the State’s contingent liability, these worthy and pragmatic principles are not applied to the specifics of regulation (as discussed above) or in the calculation of bonds (**Section 4**).

Based on interviews with quarry operators, bond calculations and resultant changes to bond amounts often include elements that are not likely to occur or do not represent how a quarry would be rehabilitated. This is thought to be due to a move away from experienced inspectors to personnel unfamiliar with the specifics of the quarry industry and construction practices in general. Despite extensive information required to be supplied under legislation, administrative decision-making has been risk-averse and has not recognised some of the values and benefits of quarry sites which are discussed in more detail further on in this report. As a result, inappropriate costs are being included and these are discussed in **Section 5.4**.

4 Review of the Bond Calculator

EHS Support undertook a review of the Victorian bond calculator (March 2021 version) to allow discussion on:

- The general architecture of the calculator and suggestions for revisions.
- The specific rate categories and rates and recommendations for removal of some rate categories and review of the value of specific rates.
- Whether the calculator acknowledges the lower risk profile of quarrying compared to mining.

The bond calculator was updated in March 2021 and the key changes are discussed in **Section 3.2**.

4.1 Architecture

The bond calculator is an Excel™ based workbook and allows the user to select one of the following workbooks depending on the specifics of their site:

- Exploration
- Open Cut and Underground Mine
- Open Cut Coal Mine
- Quarries > 5 ha disturbed
- Small Open Cut Mines and Quarries (≤ 5 ha disturbed and ≤ 5 m in depth)
- Small Underground Mine (≤ 5ha disturbed)
- Underground Mine

Each workbook contains varying numbers of sheets with typical Domains including:

- Infrastructure including administration buildings, workshops, processing plants, rail loading and roadways, product stockpile and hardstand areas
- Tailings storage facilities
- Overburden and waste rock dumps
- Pits
- Adits and shafts

The workbooks applicable to quarries are *Quarries* (> 5 ha disturbed) and *Small Open Cut Mines and Quarries* (≤ 5 ha disturbed and ≤ 5 m in depth). The workbooks have the following Domains:

- Quarries – Infrastructure, Tailings Storage, Overburden and Waste, Pits, Other, Management and Contingencies (6 Domains)
- Small Open Cut Mines and Quarries – Small Pits and Tailings and Water (2 Domains)

While *Quarries* has more Domains, the workbooks overall contain similar rate categories and rates and this is discussed below.

EHS Support believe the calculator would benefit from simplification to improve transparency, reduce the risk of errors (in the calculator itself), and make easier the user experience, especially for smaller quarry operators who may not have the resources to work through the process themselves. For example:

- There are seven different types of mines / quarries but they all draw on the same rates (some a subset of the rates) of which there are only about 120[10] (*Quarries* has about 80 and *Small Open Cut Mines and Quarries* about 40). The rationale for multiple workbooks is likely to reduce the complexity for simpler sites. However, the workbooks are similar anyway and one workbook could be created to cater for all types of quarries and mines vastly reducing complexity and improving transparency. A separate workbook for small quarry operators could be vastly simplified easing the burden on operators and increasing transparency for reviewers.
- Each workbook has multiples of the same Domain to account for sites with more than one item (e.g. multiple tailings storges). This has several issues including that as there is a limited number of sheets for each Domain (e.g. three tailings storage sheets), if there are more items at a site (e.g. four pits) it is understood (though not confirmed with the makers) the users must either combine items in a sheet or add another sheet and ensure the calculations flow through the workbook. This creates work for the user and introduces significant room for miscalculation. It also misses the opportunity for easy review of items within the same Domain (see **Figure 4-1** for example of alternate method).
- The "Applicable Y / N" column (see **Figure 4-2**) requires the User to select Y for the cost to calculate. Discussions from a previous review of a similar calculator suggested this was so that users would be forced to consider all the rates and whether each was applicable. This is not a good reason, adds burden to the user, and it is doubtful whether it achieves this aim. The inclusion of the column allows for several types of errors. If the calculator is pre-populated by mistake (as was observed in a recent download from the website (see **Figure 4-3**)), it is possible a user will not pick up the error. Conversely, if a cost is intended to be added but the user inadvertently does not select Y, the cost is not added. Both cases lead to an inaccurate estimation of rehabilitation liability.

Top	Overburden Dumps and Spoil Piles (User Defined)		OVERBURDEN DUMP DIMENSIONS					
#	Map ID	Name	Total Footprint area of Overburden Dump (ha)	Rehabilitation of flat areas (tops, benches, berms etc) area (ha)	Average doze thickness flat areas (m)	Rehabilitation of slope/batter areas(ha)	Average doze thickness slope areas (m)	Total Cost for Dump / Pile ($)
X								$ 1,000,000
1		Overburden 1						$ 1,200,000
2		Overburden 2						$ 1,200,000
3		Overburden 3						$ 900,000
4		Overburden 4						$ 2,000
5		Overburden 5						$ 2,000

Figure 4-1 Example of Items within One Sheet rather than Separate Sheets

Activity / Description	Applicable (Y or N)
Drill and blast a vertical face to achieve a minimum batter angle of 33 degrees, where blasts < 3000 t, face height is typically < 10m.	Y

Figure 4-2 Cut Shot from the Calculator showing Applicable Column

Domain	Rehabilitation Liability
Domain 1: Infrastructure Areas	$71,534.00

Figure 4-3 Cut Shot from the Calculator showing pre-populated Value (download 28th October 2021 and selection of quarries)

[10] The Ascent report (Ascent Environmental , 2020) says there are 220 rates but some are the same or similar and this was pre-revision of the calculator. Either way the number is not so large that the comments made above would change.

4.2 Rates

The Bond Calculator Guidelines (Earth Resources, 2021) states:

"… the calculator's default rehabilitation rates were determined using typical current market 'third party' contract rates as of January 2021. In estimating rehabilitation liability, the Department may choose to apply a different rate to a rehabilitation activity to the default rate, in consideration of site-specific characteristics. Where an operator is of the view that the default rate is not applicable to their site, an alternative rate can be nominated. In such circumstances, a variation of the rates must be substantiated in a form acceptable to the Department. Alternative rates must be determined using current market 'third party' contract rates and assume that all personnel and equipment must be contracted and brought on site. Justification for the alternative rate and details of its calculation should be provided in the 'Additional Info' column of the relevant domain worksheet or on the 'Assumptions' page.

The *Quarries* and *Small Open Cut Mines and Quarries* have about 40 common rates and the values are the same. The common rates include managing small dams, constructing fences, removing rubbish, reshaping overburden and mullock heaps, and rehabilitating land.

The *Quarries* workbook contains about 80 rates and 6 categories that require the user to build a rate using first principles. There are about 50 rates in *Quarries* that are not in *Small Open Cut Mines and Quarries* including:

1. Backfilling faces and benches as specified in the work plan
2. Construct safety berm, catch bench and barrier around the pit perimeter (required where final pit will include steep faces)
3. Demolition of tanks
4. Deep ripping
5. Drill and blast
6. Major bulk push
7. Onsite remediation of hydrocarbon contaminated soils
8. Remove Rail Loop and spur, including cutting and removing the tracks, sleepers and ballast material
9. Remove unwanted material from roadways (e.g. spillage)
10. Source local material, cart and spread suitable material to cap the tailings storage (cap thickness determined by approval/licence)
11. Mobilisation & Demobilisation (four rates of 4%, 5%, 6%, 7% of total pre-mobe and multipliers cost for distances to site of <50 km, 50-100 km, 100-200 km, and >200 km respectively)

The omission of these rates is reasonable as small quarries are not likely to require major earthmoving, blasting, or removal of contaminated materials.

The *Small Open Cut Mines and Quarries* workbook contains about 40 rates and 5 categories that require the user to build a rate using first principles. There are three rates in *Small Open Cut Mines and Quarries* that are not in *Quarries* and these are all *making vertical faces safe*.

The full list of rates in these two workbooks is shown in **Appendix B**.

4.2.1 Appropriateness of Rate Categories

With the exceptions discussed below, the rate categories are generally adequate to cover the typical range of activities for quarry sites.

The following rates, that may be useful for quarries, are missing from both workbooks though it is acknowledged that these are often retained on sites:

- Access roads - minor pushing of the windrows, final trim, and deep rip.
- Access roads and vehicle park-up areas - minor pushing of the windrows, final trim, and deep rip.

The rate *Reduced rate for rehab Maintenance of the rehabilitated areas that are intended to be part of the ongoing closure of the site* is welcome as it presumably allows for the situation whereby land has been made safe and stable (perhaps pending future quarrying) but would not require the effort associated with the other rates.

The categories requiring the user to build a rate using first principles are discussed in **Table 4-1**.

Table 4-1 First Principles Rates

Category	EHS Support Comment	EHS Support Recommendation
Remove all mobile plant and equipment from the site	Mobile plant and equipment will most often have re-sale or scrap value. It is very unlikely that a cost would be incurred for such items. At the very least, there would be a vibrant market for "free pick up at your cost". The calculator does allow the user to reflect the true cost of managing plant and infrastructure removal by offsetting the resale value against the decommissioning / demolition / removal cost (Earth Resources, 2021). However, the inclusion of a rate category can lead to users having to justify why they have not used it adding to the burden. This is hinted at by the ERR statement "In such instances, justification must be provided in the calculator. In reviewing infrastructure demolition costs determined by the operator, the Department or environmental auditor will consider the potential of the plant to retain its value throughout the bond review period and may require full costing for infrastructure demolition where appropriate".	Remove category and make calculator default position that mobile plant and equipment will have value even if only as scrap. In the rare event that a cost would be incurred to remove such equipment, the assumption should be that the costs are covered in the Contingency.
Engagement of an EPA accredited environmental auditor to set environmental performance requirements pre rehabilitation works and to verify performance post rehabilitation works	This item is not reasonable to include as the environmental issues are unlikely to be known and if they are known would be subject to operational compliance.	Remove the item and assume such costs are covered under contingency in the unlikely event they are required.

Category	EHS Support Comment	EHS Support Recommendation
Environmental sampling - identify any actual or potential contaminants (e.g. arsenic, salt, acid, cyanide)	Reasonable inclusion but only used if potentially contaminating activities (e.g. bulk fuel storage) are known on the site. The ERR guidelines says project management costs include sampling and analysis of soil and water but this is assumed to be the management costs of these items.	Retain but ensure reviewers do not require its inclusion if there are no potentially contaminating activities on the site.
Groundwater management – quality and quantity of groundwater	The definition does not indicate the specific activities that are contemplated by this category. Any known groundwater contamination is the subject of operational compliance.	Costs should not be anticipated (by reviewers) for this item and it would be better removed to avoid unnecessary discussion during review. At the very least the definition should be improved to ensure understanding of the expectations.
(Only if specifically required): Apply engineered treatment as required (i.e. additional compaction, capillary breaks, etc) - design in accordance with the approval/permit commitments. Generic rate assumes cap thickness of approximately 1-1.5 m.	A reasonable inclusion to capture any specific requirements for capping not covered by other rates. However, the calculator does not include a rate requiring the user to calculate by first principles.	Develop default rates to lessen the burden on the user but continue to allow alternate rates.
Any Other Costs That Would be Reasonably Expected To Be Required to Rehabilitate the Site and are not Covered Elsewhere in This Calculator	Redundant as there are spaces for User defined items through the calculator.	Category should be removed.

4.2.2 Appropriateness of Rate Values

Based on a comparison to the rates in the Queensland ERC calculator and experience of the team, the magnitude of most of the rates in the Victorian bond calculator are reasonable. However, some are high compared to the Queensland rates which were constructed using a first-principals, bottom-up calculation method with the scopes informed by experienced practitioners and rates compared to benchmarks.

An issue with the previous Queensland calculator, which seems to be the case with the Victorian calculator is that scope and unit costs behind the rates lack a transparent build-up and/or source. The commentary states the rates are based on third-party benchmark rates but these are unlikely to be representative across the industry unless the calculator builders consulted widely. Further, the rates do not allow for variation in unit cost with fleet size. Larger jobs can benefit from the application of larger fleet sizes with overall lower cost due to the higher productivity outstripping the higher operating cost (e.g. for larger material volumes, a D9 dozer can reshape land at lower cost than a D6 dozer).

The following rates should be reviewed as they are not consistent with Queensland rates that were constructed using bottom-up, first principals and informed by the experience of specialist practitioners.

Table 4-2 Rates for Review

Rate Category	Victorian Bond Calculator	Queensland Calculator	Comment
Drill and blast	< 3,000 t, face ht < 10 m $4.72 / m^3 > 3,000 t, face ht > 10 m $3.30 / m^3	20 m hole $1.92 / m^3 10 m hole $2.55 / m^3	The assumptions underlying the Bond Calculator rates are not apparent (e.g. rock type, drill hole size, bench height, powder factor, explosives type). The comparison here is not direct in that the methods are different. It would be helpful to understand the background to the Bond Calculator rates.
Major bulk push	All per m^3 < 50 m Sand $1.06 Clay $1.53 Stiff clay / soft rock $1.95 50 – 100 m Sand $1.36 Clay $1.83, Stiff clay / soft rock $2.30	All per m < 50 m $0.20 to $0.74 Range varies with dozer size 50 – 100 m $0.86 to $1.63	< 50 m Rates are multiples higher than DES. Review of a similar calculator reduced these rates by applying a detailed cost build-up. The Ascent report recommended adoption of the Queensland rates from some of these categories but this does not appear to have been adopted. A calculation undertaken by EHS Support using the ERR calculator on a real site resulted in one to two orders of magnitude higher cost than the actual cost expected. This was primarily due to these push rates (see Section 5.4).
Pest and Weed Management	$590 / ha	$450 / ha	Rate is reasonable to include, however, reviewers should not be “expecting” to see this item populated and should only question if there is a known issue. Further, the rate is higher than the Queensland rate ($590 / ha cf $450 / ha) and Victorian sites are less likely to have the issues of Queensland sites such as feral pigs. It is acknowledged that the Queensland rate is lower because the mining sites are much larger in disturbance than what would be expected with a Victorian quarry operation. However the rate should be reviewed for the larger quarry operations or a separate lower rate could be added to account for larger scale (> 5 ha) quarries with pest and weed issues.
Powerlines	$30,204 / km	Wooden $19,109 / km Steel $30,204 / km	No allowance for lower cost wooden poles. In general, reviewers should not be expecting to see inputs for these as such valuable infrastructure would be retained. In most, if not all cases such infrastructure will be valuable to the State.

Rate Category	Victorian Bond Calculator	Queensland Calculator	Comment
Reshaping of overburden and mullock heaps on the site.	The unit is incorrect in Small Quarries (the unit is cubic metres and should be hectare). $3,900 / ha	$1,834 to $7,745 / ha	Rate (with hectare units) is reasonable for larger (> 5 ha). The rate should be lower for smaller quarries where the stockpiles are likely to be smaller and less challenging to rehabilitate. Fix the unit error in Small Quarries.
Source local material, cart and spread suitable material to cap the tailings storage (cap thickness determined by approval/licence) > 5km	$8.22 / m^3	$6.32 / m^3	The rate is higher than DES and may be because the category is applied to tailings (a mine feature). Quarries do not have waste structures as complex as tailings storage dams. The rate also seems inconsistent with the bond rates elsewhere in the Victorian bond calculator. The range of rates for another set is $3.48, $3.89, $5.19, $7.79 but for this set is $2.71, $3.42, $4.13, $8.22 (the shorter distance rates are lower but the 5 km rate is higher).

4.3 Multipliers

The calculator includes multipliers on the rehabilitation cost including project management, maintenance and monitoring, and contingency.

4.3.1 Project Management

Project management is set at 10 % of the total rehabilitation liability and is applicable for all sites regardless of size. The calculator allows changing of the percentage multiplier, but it is not clear whether this is intentional (the guide says “Project management costs are set at 10 % of the total rehabilitation liability. It is applicable for all sites regardless of size”).

The ERR guideline states the project management costs cover:

- The administration process of calling in a bond.
- Preparation of detailed maps to show the extent of rehabilitation tasks.
- Surveys to determine the extent, characteristics, and location of reclamation materials such as overburden and topsoil.
- Sampling and analysis of soils and water.
- Evaluation of structures to determine requirements for demolition and removal.
- Administration of contracts
- Management and maintenance of the site by the Department prior to the rehabilitation contracts taking effect (e.g. fencing, signage, access, utilities and on-site water management).

Across the universe of project cost estimation, the method of application of project management cost ranges:

- A straight % multiplier (the method used in the bond calculator)
- Sophisticated (or unnecessarily complex depending on your view point) probabilistic approaches via statistical regression analysis and modelling.
- Past-experience and using empirical data to inform the cost estimate.

The most simplistic approach and that historically accepted as the "rule of thumb" is the straight % multiplier with 10% commonly seen and accepted.

Given the complexity of alternative approaches and general acceptance, a straight 10% multiplier for this Bond calculator is reasonable.

4.3.2 Contingency and Allowing for Unknowns

A contingency is included and set at a minimum of 10% of the total rehabilitation liability which is the same as the Queensland calculator. The contingency includes costs for:

- Rehabilitation tasks not envisaged or appropriately costed in initial estimates
- Failures in rehabilitation works, such as revegetation establishment or earthworks.

The calculator does allow the default of 10% to be changed by the user but this is likely to require justification. The bond guidelines (Earth Resources, 2021) states that "In some circumstances the Department may apply a higher contingency rate depending on the complexity of environmental management of the operation". Guidelines for what would inform the department's decision on this are not apparent. This statement is (understandably) likely a cause of concern for industry considering the movement away from experienced and informed inspectors.

A contingency does not recognise the potential for cost reduction through cyclical downturns, innovation, and technology progression with the underlying point being the actual rehabilitation liability may be less than the estimated amount.

A contingency amount is generally not included in a financial provision as it does not pass the known an estimable test. However, inclusion in a bond calculator is reasonable if the understanding is that it covers activities such as those listed above and items that have a reasonable chance of occurring but are not yet known. Anecdotal examples of ERR officers adding events that are as yet unknown to bond calculations are described in **Section 5.4.** Such events should be assumed to be part of the contingency.

4.3.3 Maintenance and Monitoring

The calculator includes a rate titled: "Post closure environmental monitoring requirements" with description: "this item is to cover any monitoring and measurement requirements that may be needed following the closure of the project". The ERR guides has further explanation: "the monitoring cost covers any environmental monitoring required during rehabilitation such as dust levels, noise levels, water quality and ongoing inspections of rehabilitation works and is set at 5%". The calculator allows changing of the percentage multiplier, but it is not clear whether this is intentional (the guide says: "This is set at 5% of the total rehabilitation liability.").

While the guide does state the rate is for larger sites, 5% is too high for quarrying. The costs of preparing work instructions for such monitoring will be low (<$50K) for most sites and should in any case be included in the project management allowance. The costs of monitoring aspects such as dust and noise are not high involving potentially some low-cost instrumentation and local labour.

Similarly, inspections of rehabilitation performance involve a vehicle and one person and are not high.

Users should be allowed to lower this percentage and provide justification by a simple first principles calculation.

4.4 Accounting for Lower Risk Profile of Quarries and Small Quarries

Small and low-risk quarries can use a standard rate of $4,000/ha and small farm gypsum pits (<5ha and <2m depth) are able to use a standard rate of $2,000/ha for a minimum area of 1 ha. Both these rates are considered reasonable.

For remaining quarries, there is no real acknowledgement in the bond calculator that quarries have a lower risk profile than mining or the lower complexity of small quarries. While there are less rate categories, the actual values are the same. Items that do account for this difference in risk or complexity are few and include:

- *OR Rip only for smaller operations* which is an alternate to *Source, cart, spread, lightly rip topsoil*
- *Topsoil spreading (topsoil stockpiled immediately adjacent to the area to be rehabilitated) for push < 50m*

The inclusion of such rates is welcome. However, the risk profile of quarrying is better reflected in either exempting them from the bonding process or applying a risk filter as recommended in this report.

4.5 Summary

A review of the calculator indicates the architecture would benefit from simplification to reduce the risk of error and the burden on the user. Based on the experience of specialist practitioners and bottom-up, first principles calculations undertaken for other calculators, some of the rates are higher that would be realised in practice. These rates should be reviewed and reduced if justification cannot be provided by ERR. The project management allowance of 10% is reasonable. However, the 5% monitoring cost should either be reviewed, or users allowed to present alternate costs more accurately reflecting what would occur in practice. The contingency is reasonable to include provided it is understood that it is to cover unknowns such as contamination associated with potentially contaminating activities and poor rehabilitation performance (e.g. seed does not take or erosion occurs). These kinds of unknowns should not be part of the main calculation as the inclusion of events that are equally (or more so) unlikely to occur will lead to an overestimation of the rehabilitation liability for the site. This point is important and is restated: the calculator should represent the rehabilitation liability as known at the point in time and not include items or anticipate costs for unknown (both in occurrence and scope) items.

5 Impact of Regulation and Bond System on Quarrying Industry and the Community

A key point made in this report is that the increasing cost of compliance and especially the cost of providing bonds has increased to the point where smaller quarries operating with thin margins become unviable. Aside from the direct financial impact on the operators and landowners, the loss of regional quarries will have real impact on the State and community as costs for supply of construction materials increase because:

- Competition decreases (leading to monopolies)
- Transport costs increase, with associated increases in greenhouse gas emissions and risk of incidents
- Employment opportunities are lost

5.1 Costs and Impacts associated with Increased Travel Distances

While Victoria has an abundance of good quality quarrying resources, unlike metallic minerals and ores, stone resources are low in value and therefore to be viable extraction needs to occur close to market sources (Day, National Competition Policy - Review of the Extractive Industries Development Act 1995, Extractive Industries Regulations 1989 and Extractive Industries Development Regulations 1996, 2001). When environmental constraints such as sensitive receptors, watercourses and native vegetation and the approvals required to access private land are considered, the likelihood of resources occurring close to markets reduces. Together with the potential for regional quarries to exit the market due to the pressures described in this report (including rising compliance costs), supply to use transport distances are likely to increase significantly.

An analysis by PWC (PWC, 2016) estimated that an extra $2 billion of transport costs would be incurred across 2015 to 2050 for every additional 25 kilometre distance over which material is transported. This figure represents the cost uplift of meeting the aggregate supply shortfalls across all locations from 2015 to 2050 by accessing material from quarries 25 km further away than those currently used. This represents 4% of total transport costs over the period.

In terms of what this means for actual cost of quarry materials, Day (2009) states that a report by Access Economics for CCAA[11] estimated that an extra 50 km transport distance will increase costs by $8.89/tonne in direct transport, environmental and social costs.

Increased transport distances create additional impacts associated with road traffic incidents, wear on infrastructure from heavy vehicle movements and greenhouse gas emissions.

In 2015, over 46 million tonnes of quarry material were transported (PWC, 2016). Assuming a load capacity of 42 tonnes for a B-Double, this equates to over 1 million trips. The average transport distance in 2015 was 112 km, which is predicted to increase to 123 km in 2025 and 128 km in 2050 (PWC, 2016). This means that in 2015, over 122 million km was travelled to transport quarry materials.

A Study undertaken for the National Heavy Vehicle Regulator (National Road Transport Commission, 2021) stated there are between 5 and 17 accidents (depending on truck size) involving heavy vehicles per 100 million kilometres travelled. In 2015 and taking the low end of the range, statistics

[11] Economic contribution of the extractive industries in Victoria (2006), Access Economics Pty Ltd for CCAA

indicate 6 major accidents associated with the transport distance associated with quarry materials. Assuming the PWC predictions hold true, predicted demand will rise to close to 88 million tonnes in 2050, meaning over 2 million trips. At a predicted distance of 128 km per trip, this would mean over 264 million km travelled to transport quarry materials with over 13 major accidents predicted using this method. This point must be kept in context as the spectre of increased chance of accident can be misinterpreted. The point is re-stated: increasing regulatory burden and cost may lead to smaller quarries going out of business with result that material must come from further away for regional projects. The likelihood of incident increases with distance travelled and consequently, less quarries close to market / project, statistically translates to increased road incident risk.

The transport sector accounts for 16% of Australia's greenhouse gas emission with heavy road vehicles accounting for 20%[12] of transport emissions. This percentage remains the same for heavy vehicles in Victoria, heavy vehicles (DELWP, 2019) (refer **Figure 5-1**).

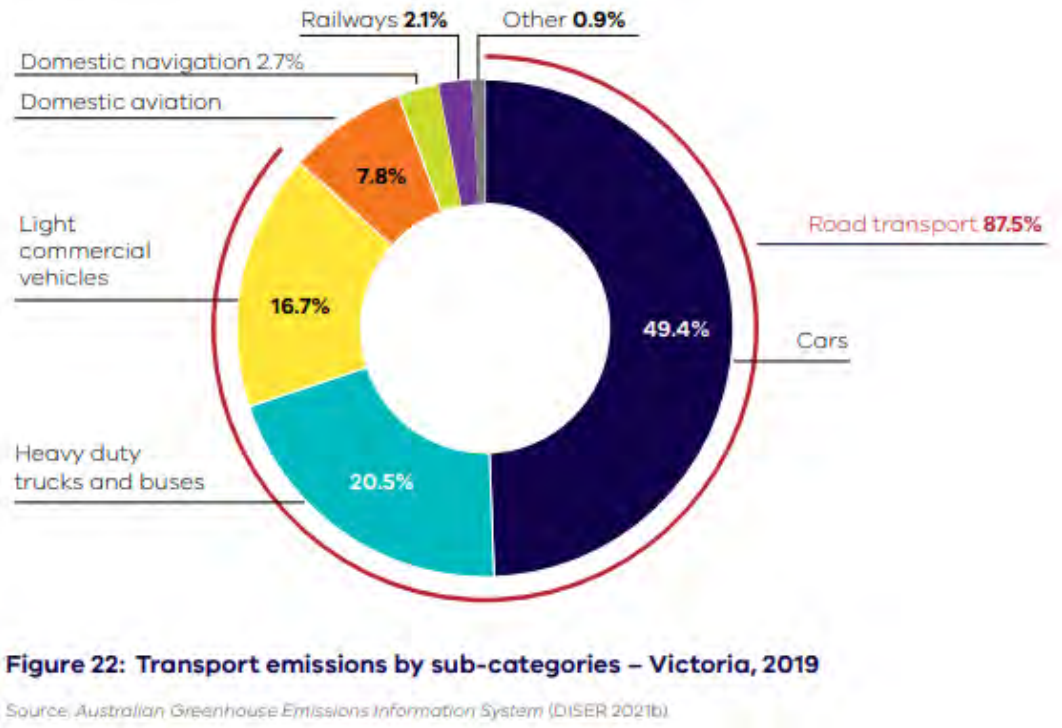


Figure 5-1 Victorian transport emissions (source DELWP, 2019)

In terms of GHG emissions, using a conservatively low specific emissions rate of 200 g CO_2 per km, annual emissions from transport of quarry material in 2015 were about 24,500 tonnes. Based on the PWC (2016) predictions, this could increase to over 52,000 tonnes by 2050.

To put this into context, the number of cars and forest area is compared to the additional mass of carbon dioxide estimated from the above. Assuming the average car produces about 5 tonnes of, dioxide a year, the increased emissions from transport of quarry materials between 2015 and 2050 is equivalent to around 5,500 cars. Young regrowing eucalypt forest accumulates between 2 and 17 tonnes of carbon dioxide per year (Government, 2021) meaning between 1,600 ha and 14,000 ha of such forest would be required to offset the predicted increase in emissions.

[12] https://www.climatechangeauthority.gov.au/reviews/light-vehicle-emissions-standards-australia/opportunities-reduce-light-vehicle-emissions

This analysis provide support to the assertion that regional quarries are beneficial to the community and State through avoidance of rising cost to construct infrastructure, increased accident risk, increased cost maintenance of infrastructure, and increased emissions to the atmosphere.

Returning to Day, smaller operators tend to be concentrated in regional areas and their elimination from the market is likely to adversely impact regional employment and cost of raw materials in regional areas due to increased transport costs (Day, National Competition Policy - Review of the Extractive Industries Development Act 1995, Extractive Industries Regulations 1989 and Extractive Industries Development Regulations 1996, 2001).

5.2 Increased Regulation

Interviews with quarry operators supported by our review of regulation over time indicate a trend of increasing regulation of rehabilitation. Notable exceptions to this trend are:

- Quarries less than 1 ha in area and less than 2 m in depth are exempt from regulation under the MRSDA; and
- Quarries where the WA is less than 5 ha are exempt from the need to provide rehabilitation plans under the MRSDA and instead must comply with the relevant code of practice (DPI, 2010). However, they are not exempt from the having to provide a rehabilitation bond.

Despite these exceptions, the consensus of opinion in the quarrying industry is that the amount of regulation (red tape) has become a barrier through the level of effort required to meet the requirements, the associated costs and the additional hidden impacts of holding bank guarantees. The combination of these is sufficient to impact the viability of smaller operators and place regional quarries at risk. There is also a consensus that increasing regulations are gradually removing reasonable access to resource material, increasing the likelihood of operators surrendering WAs. This is despite most operators being highly skilled and committed to making successful businesses.

In addition, the steady pace of change of guidance and regulatory requirements has resulted in a feeling that the ‘goalposts’ are always moving. This has real-time impacts on the industry in that applications may take years to be resolved. One instance reported to the team is an application to vary a WA which has been under assessment for a decade. Where they occur, such impacts adversely affect the ability of the operator to access the resource / continue to operate the quarry in the most efficient manner possible and may affect overall viability.

While it is true that regulatory requirements and associated guidance material have steadily increased obligations and requirements for operators and applicants for quarrying sites, it is EHS Support’s view that the regulatory framework governing the operation of the rehabilitation system is generally appropriate. For example, WA’s set the boundaries and provide the necessary authority to undertake the work; Work Plans describe proposed operations and Rehabilitation Plans detail how it is proposed to restore the site during and after operations.

EHS Support also finds that there is a degree of flexibility within the system, that allows for Rehabilitation Plans and the associated bonds to be tailored to site-specific operations, risks and conditions. For example, while key components and requirements of the framework are legislated, actual content is not, leaving discretion for the regulator in terms of what is considered appropriate.

However, to allow tailoring of plans it is recommended that the guidance material supporting the rehabilitation process is updated to state more explicitly that guidelines are just that, and where alternative approaches are proposed, appropriate supporting information should be provided to

assist in regulatory decision-making. This should promote a shift to outcome-focused assessment and conditioning of rehabilitation (an approach that is used in other jurisdictions).

The adoption of a simpler process to allow an operator / applicant to demonstrate that a proposed final land use is viable is recommended. This is likely to result in a greater diversity of proposed end land uses, many of which would not require backfilling and in comparison, to a return to agricultural land use, is likely to result in significant reductions in bond value that would more accurately reflect the true cost of rehabilitation.

The State of Victoria models and reports on near-term and anticipated development of Melbourne City and surrounds and its impact on regional areas. This work could be leveraged to support a less formal acknowledgement of potential near-term and future land use that isn't necessarily the most expensive (typically backfill the site to grade, land to pristine and, return to agricultural use).

5.3 Regulatory Inexperience

As discussed in **Section 3.1** and **Section 3.3**, consistent feedback has been received from industry of the perceived lack of experience of the ERR assessment team. Specifically that assessments used to be undertaken by local inspectors with first-hand knowledge of the industry and the specific sites, but now sits with a desk-based team with limited knowledge and experience of the industry.

Prior experience indicates that less experienced teams generally lack confidence in their decision-making and are more risk-averse, seeking ever increasing amounts of information on details that are not necessarily relevant, to satisfy themselves that a decision will be the correct one. In the case of assessing rehabilitation liability estimates, this results in the following:

- Increased processing time as each information request is issued, responded to and assessed
- Increased bond cost because of:
  - Inaccurate / incorrect rates or values being used
  - Risk aversion / over-compensation
  - Misunderstanding of how rehabilitation would be undertaken
  - Inclusion of activities that are not likely (or at least as unlikely) to occur.

With greater experience comes the awareness of standard rehabilitation techniques, site management practices, key elements of proposals and risks to the environment, the public and the State. As a result, assessments become more efficient, with fewer information requests and greater accuracy in terms of tailoring the bond value to the specifics of a site.

Quarry operators are the experts at rehabilitation and ERR should be encouraged to seek their advice.

5.4 Increases in Bond Amounts

In 2001, Prentice identified (using a database provided by the [then] DNRE), that for small firms operating during 1990 – 1996, the real value of rehabilitation bonds nearly doubled (Prentice, An Economic Analysis of the Rehabilitation Bonds System, 2001). These increases occurred following changes in regulatory procedures and occurred again in 1998-2001 when further regulatory change appeared to be partially driven by efforts to make rehabilitation bond assessments more systematic.

Day (2001) also calculated the bond as a relative ‘cost’ of production during the period 1995 – 2000 by dividing production by the bond value. EHS Support took the data from Day, 2001 and added it to

that which is available in the Annual Statistical Report 2020-2021 (DJPR, 2021) to create an overview of the relative bond cost (**Table 5-1**). Data was unable to be found for the period 2000 – 2013.

Table 5-1 Bond Cost as a "Cost" of Production

Year	# Work Authorities **in production**	Bond Value	Production (tonnes)	Bond 'Cost'
1995	DNF	n/a	33,159,136	n/a
1996	DNF	$ 14,443,350	34,298,848	$ 0.42
1997	DNF	$ 16,381,301	29,727,926	$ 0.55
1998	DNF	$ 18,344,753	35,278,774	$ 0.52
1999	DNF	$ 20,988,469	30,098,502	$ 0.70
2000	DNF	$ 23,504,919	36,312,222	$ 0.65
2013-14*	485	$ 90,900,000	40,330,000	$ 2.25
2014-15	554	$ 85,800,000	50,690,000	$ 1.69
2015-16	542	$ 88,600,000	54,090,000	$ 1.63
2016-17	544	$ 91,700,000	58,050,000	$ 1.57
2017-18	553	$ 92,200,000	61,160,000	$ 1.51
2018-19	539	$ 91,900,000	62,860,000	$ 1.46
2019-20	506	$ 93,000,000	63,110,000	$ 1.47
2020-21	427	$ 92,900,000	63,680,000	$ 1.46

Notes
After Day (Day, National Competition Policy - Review of the Extractive Industries Development Act 1995, Extractive Industries Regulations 1989 and Extractive Industries Development Regulations 1996, 2001)
* Taken from (DJPR, Earth Resources Regulation 2019-20 Annual Statistical Report, 2020) figures only provided as tens of millions to 2d.p.
DNF = Data Not Found

The data in **Table 5-1** shows a significant increase between 2000 and 2013 and then a gradual decline to 2020. The 2013 – 2020 data shows the bond value to be relatively stable at about $90 million, while production tonnages have increased from 40 – 63 million tonnes.

Figure 5-2 plots the number of work authorities and amount of rehabilitation bonds held over the last decade. The chart further demonstrates how specific bond amounts have increased over time with the bond amount increasing despite a significant reduction in the number of applications.

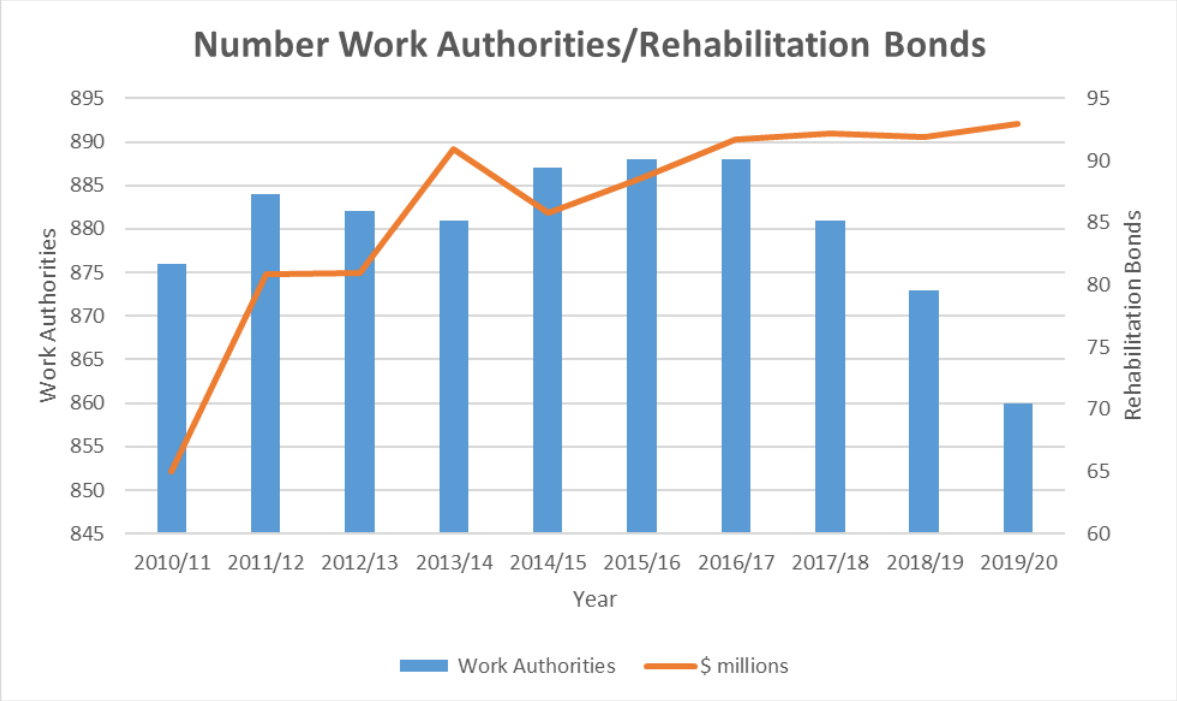


Figure 5-2 Number of Work Authorities compared to Rehabilitation Bonds Held[13]

With the recent changes to the calculator and the trend to inexperienced reviewers in ERR, current bonds are expected to increase sometimes without justification and/or alignment with proposed activities.

In December 2021, EHS Support used the ERR calculator to estimate the potential cost of rehabilitation of a confidential site. The calculator produced an estimate between one and two orders of magnitude higher than the actual cost predicted by the experienced operator. The high cost calculated by the ERR calculator was driven primarily by the rates for rehabilitating pits and in this case the bulk push <50 m rate. These rates are high and should be reviewed (see **Table 4-2**).

Another example reported to the team is shown in **Table 5-2** with comments from EHS Support. The site comprises 6 to 8 ha of disturbance and the bond increased from $8,000 to $364,000 (~ 4,500% increase)[14].

Table 5-2 Review of Bond Calculation for Specific Site

Rate	Amount Added by ERR	EHS Support Comment
Remove all mobile plant and equipment from the site.	$4000	This issue is discussed in **Section 4.2.1**. Such equipment will almost certainly have resale and/ or scrap value to the point where no costs would be incurred.
Removal of general rubbish	$650	It is likely rubbish is removed as part of operational housekeeping as confirmed by the ERR comment in the

[13] https://www.worksafe.vic.gov.au/resources/health-and-safety-statistics-victorian-mining-exploration-and-extractive-industries

[14] There is also an allowance for $8,455 of tubestock planting which should be confirmed by ERR with the operator on-site.

Rate	Amount Added by ERR	EHS Support Comment
		assumptions "No chemicals are used on site plus no accumulation of rubbish and oils".
Load, cart and dispose of low-level contaminated soil off site to a licensed landfill.	$3,900	ERR comment: "Allow for oil spills during servicing (referred to in WP), hydrocarbon leaks during refuelling from vehicle mounted mobile fuel tanks etc. WPV diagram includes area for refuelling and maintenance where portable spill tray will be used". Unknowns should not be included in a bond calculation as the event is just as, if not more likely not to occur than to occur and therefore the calculation will overestimate the true liability.
Remove Bitumen sealed areas (car park, etc). Includes disposal of waste bitumen material off site at an appropriate landfill facility.	$2,520	ERR comment: "Refer PP condition: sealing of internal quarry access road for 210m length from quarry entrance". Such infrastructure is valuable and would likely be retained (it is acknowledged this has not been confirmed).
Cultural Heritage Protection - fencing as required by CHMP 14276	$13,500	ERR comment: "Permanent fence to be constructed around Archaeological site 65m x 25m (refer CHMP 14276 pg.ii) Assume fence height 1.8m and installation approx $75pm (avg cost of fence installation pm in Vic)". The operator should be allowed to propose an alternate rate as it is likely high. It is possible the fence could be installed during the operational stage.
Major bulk pushing (Clay Batter) to achieve grades nominated in the approval/permit (i.e. < 18^{o}). 50 to 100 m	$91,643	The rate in the calculator is high as described in **Table 4-2**. An allowance of 59,125 cubic metres is added with no explanation as to how it was calculated unless "Extraction floor to be formed with a smooth surface, clay to be imported (optional) and spread evenly over quarry floor (300mm to 900mm)" is related to this item. A comment in the assumptions says the exposed area was determined from Google Earth which is not an adequate means. It is understood ERR will visit the site and it is hoped that the attendee will be experienced and conversant with rehabilitation methods or at least open to the experience of the operators.
Major bulk pushing (Stiff Clay or Soft Rock with ripping) to achieve grades nominated in the approval/permit (i.e. < 18^{o}). < 50 m	$118,800	The rate in the calculator is high as described in **Table 4-2**. ERR comment: "Operational face at 1:2 to be dozed down to 1:3 for final rehab. Assume 19m deep 1:2 dozed down to 1:3 for operation face of 200m". Operator should be allowed to review the volume calculations and evaluate whether steeper slopes are sustainable.
Soil amelioration (adding gypsum, lime, etc)	$2,125	No justification for soil amelioration and this appears to be accounting for a potential unknown. Consistent with the commentary within this report, such unknowns should be relegated to the contingency.
Pest and Weed Management	$2,125	ERR comment: "Based on max disturbance allowed; also as requirement of PP". This is another case of allowing for

Rate	Amount Added by ERR	EHS Support Comment
		unknowns without justification. See **Table 4-2** for further discussion.
Multipliers	$66,198	See comments in **Section 4**

Notes: typos are left into the accurately reflect the ERR comment.
End land use

Table 5-2 shows close to $240,000 of costs (without the multipliers) that should be reviewed. This calculation was done by ERR using aerial imagery and without visiting the site or meaningful consultation with the operator. Though not confirmed, it is likely the officer did not have the appropriate experience to understand rehabilitation requirements and the associated cost. Compellingly, the operators have experience rehabilitating a quarry of a similar size (6-8ha) and with similar characteristics and were able to complete the rehabilitation in accordance with the relevant Work Plan for about $30,000. Further, the total estimated cost using the standard rate for small quarries of $4,000 per hectare is similar at $24,000 to $32,000. While the standard rate contemplates simple sites, the standard rate would more than ten times higher to get close to the new bond amount. This order of magnitude difference between the amount estimated by the calculator and the likely actual cost is supported by others within the industry with real examples.

The point about unknowns is made several times in this report. Costs should not be added for events that may not occur and/or where there is no evidence for its occurrence, for example contamination that is not evident. This unfairly increases the amount of the bond and results in an inaccurate representation of the rehabilitation liability at the point in time.

5.5 Cost of Holding Security

Bonds are required in the form of a bank guarantee and these are provided by way of a Letter of Credit from the banking institution. For most operations the bank requires either cash or other liquidity to be presented to provide the guarantee. Effectively, the bond requires the holder to provide an “up-front“ level of funds that cannot be drawn on or used for any other purpose. This is a clear barrier to entry to the industry (Day, National Competition Policy - Review of the Extractive Industries Development Act 1995, Extractive Industries Regulations 1989 and Extractive Industries Development Regulations 1996, 2001)**.**

There is evidence that financial institutions are requiring an amount of security for a bond that is greater than the value of the bond itself (Day, National Competition Policy - Review of the Extractive Industries Development Act 1995, Extractive Industries Regulations 1989 and Extractive Industries Development Regulations 1996, 2001). There is also evidence that unpredictable and aggressive rises to the bond liability can cause the financial institution to become more risk averse to that applicant and associated entities. Anecdotally, we are informed there is evidence of financial institutions moving away from the quarry industry.

Where rehabilitation bonds are large, the requirements of bank guarantees (tying up cash / assets and incurring ongoing fees) may restrict the ability of small firms to invest, which reduces their ability to compete, and profitability (Prentice, An Economic Analysis of the Rehabiliation Bonds System, 2001).

There are concerns that recent increases in these bonds will reduce investment by small firms in particular - reducing their ability to meet community expectations on the environment and safety as well as affecting their survival (Prentice, An Economic Analysis of the Rehabiliation Bonds System, 2001).

In addition to impacting an operators' liquidity, the bond system imposes an ongoing annual cost associated with the upkeep of the bond. Two examples from a PWC presentation obtained via correspondence (Andrew, 2021) provide useful context in regard to annual costs and are reproduced in **Table 5-3** (noting that the examples provided do not include the amount of security required).

Table 5-3 Price Waterhouse Coopers Examples of Costs associated with Bonds

Example 1:	Example 2:
• Bank guarantee: $300,000 (cash backed) • Term deposit interest rate: 3.5% • Issuance / Guarantee fee: 3.35% • Annual cost: c.$8,700	• Bank guarantee: $2,500,000 (property backed) • Annual cost: c.$81,250

An idea of the financial costs of the current rehabilitation system is provided in Day (2009) (**Figure 5-3**) and in most cases, clearly shows the significant cost of meeting Work Plan requirements (including the Rehabilitation Plan) and financing the required bond. The total outlay on primary permits and licenses to allow works to commence is significant and may not be recouped for several years post production. These examples are from when the Day report was penned (2009) and the requirements have increased further since then due to items such as vegetation offsets, cultural and heritage, and geotechnical review.

Table 3 Summary of costs of case studies

No.	New or Variation	Material Type	Pre-Application Process Cost ($)	Planning Permit or EES Process Cost ($)	Management costs ($)	Financing costs ($)	Total Costs ($)	Work Authority Approved	Approved or Rejected
1	Variation	Hard rock	Included in Planning Permit process	$3,500,000	$525,000	$1,112,033	$5,137,033	Not submitted	Rejected via EES
2	New	Hard rock	$510,687[16]	$532,498	$55,317	$152,835	$1,289,337	Pending VCAT mediation	
3	Variation	Sand	$327,000[17]	$159,000	$38,880	$145,015	$669,895	Not submitted	Rejected at VCAT
4	Variation	Hard Rock	Included in Planning Permit process	$1,400,000	$98,000	$406,134	$1,904,134	Pending EES ruling	
5	Variation	Hard rock	$157,000	$185,000	$17,100	$96,450	$445,550	10-08-07	Approved
6	New	Hard Rock	$442,000	$179,000	$62,100	$188,700	$871,800	20-07-09	Approved
7	New	Sand / soil	$8,200	$1,000	$1,000	Nil	$10,200	28-03-08	Approved
8	Variation	Hard rock	$703,976[18]	$92,603	$79,658	$242,088	$1,118,325	01-06-07	Approved
9	Variation	Sand	$69,600[19]	Not at this stage	$3,500	$20,196	$93,296	Pending	

16 This includes offsets for habitat hectares of$490,000

17 This includes land holding costs of $200,000.

18 Includes purchase of land for native vegetation offsets.

19 This is an unfinished stage as at July 2009 Draft Work Plan yet to be submitted to DPI due to delay in completing CHMP.

Figure 5-3 Cost of Compliance (source: Day, 2009)

Irrespective of the way funds are arranged to secure a bond, the impact of the bond to prospective industry entrants is to reduce by the guaranteed amount the availability of working capital the business can draw on for normal business purposes such as purchasing plant and machinery. For small operators with limited availability of credit this can have a decisive impact. For a person desiring to enter the industry it can have the effect of making the proposition not viable. Equally it may also dissuade existing operators from expanding their operations to other sites (Day, National Competition Policy - Review of the Extractive Industries Development Act 1995, Extractive Industries Regulations 1989 and Extractive Industries Development Regulations 1996, 2001).

The operation of the current bond system and its reliance on the provision of security to underwrite the bonds ties up assets and constrains the ability of operators to borrow funds and/or invest their own money into new technology or expansions and remain competitive. Similarly, it is likely to reduce profitability for larger operators who may decide to invest elsewhere. This viewpoint is backed by a considerable weight of opinion across Government and Industry and forms a strong argument for change (Day, National Competition Policy - Review of the Extractive Industries Development Act 1995, Extractive Industries Regulations 1989 and Extractive Industries Development Regulations 1996, 2001), (Day, An Unsustainable Future: The Prohibitive Costs of Securing Access to Construction Material Resources in Victoria, 2009), (Prentice, An Economic Analysis of the Rehabiliation Bonds System, 2001).

Interviews undertaken with a range of quarry operators corroborate the findings of the Prentice and Day reports (Prentice, An Economic Analysis of the Rehabiliation Bonds System, 2001) and (Day, National Competition Policy - Review of the Extractive Industries Development Act 1995, Extractive Industries Regulations 1989 and Extractive Industries Development Regulations 1996, 2001), identifying the following key concerns about the current bond system:

- Ties up large and material sums in securities for the bonds, reducing cash flow and limiting the ability to borrow funds, invest / expand and compete.
- Presents a high barrier to market entry and are a significant impost on smaller (landowner / family) operators.
- Places unnecessary financial burden, on an operator by tying up equity, most particularly for low risk, rural, campaign-based quarries.

With the example discussed in **Section 5.4** (4,500% increase in bond amount), the magnitude of the bond amount would have increased leading to an increase in the annual cost of holding the bank guarantee. In turn, this adds to operating costs and the real cost per unit (e.g. tonne) of product. If this increase is wholly or partially passed onto customers the competitiveness of the quarry's product reduces and may lead to the market preferring larger operators who can absorb such increases. Conversely, if the increase is added to the quarry's operating cost, the already slim margins become slimmer and possibly to the point that the operation is no longer viable. In such a case, as a result of the demise of a small business the knock-on effects discussed throughout this document will eventuate.

The Queensland Government undertook a holistic review of its financial assurance scheme in 2017 (Queensland Treasury, 2017b) and noted the following regarding Bank Guarantees (**Figure 5-4**), which were then the driver behind the change to a pooled fund:

- Increased cost – providers applying increased fees or requiring cash deposits
- Decreased coverage – banks reducing their risk profile and moving away from bonds, leaving a limited selection of providers and reducing competition
- Lack of flexibility – changes to a bank guarantee incurs charges and costs
- Administrative burden / Timely resolution – negotiation of terms and management of bonds increases time and cost burden
- Concentration – reduction of providers concentrates Bank Guarantees with a smaller number of banks, increasing the number held by each bank and the risk to the State if one provider were to fail.

The identified industry issues point toward a scenario where operators face increasing charges and reduced competition between providers when seeking a financial institution to guarantee their bonds. The lack of competition between providers also impacts State exposure to the risk of unfunded rehabilitation costs because the remaining institutions will hold a greater percentage (number) of bonds. Therefore, should a provider become insolvent, a larger number of bonds may not be able to be called on, increasing the monetary amount that the State may have to find from other sources to fund necessary rehabilitation.

Resources Industry issues	State issues
Increased Cost Due to Basel III* capital adequacy requirements and other factors increasing focus on capital management, existing bank guarantee providers are charging increased fees or requiring the entity obtaining the bank guarantee to deposit some or all of the value of the guarantee in cash with the provider.	**Administrative Burden** Bank guarantees take the form of a physical document. The State is exposed to operational risk and administrative burden from storing these documents.
Decreased Coverage Coupled with the Increased Cost issue, Banks are generally reducing exposure limits to resource operators or seeking increased return. This is resulting in a limited range of banks providing a Bank Guarantee services.	**Concentration Issues** The decreasing number of banks willing to provide bank guarantees to resource operators exposes the State to greater risk of unfunded rehabilitation costs because the failure of one provider will affect a large number of sureties.
Flexibility A Bank Guarantee is generally for a fixed value, meaning that any adjustment to the required amount of financial assurance generally incurs additional fees and administration.	**Timely resolution of financial assurance** The State has a template form of Bank Guarantee. However, it is possible to negotiate the terms of Bank Guarantees and the State is experiencing delay and administrative burden from managing requests to negotiate individual forms of Bank Guarantee

After considering State and the Resources Industry's concerns about the current framework, the Government has identified the need to revise and enhance the system of surety in Queensland.

*The capital adequacy requirements known as Basel III issued by the Basel Committee on Banking Supervision (Basel Committee). Australia is a member of the Basel Committee.

Figure 5-4 Issues with Bank Guarantees (source Queensland Treasury, 2017b)

5.6 Rehabilitation and Sterilisation of Resources

Progressive rehabilitation is the rehabilitation of areas no longer required while operations continue in other areas of the same site. Progressive rehabilitation is mandated under Section 81 of the MRSDA. As discussed in **Section 3**, there appears to be little incentive for operators to prioritise progressive rehabilitation despite its potential to materially impact (reduce) both the size of the rehabilitation bond and the perceived contingent liability for the State.

Current regulatory advice (ERR, Rehabilitation Bond Calculator, 2021) is that ''if an operator takes steps to progressively rehabilitate sections of a site as activities take place, the liability and therefore bond amount can be reduced to recognise the completed activities.'' But industry feedback indicates that there has been limited uptake of opportunity to use progressive rehabilitation as a method to reduce rehabilitation liability. This may be due to the impracticality of rehabilitating areas to final landform while continuing operations at a site, but it may also be due to the fact that undertaking final rehabilitation where resources are still *in-situ* can negatively impact the value of the site and even sterilise resources.

Under the MRSDA, the final land use must be safe, stable and sustainable, where the sustainable aspect aligns with the principles of sustainable development.

The Brundlant commission (1987) defined sustainable development as ''development that meets the needs of the present without compromising the ability of future generations to meet their own needs'' and goes on to propose that assessment of sustainable development needs to include Economic, Environmental and Social sustainability.

EHS Support argues that for campaign-based quarries, sustainable development can be achieved through the creation of a safe and stable site that can easily be reactivated in future to supply new

campaigns – supporting economic and social sustainability. Ultimately this demonstrates environmental sustainability (and limits future capital expenditure) through the avoidance of greenfield sites and the use of existing infrastructure (e.g. roads, power). The same argument can be made for those sites where the proposed final land use is industrial or seeks to benefit from the anthropogenic land modification that has occurred.

The benefit of leaving a potential future resource in a condition where it could easily and cost-effectively be reopened is clear, especially where future shortfalls in supply of quarrying materials are forecast (PWC, 2016).

Impacts to land value and the sterilisation of resources are further discussed in **Section 6.6.4**.

5.7 Summary

The costs associated with regulation and providing bonds have increased for the quarrying industry over the last few decades and are likely to further increase with the new bond calculator and current view of the industry and bond amounts by ERR. Cost increases are challenging the viability of small operators which has a direct impact upon the State in that these operators tend to be in regional locations close to where product is required. Cost to build regional infrastructure will increase as demonstrated by several reputable sources reported herein. The impacts extend beyond direct cost with increase travel distance leading to increased accident risk, increased wear on infrastructure, and increased greenhouse gas emissions all of which have indirect costs. Increased travel distances may lead to an increase in the carbon footprint of the industry at a time when the world needs to decarbonise.

Notwithstanding these comments, the regulatory framework and the specific documents required is considered by EHS Support to be reasonable and consistent with other jurisdictions. Rather, the issues are the uncertainty associated with long review times and inadequate feedback from ERR and misuse of the bond calculator. Both these issues can be traced to an under-resourced and inexperienced department with those responsible for calculation and review of bonds lacking the training and experience to properly evaluate what is required. This is compounded by the move away from experienced inspectors who knew the site and operators and a move to evaluation of rehabilitation quantities using tools such as Google Earth™.

A bond estimate should not allow for events that are unknown and that have at least as much chance if not more likelihood of not occurring. There is evidence that such instances are finding their way into bond calculations inflating amounts and resulting in an inaccurate estimate of the true rehabilitation liability. At least one example was found for this report whereby a bond amount has increased over 4000% and the operator confirms they have rehabilitated a similar site for an order of magnitude lower cost.

Progressive rehabilitation is a challenging issue for the quarrying industry. Such rehabilitation is beneficial for all reducing the liability on the State by removing potential work to be undertaken in the event of a default and reducing an operators' rehabilitation liability at specific points in time. However, the nature of quarrying is that areas of a site may be made inactive until demand for the product increases again. In such cases, the face will be made safe and stable but not fully rehabilitated. There is a rate in the bond calculator that should be more widely used and recognises that while the land is not fully rehabilitated, work has been done that would reduce the cost to the State if they had to step in.

6 Extent and Nature of Rehabilitation Risks associated with Quarrying, Potential Exposure to the State, and Mitigating Factors

The purpose of this section is to describe the extent and nature of rehabilitation risk associated with quarrying in Victoria. Key objectives are to:

- Place the potential rehabilitation liability and risks to satisfactory rehabilitation from quarries into context with mines.
- Articulate the exposure to the State from potential rehabilitation liabilities associated with quarries in Victoria.
- Explain quarry-specific factors that will mitigate the risk that the State will be required to expend money to rehabilitate a site.

6.1 Risk to the State – Why Government must Regulate

The reasons for requiring a bonding system are clear - to minimise the risk of funds not being available for rehabilitation, thereby avoiding the taxpayer carrying this burden. This is the primary reason for bonding and financial assurance systems across Australia. Prentice (Prentice, An Economic Analysis of the Rehabiliation Bonds System, 2001) articulates why regulation is justified using a "market failure" concept and states "Hence, the unregulated market may result in too high a level of external costs from unrehabilitated work authorities". He concludes "it seems there is a clear economic case for regulation of rehabilitating work authorities". This report concludes that regulation is required for rehabilitation and bonding of the quarrying industry and the level of regulation (e.g. the stages and documents required and the level of detail within those documents) is not unreasonable and is consistent with other jurisdictions.

There is no doubt governments must concern themselves with rehabilitation liability. One major case of rehabilitation liability falling to the State is described below. There is a noticeable lack of Victorian quarry sites that have defaulted. Consequently, the example below is a mine in Western Australia and is discussed to illustrate why in the often-unscripted world of the day to day running of a State; governments and communities may be vulnerable to fearful emotion. Further, work undertaken since the default has lessened the burden on the taxpayer.

Mining at the Ellendale Diamond Mine[15] located in the West Kimberley region of Western Australia commenced in 2002. The mining tenements were held by Kimberley Diamond Company (KDC). Mining activities ceased at Ellendale in July 2015 when KDC went into administration and later was placed into liquidation (DMIRS, 2019). Environmental liabilities for the mine were estimated to be in the order of A$40 million and ongoing care and maintenance costs in the order of $100,000 per month. These were borne by the State (with some drawn from the fund). To add insult to injury, after signing onto the Mine Rehabilitation Fund in 2013, KDC received A$12 million in returned bond payments and used just less than $11 million to repay an existing loan. In the subsequent year KDC contributed $0.8 million to the fund making the estimated gap between cost to rehabilitate and amount paid to the fund close to $40 million.

This is a sobering example. However, one of the reasons this happened was that the liquidator filed a Notice of Disclaimer of Onerous Property under the Corporations Act, which when uncontested by the West Australian Government allowed KDC to terminate their rights, interests and property

[15] http://www.dmp.wa.gov.au/Geological-Survey/Ellendale-29338.aspx

relating to Ellendale. At time of writing, this apparent loophole in the Corporations Act has not been closed and indications from the Senate, 2019 report are that it will not be anytime soon.

After the mine was closed in 2015, the West Australian Minister for Mines and Petroleum created an exemption area under Section 19 of the Mining Act. This section allows the Minister to invite a mining company or consortium to apply for a new mining lease. Recent announcements[16] indicate *Burgundy Diamond Mines* have purchased the site from Gibb River Diamonds and are planning on developing the mine. The Ellendale case illustrates one of the risks States face but also how sites can have a future that will avoid the State having to fund rehabilitation. Such a future is even more pertinent for a Victorian quarry where the value of the resource and/or value of the land are typically high.

In Victoria, the Yallourn Coal Mine has suffered several major events. In 2007, a mine batter failed catastrophically and resulted in complete diversion of the Latrobe River into the mine (Victorian Government, 2008). The failure was about 500 m long on an 80 m high slope and encompassed about six million cubic metres of material. Flooding of the mine occurred again in 2012 and in July this year (2021). While these failures are very high cost to rectify and damaging to the environment (fortunately there was no loss of human life), they should not feature in a debate about bonding the quarrying industry (other than to make this point). The types of events do not pass the fundamental test of bonding – they are not known (prior to the event) and not estimable. Further, such catastrophic events are less likely to occur on quarries.

These examples are discussed as such events are used to justify bonding and the consequences are sufficiently terrifying for people to take notice. However, their use in support of such arguments is misplaced. They are not quarries in the first case and the State did not have to fund full rehabilitation. It is noteworthy that, as a consequence of the Yallourn events, the quarry industry created risk-based regulations and specific guidance on ground stability.

Examples of quarry sites being managed by the State are discussed in **Section 6.4.4**.

6.2 Is the State Liable

It is clear the State is responsible to the community for rehabilitation on Crown Land. It is not clear why this responsibility extends to privately owned land.

In ERR's Rehabilitation Bonds Guidelines the issue is mentioned:

> *The Department is non-discriminatory with respect to land tenure and requires bonds to be lodged for operations on both private and Crown land. This position is in keeping with the objectives of the MRSD Act which requires land which has been mined, or from which stone has been extracted, to be rehabilitated. The Department ensures that all land is rehabilitated to an appropriate safe, stable and sustainable standard (i.e. in relation to public safety, amenity, potential impacts on the environment and having due regard to the principles of sustainable development as set out in section 2A of the MRSD Act).*

However, this statement does not provide support for the State's responsibility to rehabilitate private land. Further, nothing in the MRSDA indicates the State is legally responsible for

[16] https://www.australianmining.com.au/news/burgundy-takes-first-steps-in-ellendale-development/

rehabilitation on private land. It does accurately illustrate the State's responsibility to regulate quarrying activities including rehabilitation by enforcing compliance and monitoring performance.

Commentary from ERR (meeting 8 November 2021) indicates acknowledgement that at least the issue is not clear cut, though they raise the issue of protection of adjoining land.

Day (Day, National Competition Policy - Review of the Extractive Industries Development Act 1995, Extractive Industries Regulations 1989 and Extractive Industries Development Regulations 1996, 2001) lays out a reasonable argument for the State not holding legal responsibility for rehabilitation on private land stating:

> *Where land is privately owned and a holder has an agreement with the landowner to use the land for an extractive industry, if the holder leaves the site un-rehabilitated the responsibility should fall on the landowner. This would be consistent with the Act which (as distinct from minerals) vests ownership of the stone resources with the landowner*.

Day goes on to test the supposition by focussing on who would be liable for two specific cases in the event private land is not rehabilitated – if an accident occurred and reduced land value. In the first case, Day argues the landowner is responsible:

> *The landowner has the discretion to allow the extractive industry to use the land and has the discretion (as to) how the land will be rehabilitated.*

On the land value issue, Day describes forces that will drive value up or down and suggests an unrehabilitated site will not necessarily be of lower value. Two examples are: economically attainable materials remaining and the nature of the unrehabilitated landform is amenable to an intended use (e.g. voids making a landfill viable (so called value "air space"), variation in topography making pumped hydro viable). Both examples demonstrate that a WA retains commercial value following a default scenario (refer **Section 6.5.3**).

These arguments while well-made and important to the overall rehabilitation liability discussion do not directly address the core issue government must attend. The point is best made by a scenario: the operator finishes exploiting the resource but is without the funds to rehabilitate and the land owner is suffering financial stress (or taking it to the extreme – both parties are insolvent). In this case, the cost of rehabilitation, regardless of who is liable would fall to the State. The scenario is unlikely in practice for the reasons discussed throughout this report. Regardless, government must allow for it and the community would likely expect it (though we have not tested this). This case would score high in the proposed risk tool and consequently would require a full or close to full, bond. In most other cases, several of the mitigating steps would come into play that would make actual expenditure (or at least significant expenditure) by the State unlikely.

Informal discussion with a legal professional indicates their view is that Government ultimately holds responsibility for rehabilitation irrespective of the land ownership. EHS Support's view is that while there appears to be albeit limited grounds to contest this view, a proper determination is beyond the scope of this report (as informed by the legal professional as to what would be required) and in any case is more likely to support Government's position. The focus should be on the estimation of the State's actual contingent liability as discussed in the next section.

6.3 Contingent Liability

Contingent liabilities are defined under international accounting standards and country specific standards. DPJR defines contingent liabilities similarly (DJPR, 2021):

> *"… possible obligations that arise from past events, whose existence will be confirmed only by the occurrence or non-occurrence of one or more uncertain future events not wholly within the control of the entity, or present obligations that arise from past events but are not recognised because – it is not probable that an outflow of resources embodying economic benefits will be required to settle the obligations, or the amount of the obligations cannot be measured with sufficient reliability".*

DPJR state the contingent liability is raised as per the requirements under the MRSDA, which stipulates holders of a Work Authority are required to rehabilitate their site, and failure to do so by them, may result in the State being liable to rehabilitate the sites under the Act. The contingent liability represents an estimate of the State's possible financial exposure, in the event that authority holders with a rehabilitation bond shortfall default on their obligations and the State makes a determination to rehabilitate the sites. Put simply, the contingent liability is the difference in funds held in bonds and the actual rehabilitation liability.

The contingent liability reported by DPJR is $124M (cut shot (DJPR, 2021)) and this includes mining and quarrying. This is up from $30M in 2018-2019 as reported in the VAGO report.

Quantifiable contingent liabilities as at 30 June

	($ thousand)	
	2021	2020
Legal disputes	–	1,144
Insurance claims	502	502
Mining site rehabilitation bonds(i)	123,674	55,790
Total contingent liabilities	**124,176**	**57,436**

ERR calculate contingent liability using the framework illustrated below and this provides fodder to argue that the real State liability is much less as it recognises factors such as likelihood of default should be accounted. This framework is similar to that proposed in this report for calculating the actual rehabilitation bond amount for quarry sites.

Source: VAGO.

In reality, the contingent liability is likely nowhere near that stated (and possibly even zero) due the mitigating factors discussed in this report.

6.4 Adequate Amount to be held by the State

6.4.1 Government Assessment

According to the VAGO report (VAGO, 2020), ERR undertook a preliminary assessment of how much it would cost to rehabilitate Victoria's mines and quarries and found that the $813 million figure may be $361 million short. VAGO opined that the $361 million is a low estimate because the assessment was done largely as a desktop analysis and automatically applied $10,000 as the estimated restoration cost for over 500 mines and quarries that currently have less than $10,000 in rehabilitation bonds and a modest 10% increase in restoration costs for over 800 sites that currently have at least $10,000 in rehabilitation bonds.

If the actual likely rehabilitation costs are considered on a site-by-site basis and added together, the above evaluation is reasonable. Though it is not clear whether WA that were not approved at that time and where quarry activities were yet to commence were included. If they were this would lower the actual rehabilitation liability. The bigger issue is the evaluation does not consider the actual exposure of the State in terms of the amount that they may need to expend to rehabilitate sites if defaults occur. For example if an operator defaults, the State is likely to be able to pass the site on to a third-party to either continue operations or develop as an alternate land use. In such cases, the actual exposure of the State is significantly less than the cost to rehabilitate the site.

6.4.2 Form of Bond

Ensuring the State has the right amount of funds to cover rehabilitation not undertaken by the proponent is key to the bonding framework. The debate is what amount this translates to when all the mitigating factors are considered. This is important in the context of this report because a bonding system such as that in Victoria whereby the bond must be held in a bank guarantee, ties up capital that could otherwise be used for developing the resource and investing in safety and performance improvements.

In a 2017 discussion paper, the Australia Institute[17] (Australia Institute, 2017) stated Australian governments collectively held around $10 billion in environmental bonds for mine rehabilitation liabilities alone. Based on individual State estimates, this is now likely to be over $12 billion. For context, anecdotally the amount set as a target for the West Australian Mine Rehabilitation Fund was in the order of $500M and was set as it was the largest rehabilitation amount for a single mine (the Kalgoorlie Super Pit). The point is made because it shows that the West Australian government recognised the State's liability is not the total rehabilitation liability of all mines and resource projects.

The biggest actual rehabilitation costs are associated with large and financially stable multi-national mining and oil and gas companies. In support of this, the Queensland Treasury Financial Provisioning Scheme 2019-20 Annual Report (Queensland Government, 2020) states "Analysis of risk outcomes completed within the 2019-2020 financial year and a preliminary review of environmental authorities yet to be assessed identifies that the bulk of the State's rehabilitation exposure sits with investment grade or equivalent entities (that is, strongly rated companies with relatively lower probabilities of default)".

[17] The Australia Institute is a not-for-profit independent think tank funded by donations and grants.

Acknowledgement that a bank guarantee based bonding system unnecessarily hinders industry and that the real liability to the State from rehabilitation is mitigated by factors such as stability of the company and value of the resource, are posited as two key reasons why Western Australia and Queensland moved from a bank guarantee based bonding system to a pooled fund system. In both cases an estimate of rehabilitation liability is still made based on "100% rehabilitation"[18]. However, the actual amount the company must pay is determined by a multiplier. In Western Australia the multiplier is 1% of the estimated total rehabilitation liability and in Queensland the highest rate is 2.75%. Queensland does have special cases where by high-risk proponents are still required to provide surety.

South Australia has a fund specifically for the quarrying industry. Income for the Extractive Areas Rehabilitation Fund is assigned from the royalties received from or recovered on extractive minerals. The State can still require a bond if it is determined that the site rehabilitation liability poses a disproportionate risk to the State. An actuarial assessment of the fund is completed when required to ensure the balance of the fund adequately protects the state from the risk of unfunded rehabilitation liabilities, and to inform the setting of the prescribed rate of hypothecation into the fund. Importantly, funds can only be used if all other enforcement measures have been exhausted. The fund acts as a low-cost financial assurance model for industry where financial security is generally not required.

South Australia has a risk-based approach to managing rehabilitation liabilities associated with oil and gas and geothermal activities. The amount to be paid is determined by two factors: 1. Deemed assets - estimated monetary value of exploration projects, pipeline assets and proven (1P) reserves for production projects; and 2. Financial performance. The applicable security level is determined by the intersection of these two factors on a financial security level matrix. The security level is multiplied by the Rehabilitation Liability Estimate (RLE) to determine the amount of financial assurance to be paid or held.

A key aim of the framework was to reduce the risk associated with legacy and orphan wells and this achieved via a risk-based approach using evidence-based management plans. Wells are categorised by their operating status which include active, inactive, expired, legacy and orphan. Inactive wells attract a fee with the fee increasing with the age of the well (e.g. wells greater than 31 years old attract a fee of $46,500 per year). Any well that has been inactive for more than 24 months requires a Future Use Plan to be submitted for approval by DEM. A Rehabilitation Management Plan (RMP) is required for Expired Wells. The RMP must articulate how the wells are prioritised for rehabilitation and how rehabilitation will occur. Expired wells must be rehabbed at a minimum rate of 2 wells per year (1 to 40 wells) or 5% of the total number (> 40 wells).

The South Australian approach gives an indication as to how the Victorian quarrying industry bond system may move to a risk-based system that accounts for mitigating factors such as value of the resource.

All jurisdictions in Australia have a system in place and these were reviewed for a previous report (EHS Support Pty Ltd, 2020). The report concluded that a pooled fund with options to provide surety for higher risk companies or where the risk to the State is too high, is the optimal bonding framework that balances the objectives of minimising the risk to the State while not unduly burdening industry. Further, the Queensland Treasury Corporation in its review of the Queensland

[18] This phrase is inserted in quotation marks as the concept of 100% rehabilitation liability estimation from generic calculators attempting to represent multitude of variations of sites and rehabilitation activities is not realistic.

framework (Queensland Treasury Corporation, 2017) recommended the State expand the market for the provision of upfront rehabilitation bonds, or surety, beyond the Australian regulated banking sector to include other entities (including insurance companies).

The advantages of a pooled fund are:

- Frees up capital allowing companies to invest in safety and productivity improvements.
- Is readily tailored to a risk-based method, by the use of varying contribution / levy rates depending upon the risk of default /extent of potential government expenditure.
- Allows use of the interest generated from the fund for other related activities such as rehabilitation research[19].
- Allows government to access a larger pool of funds rather than just a specific bond for a site.
- Funds are directed to the specific issue of rehabilitation rather than to the banks.

The primary arguments against a pooled fund are that it does not encourage progressive rehabilitation and may increase the risk of default by unscrupulous operators. On the former, the bond review system should encourage operators to progressively rehabilitate by supporting the use of the *Maintenance of the rehabilitated areas that are intended to be part of the ongoing closure of the site* rate not only for rehabilitated but also areas that had been made safe and stable pending potential further access to the resource as market conditions dictate. Further, the risk filter discussed in this report has the potential to encourage progressive rehabilitation.

The risk of unscrupulous operators defaulting exists regardless of the bonding system. This risk should be addressed by proper resourcing of the regulatory authority to maintain visibility on the financial stability of companies and the status of rehabilitation / environmental performance on the sites (inspections by experienced and suitably qualified personnel).

The issue of who would manage such a fund and how it would be administered is important to consider. There are examples of industry managed funds around the world, but the primary framework seems to be government managed. In Queensland the move from surety to pooled fund required a change in legislation and appointment of a Scheme Manager. An important consideration in building that legislation was ensuring the funds could only be used for specific purposes and providing transparency as to the management of the fund. The specifics of such a framework must be carefully thought through considering the fund will rapidly contain hundreds of millions of dollars and could build to billions.

The opinion of this report is the benefits of a pooled fund outweigh the disbenefits and is worth pursuing despite it likely requiring significant legislative change.

6.4.3 Current Bond Amounts

The Earth Resource Regulation 2019-20 Annual Statistical Report (DJPR, Earth Resources Regulation 2019-20 Annual Statistical Report, 2020) documents rehabilitation bonds. Of note:

- $93 million of rehabilitation bonds were held for quarries (extractives)
- $718 million of rehabilitation bonds were held for mining

[19] It is not a recommendation of this report but interest could be used to fund an external expert panel that could inspect sites, review bonds submissions, and adjudicate disputes.

- A total of 65 rehabilitation bonds were reviewed (across both the extractives and mining industry), 32 of which increased, 3 did not change and 30 decreased following review. Details regarding which industry bond were reviewed for were not included in the report.

ERR provides a list of all bonds at the website[20] and the bonds held as of 3 December 2021 are summarised in **Table 6-1**.

Table 6-1 Bond Amounts for Mining and Quarrying in Victoria

Instrument	# Bonds Held	Total Amount	Percentage of Total Amount
Exploration License	223	$3,126,000	0.4
Mining License	203	$717,853,364	88
Prospecting licence	42	$439,000	0.05
Retention licence	20	$433,000	0.05
Work Authority (quarries)	912	$92,648,153	11
Total	1,397	$814,499,517	100

The largest bonds are representative of the largest potential rehabilitation liabilities with the coal mines in the Latrobe Valley accounting for 82% of the held bonds. For quarries, the largest bonds held by companies are the large multinationals including Boral ($9.5M), Holcim ($12.6M), and Hanson ($7.9M). The largest individual Work Authority bond amount is held by Adelaide Brighton Cement ($6.9M).

While the amount held far exceeds what the actual rehabilitation liability to the State would be when the likelihood of defaults is considered, the current bond system in Victoria does not allow a draw on the common funds. Funds can only be drawn on a bond for a specific site and this is likely a reason why 100% rehabilitation liability for each site is required. This provides another reason for moving to a pooled system whereby the common funds could be accessed and achieve a benefit to industry and the state by freeing up capital that could be invested in safety and performance improvements and developing the resources.

Taking the actual likely rehabilitation costs in isolation, some of the existing bond amounts are less than what the actual cost would be to rehabilitate a site. There are examples where the site has extensive high walls with vertical faces and comprehensive handling equipment (e.g. conveyors) or where over-excavation has led to exposure to third-party infrastructure (e.g. public roads) or potential harm to the environment. However, such high-risk sites are the exception for quarries and in most cases, one or more of the mitigating factors apply.

6.4.4 Actual Defaults and Rehabilitation Costs

The VAGO report states that other than for rehabilitation of the Benambra mine in East Gippsland, ERR was unable to advise of other instances when the State rehabilitated mines or quarry sites

20 https://app.powerbi.com/view?r=eyJrIjoiNDkzYjE5MzktNmY3Mi00MWUzLWJiMGItY2YwMTM1OTEzMTI2IiwidCI6IjcyMmVhMGJlLTNlMWMtNGIxMS1hZDZmLTk0MDFkNjg1NmUyNCJ9

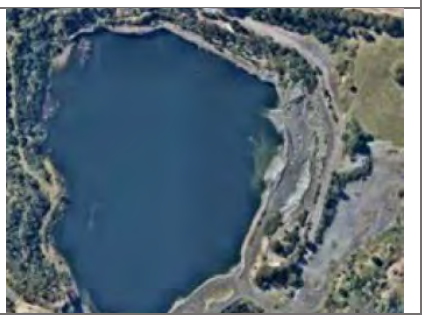
under the Act. Further pursuit by VAGO indicates no bonds have been called in by ERR. Definitive information from ERR on the nature and extent of any calls on bonds was not obtained for this report. However, anecdotally, calls on bonds are rare and more importantly, actual defaults by quarries leading to expenditure by the State on rehabilitation are not evident.

The reasons for the lack of defaults are discussed throughout this report and include longevity / stability of ownership; commercial arrangements for leasing (typically with local private landholders); and the value of the land and resource. Related to value of the resource, a WA has a commercial value and is a tradeable item. An operator who foresees economic hardship or failure will most likely choose to exit the industry by offering the WA to the market (competitors and others interested in entering the sector). This is a primary reason why defaults have not occurred. Further, if a WA is cancelled, consultation with both the landowner and local government authority must occur prior to release of the bond. This further reduces the risk to the State.

In an October 2021 presentation to the quarrying industry (Earth Resources, 2021), ERR discussed several sites as examples of current rehabilitation risks (**Table 6-2**). While some of the rehabilitation issues are significant, in most cases there are factors that materially reduce or remove the risk that the State may have to fund rehabilitation. These are discussed in **Table 6-2**.

Table 6-2 Government Presentation – Examples of Rehabilitation Risks

Permit Year Granted	Company Location Product Area Bond	Government Comment	Mitigating Factors	Image
WA185 PL both depth limited and not depth limited	Wodonga Quarries Wodonga Sand 101 ha Bond $455K	Scale of unrehabilitated areas Erosion of unrehabilitated batters	The image shown does not accurately represent the rehabilitation status. The eastern pit is fully rehabilitated. Part of the southern pit is rehabilitated. The northern / western pit is awaiting feedback from ERR on the rehabilitation method. Large company committed to rehabilitation.	
WA45 1989 Title PL with no depth limit.	Yea Sand and Gravel Ghin Sand & gravel 32 ha Bond $511K	Rehabilitation of adjacent creek required Potential for Off-site Impacts	Large company committed to rehabilitation. Process of approving rehabilitation method has been ongoing since 2017/18.	

Permit Year Granted	Company Location Product Area Bond	Government Comment	Mitigating Factors	Image
WA91 1979 PL depth limited	Boral Resources Tanjil East Basalt Old 138 ha Bond $621K	Faces steeper than approved workplan Scale of unrehabilitated areas Erosion of terminal faces Surface water drainage issues Revegetation lacking resilience	Multi-national large company with extensive operations in Australia and large bond commitment across its operations.	
WA382 1976	Hanson Construction Materials Harkaway Basalt Old PL no depth limited 60 ha Bond $1.2M	Vertical faces Erosion issues Risk to public safety Backfill deficit Operations ceased > 10 years ago	Multi-national large company with extensive operations in Australia and large bond commitment across its operations.	

A commonly held industry view is that estimates made by rehabilitation calculators are high because they do not reflect the lower costs that can be realised using the company's equipment. The counter to this is that the rehabilitation estimate must be the costs that government could attain if they had to take over the site. This underplays the ability of government to negotiate competitive rates. Notwithstanding, actual cost expended on rehabilitation of sites informs the potential gap between the cost estimated by a calculator and actual amounts. One example given by an operator is rehabilitation of a 6 ha site for less than $30,000. The same operator stated they have a similar size site with similar rehabilitation requirements and the calculated bond amount is over $300,000. This is a 10X differential which even accounting for the additional cost that government perceives it would require to manage the site themselves is excessive.

6.5 Mitigating Factors for Quarries

One of the key points made in this report is that the likelihood and consequence of default by quarry operators / land owners is low. This section discusses specific factors that serve to mitigate the risk of default by quarries and the magnitude of potential expenditure by the State should a default occur.

6.5.1 Stability, Ownership and Longevity

The likelihood of default is considered by the State in its assessment of contingent liability. However, it does not factor in the instrument used to secure bonds (bank guarantees) or the setting of bond amounts. Actual defaults across the Australian resource industry including oil and gas and mining are rare. The financial and environmental regulation in Australia and industry developed Codes of Practice mitigates this risk.

Instances of quarry defaults whereby the State of a Victoria had to expand money on rehabilitation are non-existent. Part of the reason for this is the stability of the quarry operators in Victoria especially the smaller operators where in many cases the land and / or business has been owned by the same family for decades. When land is leased they are typically long term and made with private landholders who are responsible for the bonds.

This stability mitigates the risk that a default will occur in the first place.

6.5.2 Value of Resource

A commonly made point by quarry operators is that while an economically viable resource remains, a quarry is an asset and should be treated as such in the context of rehabilitation bonding. The current system does not allow for this aspect. It is acknowledged that in some cases the costs of rehabilitation may outweigh the proceeds from future quarrying. However, this is unlikely to be the case during the early stages of quarrying and in any case would be offset in most cases by the value of the land. Further, in the unlikely event the State has to step in, the future commercial arrangements could be set so that a portion of the proceeds are allocated to rehabilitation, sacrificing some profit for the greater good.

Where quarries are early in their development with large quantities of remaining resources (as certified in accordance with the JORC code), the value of the resource and the demand for quarry products, means that:

1. An operator encountering difficulties is likely to offer the WA to the market as part of its exit strategy – decreasing the likelihood of a default; and
2. Should a default occur it is highly likely that another operator would take on the site, avoiding altogether the need for the State to step in. This point is made by Day writing on behalf of the government: “there is every likelihood that an abandoned site would be attractive to another quarrying industry operator and the Review Team has been told of examples where abandoned work authorities have been purchased and the sites re-commenced under a new work plan” (Day, National Competition Policy - Review of the Extractive Industries Development Act 1995, Extractive Industries Regulations 1989 and Extractive Industries Development Regulations 1996, 2001).

The value of the asset and the site should therefore be taken into account during estimates of rehabilitation liability, because it is highly likely that with minimal expenditure the State Government will find a new operator to take on the Site and its associated liabilities. The longer a site has been operating, or the smaller the amount of unrecovered resource, the less this argument holds true.

Regardless of the economic analysis undertaken, the value of the resource serves to reduce the risk to the State of significant expenditure on rehabilitation if a default were to occur. Returning to Day: “The point here is that extractive industry sites have commercial value and this should act to assuage some concerns about abandoned sites being left to the Government to rehabilitate”.

6.5.3 Value of Land

Metropolitan Melbourne is projected to grow by to a population of around 6.3 million people by 2031. By 2051 the Greater Melbourne area is projected to grow to around 8.5 million people (Department of Enviornment, Land, Water, and Planning, 2021). Demand for industrial land remains high for uses such as logistics and advanced manufacturing. These sectors continue to require large tracts of land, and as such, the provision of a well-suited supply of industrial land will continue to be

required to support the contemporary Victorian economy ((Department of Enviornment, Land, Water, and Planning, 2021).

Figure 6-1 shows the locations of CMPA members sites in Greater Melbourne. Many sites are in areas where the value of land for residential and associated commercial and infrastructure development is high and increasing.

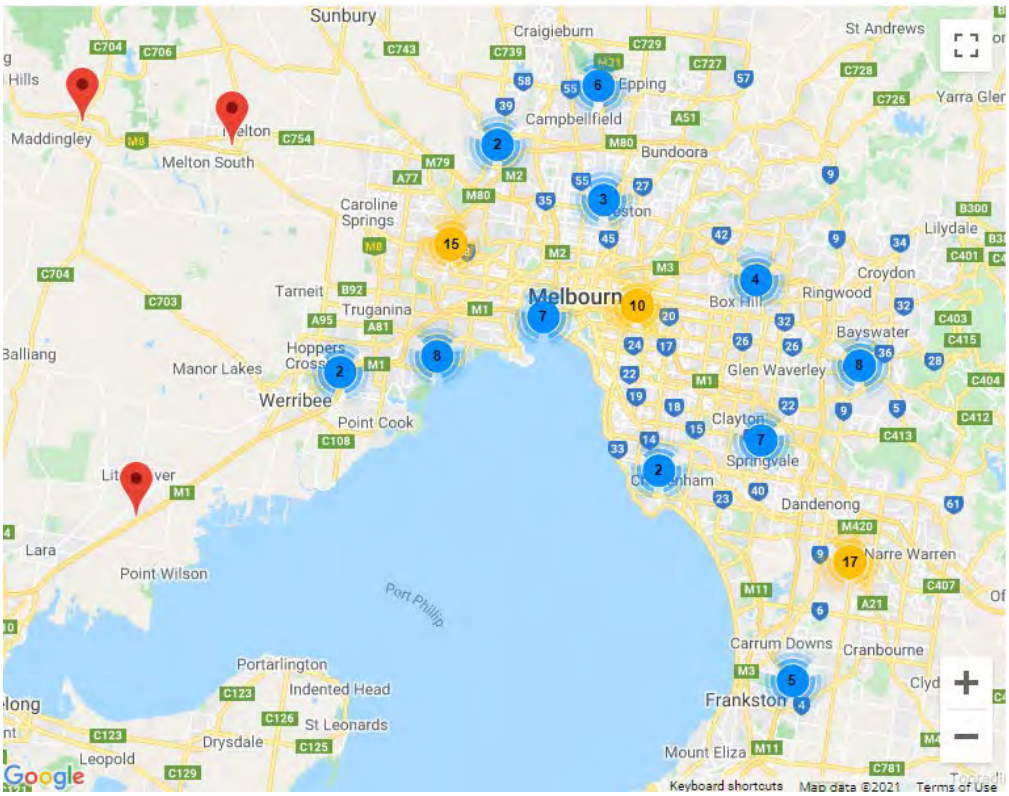


Figure 6-1 Quarry Locations in and near Melbourne city (CMPA members only)[21]

In Bendigo, industry has achieved sustained growth relative to the State and the demand for land is forecast to grow and in some cases be constrained. The supply of industrial lots in area between 1 hectare and 5 hectares, are forecast to be completely exhausted by 2027 (Remplan, 2020).

Figure 6-2 shows the locations of CMPA members sites in Greater Bendigo. Similarly to Melbourne, many of these sites are in areas where land is in high demand.

[21] https://cmpavic.asn.au/member-map/

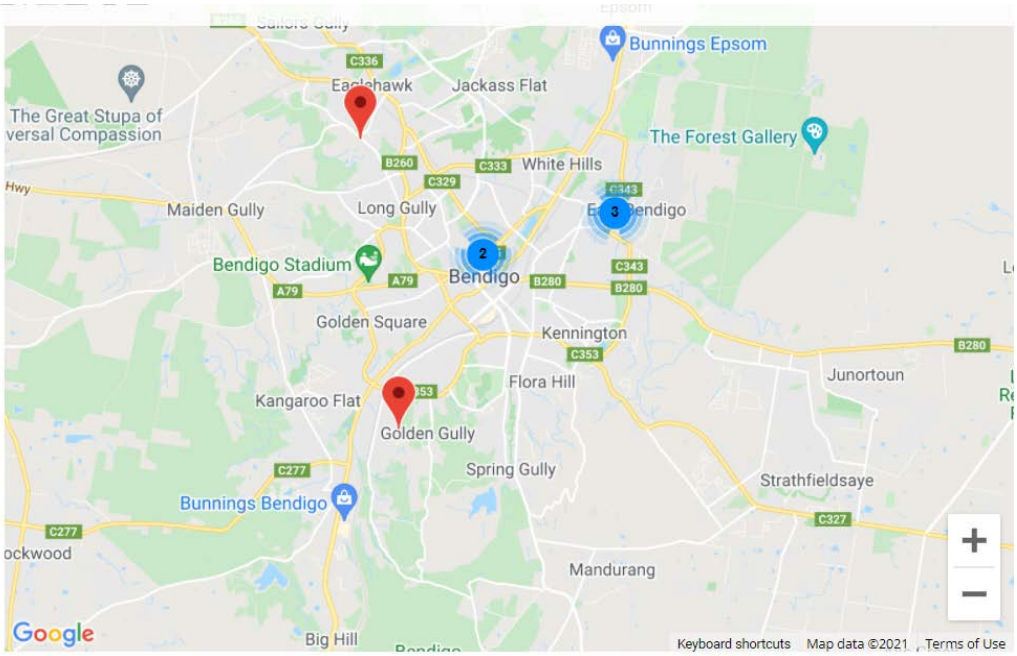


Figure 6-2 Quarry Locations in Greater Bendigo (CMPA members only)[22]

Regardless of the source of information or the evaluation undertaken, land in Victoria will continue to be valuable and likely increase in value as the population increases and activities thirsty for hectares such as warehousing for ecommerce and the infrastructure that will support decarbonization (e.g. solar panels and batteries, wind turbines, hydrogen plants), grows.

Victoria has a history of beneficially re-using former quarries often retaining pits, walls, and other features to enhance the development. The recently published (by the Victorian Government): "The New Lives of Old Quarries – Innovative Development after quarrying ceases" (DJPR, 2022) showcases former quarry sites where such features are retained to create "premium" residential and nature developments with "dramatic cliff face(s) and uniquely sloping blocks", "impressive views of the city", "beautiful lakes", and "popular fishing spot(s)". The document shows former quarries turned into residential developments (e.g. Valley Lake); parks, gardens and reserves (e.g. All Nations in Northcote, Quarries Park in Clifton Hill, and Quarry Reserve in Ferntree Gully); shopping centres (Highpoint); and one of Melbourne's premier attractions for locals and visitors, The Royal Botanic Gardens. Such uses often increase the value of surrounding land. Return of buffer land previously required around a quarry site adds further value.

Rehabilitation of quarried land back to grade is often, and in many cases, definitely not, the best (and thereby most sustainable) use of land for the community and State. The Victorian Government document discussed above provides compelling support to this case. For uses requiring air-space and changes in topography such as the examples above, high cost activities (e.g. excavations) are already completed by virtue of the quarrying. This reduces the risk to the State in that expenditure to return the land to grade would not be required. Such sustainable outcomes should be reflected in the bond assessment process.

In an example calculation undertaken by EHS Support (**Section 5.4**), the impact of rigid assumptions made in Rehabilitation Plans was realised. In this case, the Rehabilitation Plan stated a 1:3 batter,

[22] https://cmpavic.asn.au/member-map/

when in reality, steeper batters are evident throughout the natural and built environment and a steeper batter could assist in realising a future use that better serves the community. In such a case, if the end use could inform the bond calculation, the operator benefits from increased capital during production and the community ultimately benefits from a useful area after rehabilitation.

6.5.4 Retention of Infrastructure

The topic of retained of infrastructure in context of financial assurance has been discussed in several jurisdictions including Victoria. For a bond calculation to accurately reflect the potential rehabilitation cost it must not allow costs for infrastructure that would be retained. The retention of infrastructure should be loudly communicated across all aspects of regulation as it is fundamental to a sustainable society. Inclusion of a blanket assumption that all infrastructure must be removed is counter to our aspirations for a sustainable future.

On quarry sites and resource sites in general, valuable infrastructure is supplied by the owner and or built by the operator and useful for the owner to retain. Such infrastructure includes tracks and roads, hardstand, water storage, sheds and warehouses, and service connection including electricity and water. Further in some cases, processing equipment and buildings are an important part of our heritage and every effort should be made to retain and reflect these amounts in the bond calculation.

A common issue associated with this aspect of bond calculation is the effort required to demonstrate that infrastructure will be retained. Considering submitters of a bond calculation are subject to recourse if knowingly incorrect information is stated, adding a comment about retention of infrastructure to the calculation notes should be sufficient. Confidence could be improved by having a simple form that states the infrastructure to be retained and is signed by the bondee and operator or recipient of the infrastructure. This form could be submitted with the bond calculation.

6.5.5 Risk of Degradation to the Environment

Compared to quarries, mines are typically larger, more complex, and have inherently higher risk of environmental degradation and rehabilitation challenges. While the main environmental risks posed by each sector are similar, the magnitude of potential impact to the environment that would affect rehabilitation is vastly different.

Within the quarry industry, the risk of degradation of land is further reduced by the nature of activities. Often quarries are inactive (no production) pending market demands. In the 2020-2021 report (DJPR, 2021), ERR reported that just over half of quarries with WA's were producing. Further, an industry practitioner informs that blasting is only undertaken on a subset of those sites. Regardless of the actual numbers, the fact is only a subset of quarries carry out aggressive activities that may ultimately require more intensive rehabilitation.

Regulation serves to further mitigate the risk of degradation to land as the Minister can cancel a WA under Section 77O of the Act if, for example, the Holder "has not substantially complied with this Act or the regulations" or "has undertaken work on the land other than in accordance with the work plan". This can serve to prevent more serious degradation controlling potential rehabilitation cost. Consequently, even in the unlikely case of a quarry defaulting on its rehabilitation obligations in combination with a depleted resource and low land value, the actual nature and extent of rehabilitation required is more likely to be easily defined, readily executed, and low cost.

The main environmental risks potentially affecting rehabilitation associated with quarrying and mining are summarised in **Table 6-3** and **Table 6-4**. The entries are informed by Publication 1823.1 (EPA Victoria, 2021) and the expertise of the practitioners associated with this report.

6.6 Key Differences between Mining and Quarrying

The differences between mining and quarrying are such that the case is clear to treat the sectors separately with respect to rehabilitation regulation and bonding. **Table 6-3** summarises the key differences and further detail on specific items is contained in other sections.

Table 6-3 Key Differences between Mining and Quarrying

Item	Quarrying	Mining
Ownership / leasing of land	• Several owner / operator sites • Land is often held long held (multiple decades) by a family business • Leases are typically long term and made with private land owners who are responsible for the bonds • Land owners give specific permission for activities to occur and receive compensation	• Often on Crown Land • Rarely if at all on company owned land
Business ownership	• Often family owned and operated with many running the operations from the beginning • Many smaller operators	• Often large multi-nationals
Ownership of Resource	• Sits with Landholder (section 11A of the MRSDA) • Royalties to the owner	• Sits with the crown (section 9 of the MRSDA) • Royalties to the State
Value of resource and markets	• A quarry in its early stages is an asset, not a liability. All future earthworks can be funded by a new operator who can step in, sell product, and fund the rehab earthworks. • Resource and costings are more predictable and relatively easy to quantify. Relatively low financial risk. • Prices are locally controlled • Quarry markets are spread over a range of opportunities and a range of products that are tied to the State's and Country's growth and maintenance of standard of living.	• With mining (as opposed to quarrying) estimates of yields and costings can be hard to predict. Thus mining can be financially risky. • Mining more complex, ready operators • Prices typically subject to international markets and often a single commodity.

Item	Quarrying	Mining
Agreements with landowners	• Owner often provides infrastructure such as ponds and tracks. Such infrastructure should not be part of the bond as it will be retained.	• Company often builds infrastructure
Environmental risks and extent of degradation to land (see **Table 6-3** for details)	• Generally smaller scale, simple processing, benign materials, lower risk of ignition. • Dust and noise emissions are generally the key environmental concerns and these are not relevant to rehabilitation liability.	• Typically larger, more complex, with inherently higher risk of environmental degradation and rehabilitation challenges. Fire risk from coal, toxic chemicals used in processing, often large waste storages (e.g. tailings dams) containing acid-forming, toxic, hyper-saline materials.
Right of Entry	• Landholder must give consent to proposed operations	• Mining Licence gives right to access land, but Landowner consent must be provided as part of the Mining Lease application

Table 6-4 Comparison of Environmental Risks

Item	Quarrying	Mining
Ignition risk causing fire leading to injury / death of humans and animals; damage to vegetation and general environment; property, infrastructure and equipment damage.	Quarried materials are generally benign, no or minimal processing steps using materials that can ignite, mostly only small and often no volumes of bulk fuel stored on the sites. Simple infrastructure and equipment.	Coal is readily ignited. “Open-cut coal mines are vulnerable to fire (e.g. from spontaneous combustion) that may spread quickly and is difficult to extinguish” (VAGO, 2021). Recent example is the Hazelwood mine fire in 2014. The inquiry report estimated the cost borne by the State at $100 million. Tragic recent examples of tailings dam failures in Brazil. Mines often use large quantities of combustible diesel and other fuels and store such materials on site in bulk.
Toxic chemicals released into the environment causing contaminated land, surface water and/ or groundwater.	Quarried materials are generally benign, no or minimal processing steps using toxic / contaminating materials.	Processing of gold ore can generate arsenic and mercury concentrated in tailings. Both chemicals are toxic to humans and wildlife. Mines often use large quantities of diesel and other fuels and store such materials on site in bulk that can be contaminating if released to the environment.
Acidification of water	Quarried materials are generally benign. No acid forming materials.	Oxidation of potentially acid- forming materials from acid rock drainage.

Item	Quarrying	Mining
Excavation, groundwater pressure change, poorly stabilised walls leading to subsidence, cracks in roads and buildings.	No underground mines and therefore no vulnerability to subsidence and collapse from such activities. Quarries may have near vertical faces with sub-benches but these are the exception and near vertical faces are in competent rock.	Typically larger scale pits with high walls. Very large waste structures and storage facilities including tailing dams may contain potentially acid forming / hyper saline / toxic / radioactive materials. Yallourn coal mine example discussed in **Section 6.1**.

It is acknowledged that the modern mining industry typically strives to avoid / minimise environmental harm and generation of waste; however, the inherent nature and extent of the activities associated with mining make the potential for a rehabilitation liability higher than for quarrying despite the regulatory framework and bond calculator being similar.

6.7 Summary

This section demonstrates that the risks to the environment from quarrying are relatively benign, well understood, and damage readily rectified. The nature of the quarrying business is such that there is inherently low risk of operator default and even in this unlikely scenario, in most cases the value of the remaining asset and land would be outstrip the rehabilitation liability.

Considering the mitigating factors discussed in this section including the overall risk of default in the first place (and especially multiple default), the value of remaining resources, and the value of land, the actual rehabilitation liability to the State from the quarrying industry is likely significantly lower than that reported by government. A detailed study into land value may indeed show that large scale default maybe cost positive.

Understanding these factors and applying them to the industry at large has the potential to create a powerful risk-assessment tool that will:

- Assist the government in better understanding the rehabilitation liability from quarrying, and
- Deliver bond valuations that account for the inherent value of the site and resource in a state that is not the final rehabilitated landform.

EHS Support proposes the implementation of this risk-assessment tool and provides further discussion on its design and operation in **Section 7.5**.

Finally, holding bank guarantees is a financial burden (especially on smaller operators) that could be alleviated by a move to a pooled fund such as that operated by Queensland and Western Australia. Such a system has benefit to government in that if a default occurs, they can access the pooled funds rather than just the amount covered under a bond for a specific site.

7 Specific Issues and Proposals

This section focusses on specific aspects of the bonding system and proposes changes.

7.1 Regulation

Increasing regulation over time has resulted in an inefficient, costly and time-consuming approvals process that does not give full reign to the flexibility allowed by the legislative framework.

To allow tailoring of rehabilitation plans and bespoke rehabilitation methods or outcomes, it is recommended that the regulatory guidance material supporting the rehabilitation process is updated to state more explicitly that guidelines are just that, and where alternative approaches are proposed, appropriate supporting information should be provided to assist in regulatory decision-making. This should promote a shift to outcome-focused assessment and conditioning of rehabilitation (an approach that is used in other jurisdictions).

This recommendation supports and strengthens a theme that is woven into the fabric of some but not all guidance / policy material; and in these instances, is a call for the recognition of the opportunity to move away from prescriptive and risk-averse outcomes.

For example:

- the Preparation of Rehabilitation Plans Guideline for Extractive Industry Projects (2021) includes the following:
  - *…The level of detail and supporting information required in a rehabilitation plan should be proportionate to risk…*
  - *…While upfront clarity in rehabilitation obligations and outcomes is important, it needs to be viewed in the context of what level of information and knowledge can reasonably be expected at the application stage of a quarry. If you cannot provide sufficient detail for any element in the rehabilitation plan, the actions that you will undertake to acquire the level of detail required should be included instead…*
  - *…You should make your own informed assessment on what level of supporting information may be required and what is relevant to your particular operation and site…*

- the Regulatory Practice Strategy for the Rehabilitation of Earth Resources Sites
  - *Develop rehabilitation risk profiles for the earth resources sector. We will develop an up-to-date profile of the risks associated with rehabilitation across the earth resources sector. <u>We will use this information to inform a risk-based approach to the regulation of site rehabilitation activities and outcomes</u>* [emphasis added].
- Other material such as the Geotechnical guideline for terminal and rehabilitated slopes (DJPR, 2020) which are more prescriptive, may require some amendment to make allowance for alternative approaches where sufficient justification can be provided.

The ability for operators to choose their own path in terms of rehabilitation opens the door to bespoke pragmatic solutions and moves away from a one-size fits all approach. This would allow for innovation in the rehabilitation space and real-time evolution of best practice. The onus would be placed on the operator to justify the proposed rehabilitation outcome.

7.2 Rehabilitation and Sterilisation of Resources

There appears to be little incentive for operators to prioritise progressive rehabilitation despite its potential to materially impact (reduce) both the size of the rehabilitation bond and the perceived contingent liability for the State.

Rehabilitation must be undertaken as specified in the Rehabilitation Plan, and the final land use must be safe, stable and sustainable, where the sustainable aspect aligns with the principles of sustainable development (sections 5 and 11(2)(b)(i) of the MR(SD)(EI) Regulations.

EHS Support argues that for campaign-based quarries, sustainable development can be achieved through the creation of a safe and stable site that can easily be reactivated in future to supply new campaigns – supporting economic and social sustainability. Ultimately this demonstrates environmental sustainability (and limits future capital expenditure) through the avoidance of greenfield sites and the use of existing infrastructure (e.g. roads, power).

EHS Support recommends that progressive rehabilitation during operations is not viewed as returning parts of the site to the final landform but is designed to lead to a safe and stable site, maximising its resale value, conserving resources for future use (sustainable), and limiting the State's exposure to contingent liability.

A rehabilitation approach that allows flexibility in terms of rehabilitation methods and encourages progressive rehabilitation toward a common rehabilitation outcome will likely increase the ability of operators to use progressive rehabilitation as a means of reducing rehabilitation liability and reduce the level of contingent liability that the State is exposed to.

7.3 Resolution on Point of Time and Frequency of Review of Bond Calculation

A major source of inaccuracy of rehabilitation liability estimation in Victoria has been the requirement to calculate based on the point of maximum disturbance of the land for a defined stage as documented in the approved Work Plan. Recent communications from government[23] indicate an acknowledgement that this is not appropriate method and the supposition made herein is the reason is that it does not fairly reflect the rehabilitation liability at a reasonably anticipated time frame.

It is understood ERR now encourage or offer annual bond reviews with the calculation based on the maximum disturbance within the year.

Annual bond reviews are welcome in that they would more accurately represent the rehabilitation liability at a point in time (or the short term), but without a simple and effective process preparing the calculation and supporting information and engaging with the department creates an additional burden on Authority Holders. There is also some doubt as to whether ERR is adequately resourced to undertake timely review of annual submissions.

EHS Support proposes the following:

[23] "An important change to the way bond amounts are calculated now recognises ongoing and completed rehabilitation works, this encourages site operators to complete rehabilitation work early rather than waiting until their projects are completed". https://earthresources.vic.gov.au/about-us/news/improving-rehabilitation-provisions-for-resources-sites

1. Allow companies to state the number of years the calculations will represent – up to a maximum of 5 years.
2. Regardless of the number of years the company stipulates, they must prepare the calculation based on their best estimate of maximum disturbance in the period.
3. If the company becomes aware they will exceed the stated maximum disturbance in the period, they must recalculate their bond and re-submit prior to exceeding the stated amount.
4. The maximum disturbance entered to the calculator can never exceed that approved in the Work Authority.

EHS Support considers that the inclusion of aerial survey with working notes would also provide a simple and efficient method for assessing disturbance and activities at individual sites. Over time, a picture of the speed of growth and disturbance footprint can be built up and each 'point in time' survey provides a baseline against which future impacts can be assessed. An additional benefit for the regulator, in that in requiring a visual assessment, operators are more likely to build a greater awareness of their environmental footprint and build it into their operations as part of holistic decision-making (e.g. marketing or phasing / scale of future developments).

7.4 Changes to Bond Calculator

EHS Support's review of the 2021 Bond Calculator identified the areas where improvements may be made to the useability, functionality and accuracy of bond calculator and recommends their adoption:

- One workbook could be created to cater for all types of quarries and mines vastly reducing complexity and improving transparency.
- Alternatively a simple workbook could be separated from the other types of disturbance and tailored to quarrying.
- Amend domain layout to allow easy review of items within the same Domain (see **Figure 4-1**)
- Remove the "Applicable Y / N" column
- Update calculator to remove the pre-populated value (see **Figure 4-3**)
- Amend the rates as detailed in the recommendations column of **Table 4-1**
- Review and update those rates identified in **Table 4-2**

7.5 Acknowledging Lower Risk Profile of Quarrying

EHS Support has considered how best to account for the differing risk profile of quarrying to mining. Key differences are the general risk of environmental harm and the stability of ownership. This needs to be coupled with an understanding of the resources remaining and the intended remaining lifespan of the quarry and the potential value of land. Resources remaining and remaining life of quarry combine to provide an indication of the likelihood that another operator will take on the site as an operational concern, thereby minimising the State's exposure to contingent liability. The value of land lessens the risk of material expenditure by the State in the unlikely event of a default.

EH Support recommends the following principles apply to a risk filter concept.

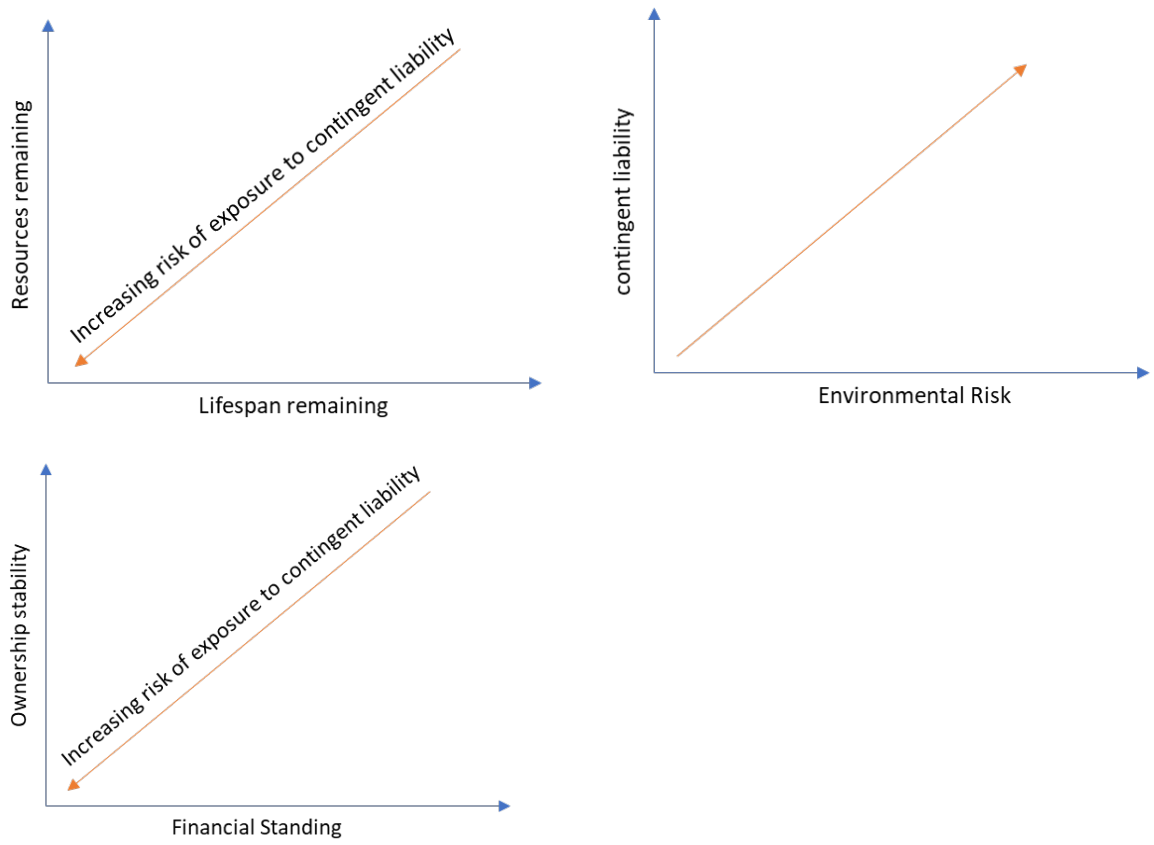


Figure 7-1 Risk Filter Considerations

Using an appropriate assessment methodology the risk-weighting for each individual site will be calculated. The risk-weighting will be on a scale of 0-1, with those sites where the State's exposure is greatest have a weighting of 1 (meaning that the full estimated rehabilitation liability would be applied). Less exposure leads to lower risk-weightings.

EHS Support considers that this approach provides a simple tool to effectively assess the State's exposure on a site-by-site basis. Its implementation would not require legislative change but would result in material change to bond amounts for quarries and more accurately reflect the true likely rehabilitation cost.

For example, a site may have an estimated rehabilitation liability of $500,000, but has limited depth, no on-site chemical storage, ample remaining resources and is owned by a reputable and longstanding privately held business and/or large multinational business with high credit rating. As a result it receives a 'low' risk weighting – theoretically 0.3. This is applied to the RLE to give an actual bond value of $150,000.

This approach has similarities with the Queensland system whereby a risk-based (though only financial in the Queensland case) contribution rate is applied to the bond calculation to determine the amount payable to the pooled fund. The approach described above allows the existing system to continue until a pooled fund system could be evaluated.

7.6 Form of Bond

The existing instrument for bonding is a bank guarantee (or cash in limited cases) is a significant burden on industry particularly smaller operators. It ties up capital and assets that may otherwise be

used to improve safety and productivity. Queensland and Western Australia moved from a bank guarantee-based system to a pooled fund. Such a fund has significant advantage for government most notably the ability to access a pool of funds rather than a specific bond for a site.

7.7 Feasibility of Proposed Changes

Table 7-1 sumarises changes discussed in the report and estimates the effort to implement, impact to industry and government of the change, and the likelihood that governed would consider the change. The intent of the table is to focus in on low effort, high impact, readily achievable actions that will benefit industry and government.

Table 7-1 Proposed changes and feasibility of implementation

#	Item	Action	Effort	Impact	Conclusion
Bond Calculator Structure					
1	Bond calculator pre-population	Correct calculator so it does not include any pre-populated fields once downloaded	Low (an easy edit to the calculator)	High (if values not deleted, an additional $70,000 is added to the bond value)	ERR likely to implement
2	"Applicable Y / N" column	Remove	Low (an easy edit to the calculator)	High – increased useability and functionality	ERR likely to implement
3	*'Maintenance of the rehabilitated areas that are intended to be part of the ongoing closure of the site'*	Remove category	Moderate – easy physical change to the calculator, but involves a change in stance from the regulator	Moderate – impact will be to increase simplicity and useability of the calculator	ERR may implement
4	*'Remove all mobile plant and equipment from the site'*	Remove category	Moderate – easy physical change to the calculator, but involves a change in stance from the regulator	Moderate – impact will be to increase simplicity and useability of the calculator	ERR may implement
5	'Groundwater management – quality and quantity of groundwater'	Remove category	Moderate – easy physical change to the calculator, but involves a change in stance from the regulator	Moderate – impact will be to increase simplicity and useability of the calculator	ERR may implement
6	'Monitoring and Maintenance Costs During the Rehabilitation Works Period'	Remove category	Moderate – easy physical change to the calculator, but involves a change in stance from the regulator	Moderate – impact will be to increase simplicity and useability of the calculator	ERR may implement

#	Item	Action	Effort	Impact	Conclusion
7	'Any Other Costs That Would be Reasonably Expected To Be Required to Rehabilitate the Site and are not Covered Elsewhere in This Calculator'	Remove category	Moderate – easy physical change to the calculator, but involves a change in stance from the regulator	Moderate – impact will be to increase simplicity and useability of the calculator	ERR may implement
Bond Calculator Rates					
8	Drill and blast	Review rate	Moderate – requires ERR to resource a review and update to the calculator outside of any planned maintenance.	Dependent on what change (if any) is made as a result of the review	ERR may implement
9	Major bulk push	Align with rates in Qld calculator as per Ascent environmental report	Moderate – requires ERR to resource a review and update to the calculator outside of any planned maintenance.	High – largest component of rehab cost, even small reductions in the rate will have a large impact on overall costs	ERR may implement
10	Pest and Weed Management	Review rate and/or consider lower rate for smaller sites or those without known pest or weed issues	Moderate – requires ERR to resource a review and update to the calculator outside of any planned maintenance.	Low – if rate similar to Queensland adopted, it is a reduction of $140/ha	ERR may implement
11	Powerlines	Include rate for lower cost wooden power poles	Low, simple addition of new rate to account for on-ground reality	High – potential cost difference of c.$10,000/km	ERR likely to implement
12	Reshape mullock in Quarries	Correct units error	Low (an easy edit to the calculator)	High (if values are entered as cubic metres the errors could be significant)	ERR likely to implement
13	Source local material, cart and spread suitable material to cap the tailings storage (cap thickness determined by approval/licence) > 5km	review rate	Moderate – requires ERR to resource a review and update to the calculator outside of any planned maintenance.	Dependent on what change (if any) is made as a result of the review	ERR may implement

#	Item	Action	Effort	Impact	Conclusion
Form of Bonding					
14	Change the bond framework	Move to a pooled fund	High (likely requires a change to legislation)	Significant benefit to industry (frees up capital) and government (access to pooled) funds.	Encourage government to evaluate.
Risk filter / tool					
15	Risk filter	Develop and apply a risk filter to account for quarrying's lower risk profile	Moderate – novel approach to rehabilitation requiring further work to develop.	High, recognises reduced risk of quarry operations and associated reduction in the State's exposure to contingent liability,	ERR may implement
Regulation / Policy					
16	Progressive Rehabilitation	Review of requirements and assessment approach (refer to **Section 7.2** for details)	Low – it is arguable that the necessary flexibility is already present in legislation and policy and may require someone to test the system.	High– increased up take of progressive rehab will limit rehabilitation liability for operators and also limit exposure to contingent liability for the State.	ERR may implement

7.8 Proposed Review of Bond Changes

The following recommendations are made for about 10 months hence:

- Review bond changes. The objectives will be to identify the specific reasons for changes and provide opinion on whether they are justified.
- A high level review of any changes made to the bond system and industry responses (e.g. is the proposal annual review cycle working and beneficial).
- Impacts of any advocacy undertaken on behalf of the industry.

8 Limitations

EHS Support Pty Ltd ("EHS Support") has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of the Construction Materials Processors Association and only those third parties who have been authorised in writing by EHS Support to rely on the report. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the Proposal.

The methodology adopted and sources of information used by EHS are outlined in this report. EHS has made no independent verification of this information beyond the agreed scope of works and EHS assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to EHS was false.

This report was prepared In October and December 2021 and is based on the information reviewed at the time of preparation. EHS Support disclaims responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

This report contains information obtained by inspection, sampling, testing or other means of investigation. This information is directly relevant only to the points in the ground where they were obtained at the time of the assessment.

Whilst to the best of our knowledge information contained in this report is accurate at the date of issue, subsurface conditions, including groundwater levels can change in a limited time. Therefore, this document and the information contained herein should only be regarded as valid at the time of the investigation unless otherwise explicitly stated in this report.

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Appendix A Team Credentials

EHS Support has completed several major studies and reviews of financial assurance and reporting for the mining, energy, and other extractive industries. EHS Support has completed financial assurance estimates and studies in SA, NT, QLD and NSW and has developed guidance and calculators for the Queensland Government. One of our EPA accredited Auditors regularly verifies financial assurance estimates for landfills in Victoria. We have also completed numerous advocacy assignments for Industry including the Queensland Resources Council, APPEA and the Mining Club associated with, rehabilitation requirements, offsets, financial assurance, and taxation.

EHS Support is currently working on the closure and rehabilitation of the Anglesea Coal Mine in Victoria and has worked on decommissioning and rehabilitation of quarry/borrow sites in Queensland, provided risk assessments and evaluations to support transfer of quarry sites between private entities and from private entities to public entities and has numerous projects involving mine closure in the United States. Our core strengths include an understanding of the regulatory complexity (and inherent duplicative nature of regulation in Victoria with Mine and Quarry closure, a track record in mining and extractive industries and a core role (and associated credibility in development of financial assurance guidance). The team includes specialists in rehabilitation bonding, mine and quarry rehabilitation, and extractive industries regulation.

Table A-1 Key Contributors

Person / Company	Qualifications / Role	Relevant Experience
Kevin Simpson EHS Support	Bachelor of Mechanical Engineering / Principal Engineer	Over 20 years of environmental engineering experience including development of bond estimates and engineering cost estimates for development projects. Kevin authored the EHS Support 2020 paper Financial Assurance – Getting the Balance Right.
Phil Wilkinson EHS Support	MSc Environmental Impact Assessment / Senior Environmental Scientist	Over 15 years environmental and regulatory experience including as assessment delegate for the Queensland Government deciding Financial Assurance applications. More recently, Phill has been assisting in the major review of the Queensland Estimated Rehabilitation Calculator and developing estimates of rehabilitation liability for various clients.
Mike Slight	Mining Engineer Specialist technical input from a mine / quarry rehabilitation perspective	Over 40 years mining experience including at the General Manager level. Mike held site management responsibility for operations as well as planning for, and successfully implementing and closing two large-scale mining operations. Mike was responsible for the establishment, management, and leadership of a corporate closure planning function within Newmont's Asia Pacific region. This included management responsibility for the company's seven closed mine sites across Australia. Mike has been a member of the University of Queensland's Centre for Mined Land Rehabilitation advisory board for over 10 years and served two terms as chair of the Mining Rehabilitation Fund Advisory panel of the Department of Mines, Industry Regulation and Safety of WA.

Person / Company	Qualifications / Role	Relevant Experience
Natasha Reifschneider ESA2	Specialist technical input on the extractive industry in general	An extractive industries specialist with over 22 years of professional experience in the management and delivery of impact assessment and environmental and planning approvals for the industrial and infrastructure sector. Natasha undertakes work for extractive industry companies including Holcim, Hanson, and Fulton Hogan. She is a member of the Institute of Quarrying Australia.
Stephen Cambridge EHS Support	Chartered Professional Environmental Engineer Contaminated Land Auditor appointed by the EPA Victoria	Stephen has extensive experience in understanding regulation in Victoria under a broad number of acts associated with mining, resource development, water and the environment. As an Auditor, Stephen has been involved in the Work Authority approval processes
Nigel Goulding EHS Support	M. Phil., Environmental Science first class honours / Director	Currently works on projects in the US, Canada and Australia involving the remediation and rehabilitation of industrial, upstream oil and gas and mining sites. Mr Goulding was extensively involved in the review of former proposals from State government on changes to financial assurance and has worked on over 200 major projects where financial assurance and rehabilitation has been required. Mr Goulding is the technical director for the closure of the former Alcoa Anglesea Mine and has worked on mine closures for Alcoa around the world.
Matt Russ EHS Support	Bachelor of Environmental Engineering (Hons) / Project Hydrogeologist	Over 5 years of experience within the environmental assessment, remediation and auditing industry. Matt has worked on a wide variety of projects including environmental site assessments, remediation projects and statutory environmental audits for clients in the rail, manufacturing, water, oil and defence industries.

Appendix B Review of Rates in the Bond Calculator

Bond Calculator Rates

	Item		Quarries > 5ha		Small open cut and quarries (<=5ha)		DES 2018		Comment
1	Backfilling faces and benches as specified in the work plan< 1km	< 1km	$ 3.90	m3			$ 4.92		ok
2	Backfilling faces and benches as specified in the work plan1-2km	1-2km	$ 5.22	m3					ok
3	Backfilling faces and benches as specified in the work plan2-5km	2-5km	$ 6.88	m3					ok
4	Backfilling faces and benches as specified in the work plan5km	5km	$ 9.13	m3					ok
5	Clean small surface water management dams (include all structures) to be retained after mine closure - make	0	$ 2,360	@	$ 2,360	@	$ 10,500		ok DES high
6	OR Backfill dams and reinstate to natural surface. (Push only)	0	$ 0.74	m3	$ 0.74	m3			ok
7	Construct a standard stock fence around the site	0	$ 9.44	m	$ 9.44	m	$ 15.20		ok
8	Construct safety berm, catch bench and barrier around the pit perimeter (required where final pit will include s	0	$ 67.85	m			$ 23.20	$ 46.10	On high side but ok
9	Contingency	0	$ -	%	$ 76.70	%			ok
10	Deep ripping	0	$ 590	Ha			$ 405	$ 750	ok
11	Demolish / relocate FIXED process infrastructure (ie. crushers, screening plants, pug mills and wet mix plants)	0	$ 189	m2					Revisit if time permits. Comment on focus area
12	Demolish and remove industrial buildings such as workshops and large sheds	0	$ 189	m2	$ 188.80	m2			Revisit if time permits. Comment on focus area
13	Demolish and remove overhead conveyors, transfer stations & gantries (scrapping only - does not include dism	0	$ 295	m	$ 295.00	m	$ 385		ok
14	Demolish and remove overland conveyors, transfer stations & gantries (scrapping only - does not include dism	0	$ 370	m					ok
15	Demolish and remove small buildings / tanks	0	$ 82.60	m2	$ 82.60	m2			Revisit if time permits
16	Demolish thickener tanks or flocc tanks (variable rate for small, medium and large structures).< 10 m dia	< 10 m dia	$ 11,800	#			$ 10,000		ok
17	Demolish thickener tanks or flocc tanks (variable rate for small, medium and large structures).10-30 dia	10-30 dia	$ 41,300	#			$ 30,000	$ 45,000	ok
18	Demolish thickener tanks or flocc tanks (variable rate for small, medium and large structures).> 30 m dia	> 30 m dia	$ 88,000	#			$ 85,000	$ 100,000	ok
19	Direct seeding (native tree species OR using native grasses), with single application of fertiliser	0	$ 4,130	Ha	$ 4,130	Ha	$ 3,635	ha	ok, DES 2021 will be close
20	Direct seeding (pasture grass species), with single application of fertiliser	0	$ 1,062	Ha	$ 1,062	Ha	$ 1,415	ha	ok, DES 2021 will be close
21	Disconnect and terminate services	0	$ 35,000	item	$ 35,000	item	$ 35,000		Same source
22	Drill and blast a vertical face to achieve a minimum batter angle of 33 degrees, where blasts < 3000 t, face heig	0	$ 4.72	m3			$ 1.92	$ 2.55	Challenge rates, DES is first principles
23	Drill and blast a vertical face to achieve a minimum batter angle of 33 degrees, where blasts > 3000 t, face heig	0	$ 3.30	m3					Challenge rates, DES is first principles
24	Engineering treatment to stabilise the faces on the benches (compaction of the backfill)	0	$ 1.48	m3					ok
25	Erect a 6' chain mesh security fence around the adit to restrict access to the site where the shaft can not be ba	0	$ 59.00	m					ok
26	Has a Contaminated Site Assessment been undertaken for the site? If not this item applies	0	$ 15,000	item	$ 15,000	item			ok
27	Hydro-seeding with straw mulching and bitumen tack.	0	$ 1.80	m2	$ 1.80	m2	$ 1.80	m2	ok
28	Installation of sediment fence	0	$ 10.03	m2	$ 10.03	m2			Unit is metres in Exploration
29	Load, cart and dispose of contaminated soil (ie. Hydrocarbon, chemical spillage in / around storage sheds or fu	0	$ 797	m3	$ 797	m3	$ 700	m3	ok
30	Load, cart and dispose of low-level contaminated soil off site to a licensed landfill. Assumes cartage to a loca	0	$ 460	m3	$ 460	m3	$ 200	m3	ok, disposal rates higher in Victoria than Qld
31	Load, cart and dispose of contaminated soil (ie. chemical spillage in / around storage sheds) off site to a licens	0	$ 797	m3	$ 797	m3	$ 700	m3	ok
32	Making safe vertical facesSand	Sand			$ 1.06	m3			ok
33	Making safe vertical facesClay	Clay			$ 1.53	m3			ok
34	Making safe vertical facesStiff or rock	Stiff or rock			$ 1.95	m3			ok
35	Maintenance of the rehabilitated areas that are intended to be part of the ongoing closure of the site.	0	$ 767	Ha	$ 767	Ha			Not appropriate
36	Minor pushing, final trim, rock rake & deep rip (minor shaping and landscaping)	0	$ 1,534	Ha					ok
37	Major bulk pushing (Clay Batter) to achieve grades nominated in the approval/permit (i.e. < 18o)< 50 m	< 50 m	$ 1.53	m3			$ 0.19	$ 0.74	Challenge rates, DES is first principles
38	Major bulk pushing (Clay Batter) to achieve grades nominated in the approval/permit (i.e. < 18o)50 -100 m	50 -100 m	$ 1.83	m3			$ 0.55	$ 1.57	Challenge rates, DES is first principles
39	Major bulk pushing (Sand Batter) to achieve grades nominated in the approval/permit (i.e. < 18o)< 50 m	< 50 m	$ 1.06	m3					Challenge rates, DES is first principles
40	Major bulk pushing (Sand Batter) to achieve grades nominated in the approval/permit (i.e. < 18o)50 -100 m	50 -100 m	$ 1.36	m3					Challenge rates, DES is first principles
41	Major bulk pushing (Stiff Clay or Soft Rock with ripping) to achieve grades nominated in the approval/permit (i.	< 50 m	$ 1.95	m3					Challenge rates, DES is first principles
42	Major bulk pushing (Stiff Clay or Soft Rock with ripping) to achieve grades nominated in the approval/permit (i.	50 -100 m	$ 2.30	m3					Challenge rates, DES is first principles
43	Major bulk pushing to achieve grades nominated in the approval/permit (i.e. < 18o)< 50 m	< 50 m	$ 0.74	m3					Challenge rates, DES is first principles
44	Major bulk pushing to achieve grades nominated in the approval/permit (i.e. < 18o)50 -100 m	50 -100 m	$ 1.14	m3					Challenge rates, DES is first principles
45	Mobilisation & Demobilisation (third party contractor rates apply).<50km	<50km	4%	$ -					Seems arbitrary
46	Mobilisation & Demobilisation (third party contractor rates apply).50-100km	50-100km	5%	$ -					Seems arbitrary
47	Mobilisation & Demobilisation (third party contractor rates apply).100-200km	100-200km	6%	$ -					Seems arbitrary
48	Mobilisation & Demobilisation (third party contractor rates apply).>200km	>200km	7%	$ -					Seems arbitrary
49	Onsite remediation of hydrocarbon contaminated soils< 50 m3	< 50 m3	$ 64.90	m3			$ 109.00		ok
50	Onsite remediation of hydrocarbon contaminated soils50-100 m3	50-100 m3	$ 51.92	m3			$ 75.00		ok
51	Onsite remediation of hydrocarbon contaminated soils100-500 m3	100-500 m3	$ 38.94	m3			$ 26.00		ok
52	Onsite remediation of hydrocarbon contaminated soils>500m3	>500m3	$ 34.40	m3			$ 7.64		High. Review further if time permits.
53	Pest and Weed Management	0	$ 590	Ha	$ 590	Ha	$ 150	Ha	Challenge rate
54	Planting tubestock (< 15cm)	0	$ 10.00	@	$ 10.00	@	$ 10.00		ok
55	Project Management & Surveying	0			$ 76.70	%			Entry shown ($76.70) is held on the download
56	Removal of powerlines (this includes disconnection, rolling up the wires and removing the poles). It does not i	0	$ 30,204	km	$ 30,204	km	$ 19,199	$ 30,104	Wooden poles not included (lower rate)
57	Removal of general rubbish from the site to a licensed landfill facility	0	$ 767	@	$ 767	@			ok. Skip bin
58	Removal of underground fuel storage tank (UST) above 5,000L and below 15,000L capacity (include all site faci	0	$ 30,000	@	$ 30,000	@	$ 31,000		ok
59	Removal of underground fuel storage tank (UST) up to 5,000L capacity (include all site facilities and is to includ	0	$ 24,780	@	$ 24,780	@	$ 21,000		ok
60	Remove all mobile plant and equipment from the site	0	$ 2,360	item	$ 2,360	item			User should be able to make case for resale/scrap
61	Remove Bitumen sealed areas (car park, etc). Includes disposal of waste bitumen material off site at an appro	0	$ 14.10	m2					ok
62	Remove Concrete pads & footings (< 300mm thickness).	0	$ 11.80	m2	$ 11.80	m2	$ 15.00	m2	ok
63	Remove Concrete pads, footings and foundations (> 300mm thickness)	0	$ 65.00	m2	$ 65.00	m2	$ 65.00	m2	ok
64	Remove Rail Loop and spur, including cutting and removing the tracks, sleepers and ballast material.	0	$ 76.70	m			$ 55.00	m	ok
65	Remove unwanted material from roadways (e.g. spillage) < 1km	< 1km	$ 3.48	m3			$ 3.28	m3	ok
66	Remove unwanted material from roadways (e.g. spillage) 1-2km	1-2km	$ 3.89	m3			$ 3.81	m3	ok
67	Remove unwanted material from roadways (e.g. spillage) 2-5km	2-5km	$ 5.19	m3			$ 5.01	m3	ok
68	Remove unwanted material from roadways (e.g. spillage) 5km	5km	$ 7.79	m3			$ 6.32	m3	Challenge rate
69	Reshape deep rip and ameliorate sealed and unsealed roads	0	$ 2,950	Ha			$ 1,834	$ 7,745	ok
70	Reshaping of overburden and mullock heaps on the site.	0	$ 3,900	Ha	$ 3,900	m3		Ha	Unit in Small quarries is incorrect
71	Reshaping (earthworks only) of the walls & surrounds of the tailings storage	0	$ 3,900	Ha	$ 3,900	Ha	$ 1,834	$ 7,745	ok
72	Shaping or levelling of minor excavations, batters and stockpiles, final trim, rock rake and deep rip	0	$ 1,534	Ha	$ 1,534	Ha	$ 1,834	$ 7,745	ok
73	Soil amelioration (adding gypsum, lime, etc)	0	$ 590	Ha	$ 590	Ha	$ 250	ha	ok as DES rate is being challenged
74	Source, cart, spread and lightly rip topsoil< 1km	< 1km	$ 3.26	m3	$ 3.26	m3	$ 3.28	m3	ok
75	Source, cart, spread and lightly rip topsoil1-2km	1-2km	$ 3.91	m3	$ 3.91	m3	$ 3.81	m3	ok
76	Source, cart, spread and lightly rip topsoil2-5km	2-5km	$ 5.97	m3	$ 5.97	m3	$ 5.01	m3	ok
77	Source, cart, spread and lightly rip topsoil5km	5km	$ 8.22	m3	$ 8.22	m3	$ 6.32	m3	Challenge rate
78	Source local material, cart and spread suitable material to cap the tailings storage (cap thickness determined b	< 1km	$ 2.71	m3			$ 3.28	m3	ok
79	Source local material, cart and spread suitable material to cap the tailings storage (cap thickness determined b	1-2km	$ 3.42	m3			$ 3.81	m3	ok
80	Source local material, cart and spread suitable material to cap the tailings storage (cap thickness determined b	2-5km	$ 4.13	m3			$ 5.01	m3	ok
81	Source local material, cart and spread suitable material to cap the tailings storage (cap thickness determined b	5km	$ 8.22	m3			$ 6.32	m3	Challenge rate. Rate is high and not consistent
82	Source local material, cart and spread suitable material to cap the waste rock dump (cap thickness determined	< 1km	$ 2.71	m3				m3	ok
83	Source local material, cart and spread suitable material to cap the waste rock dump (cap thickness determined	1-2km	$ 3.42	m3				m3	ok
84	Source local material, cart and spread suitable material to cap the waste rock dump (cap thickness determined	2-5km	$ 4.13	m3				m3	ok
85	Source local material, cart and spread suitable material to cap the waste rock dump (cap thickness determined	5km	$ 8.22	m3				m3	ok
86	OR Rip only for smaller operationsSoft	Soft			$ 295	ha			ok
87	OR Rip only for smaller operationsHard	Hard			$ 590	ha			ok
88	Structural water management works, banks, drains, rock lined waterways, sediment dams	0	$ 2,360	Ha	$ 2,360	Ha		Ha	ok
89	Topsoil spreading (topsoil stockpiled immediately adjacent to the area to be rehabilitated) for push < 50m	0	$ 1.06	m3	$ 1.06	m3		m3	ok