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Dark side of the boom

What we do and don't know about mines, closures and rehabilitation

Little data is available to the public on the clean-up from the mining boom. State government agencies often lack basic information on how many mines are in operation, with still less published on closures and abandonments.

Discussion paper

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Summary

As the mining boom winds down and the mining clean up boom begins, mine site rehabilitation and mine abandonment are emerging as major issues for Australian communities, governments and taxpayers. All stakeholders will need information on the status of mines and their rehabilitation efforts to ensure this is carried out in a way that does not leave taxpayers and the environment with the costs of abandoned mines and rehabilitated sites.

Unfortunately few reliable statistics are available. While detailed statistics are published on current mine production, price forecasts and future mining projects, far less data is available on mines that are not producing and may be abandoned.

This report attempts to compile data from each state's relevant department on numbers of mines that are operating, have suspended operations (are in "care and maintenance"), are being closed and have been abandoned. We also summarise available information on the environmental bonds that miners pay to governments.

Most states' mining departments do not publish detailed estimates of how many mines are operating in the state. Australia has somewhere between 460 and 2,944 mines currently operating according to government estimates. Much of this discrepancy is definitional. Some databases include huge numbers of small mines categorised as operational, but they are only worked intermittently, if at all. Other sources count only "significant" mines, but this categorisation is subjective and rarely defined. Other major mining complexes are sometimes counted as one complex or as many separate mines.

Little data is published on mines in care and maintenance. Official estimates aggregate to between 206 and 972 mines in care and maintenance across Australia. In addition to the same definitional problems above, distinguishing between mines that are likely to recommence production and mines that will remain closed is difficult. To assist with this question we asked departments for statistics on how many of the mines currently not operational had been in care and maintenance for the last 5, 10, 20 and 30 years. Tasmania was the only state able to provide this information. Most had examples of mines being in care and maintenance for decades, one in the NT since the 1920-30s.

Still less information is available on mines undergoing final closure. Data from Tasmania and examples from other states sum to 8 mines that have begun final closure in the last ten years. Western Australia's database includes 1,137 mines that are "shut" although the scale and precise status of these sites is unclear.

Mine closure, complete rehabilitation and relinquishment of the former mine site is almost unknown in Australia. Known examples are the New Wallsend coal mine in NSW and a sand quarry near Melbourne. Tasmanian data lists one in the last ten years and a further five over the last thirty years, although the rehabilitation standard of the earlier sites is unclear. There are no examples of major, modern open cut mines completing rehabilitation to the point where the site can be relinquished.

In stark contrast, numbers of abandoned mines are huge across Australia, with estimates of around 60,000 sites, although again definition and scale are important. While definitions and data limitations make exact numbers of abandonments difficult to estimate, what is certain is that this is not a practice limited to distant history. In 2015 the Western Australian government took on responsibility for a diamond mine and a nickel mine that had been abandoned in the last two years. Last year Queensland taxpayers became liable for a silver mine abandoned in 2015 and a tin mine that produced until at least 2008. On average one mine is abandoned per year in Victoria, including the Benambra gold mine which has already cost Victorian taxpayers $7 million. As the owners of the largest mines come under financial pressure, such as the coal company Peabody, close attention needs to be paid to the ongoing phenomenon of mine abandonment in Australia. This represents a massive subsidy to the mining industry, paid by taxpayers and the community through a degraded environment.

Australian governments hold around $10 billion in environmental bonds to assist with rehabilitation if companies abandon their sites. In most cases there is considerable concern that these bonds may be insufficient to cover rehabilitation liabilities of operating mines. Large open cut mines can cost hundreds of millions or even billions of dollars to rehabilitate. Departments and Auditors General in several states have expressed concern that states are facing serious liabilities.

The stakes are high in Australia's mining clean up boom. The Australian public stands to incur billions of dollars in rehabilitation costs through either use of taxpayer funds or a degraded environment if rehabilitation is not well managed and regulated. This would represent a huge subsidy to the mining industry. The large number of historical and modern abandoned mines compared with the handful of fully rehabilitated sites shows that the mining industry does not have a good record at cleaning up after itself.

The last ten years have seen an increase in public attention paid to mining activity, with community groups and NGOs playing a key role in working with and monitoring the mining industry. Provision of better data on mines in each state, their status and history, would empower the community, the industry and the public service to ensure that sites are properly rehabilitated.

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Introduction

The old cliché goes that if you can't measure it, you can't manage it. As Australia attempts to manage the clean-up from the mining boom, it is important to see how the government agencies measure this process.

Australia's government agencies publish a bewildering range of statistics on mining, such as production volumes, revenue, royalty forecasts, capital expenditure and miners employed. Twice a year, the Office of the Chief Economist identifies what mining projects might exist in the future – those at the 'publically announced' stage, those at the 'feasibility stage' and other stages of development or speculation.[1]

While figures on current profits and future projects are easy to get, measurements of the clean-up and rehabilitation of mine sites are far harder to come by. This report compiles this data, to the extent that it exists:

- Number of operating mines
- Number of non-operational mines in 'care and maintenance' and length of time mines have been in care and maintenance
- Number of mines shut-down and undergoing final rehabilitation
- Number of mines fully rehabilitated with site relinquished back to the state or sold to a third party
- Sum of rehabilitation bonds held and estimates of likely rehabilitation expenses
- Number of abandoned mines.

A copy of the questions sent to state mining departments is provided in the appendix.

Compared to statistics on the future of mining, or on exploration expenditure in the last financial year, statistics on the number of operating mines or the number of mines in care and maintenance may seem simple. However, they are far more difficult to access. Part of this difficulty is definitional. While the spot price for Newcastle Benchmark thermal coal or the number of tonnes of iron ore shipped through the Port of Darwin are objective, classifying and counting the number of mines in a state requires subjective decisions. Still more complicated are the questions of how many mines are in care and maintenance and how many are being closed.

[1] OCE (2015) *Resources and Energy Major Projects*, http://www.industry.gov.au/Office-of-the-Chief-Economist/Publications/Pages/Resources-and-energy-major-projects.aspx#

When it comes to data on the end of mine operations – of how many mines have been abandoned or how many have been successfully rehabilitated and relinquished for other use – estimates are not ambiguous so much as but absent. There is very little official, comprehensive, publically available data on mine abandonment or relinquishment in Australia.

What data is available on all aspects of mine rehabilitation in Australia is generally poorly defined and often contradictory. Getting data is difficult, as is getting explanations of what the data does or doesn't represent. While some states provided relatively detailed data in a timely manner, in general the government departments that manage and regulate the mining industry are not well equipped to provide this information to the public. While individual representatives are often diligent and helpful, the departments as a whole do not make important data accessible.

For example, obtaining data on NSW required 18 phone calls and emails to the NSW Division of Resources and Energy over six months. At time of writing, our questions referred to the "Industry Coordination" section still had not been responded to. Queensland's Department of Environment and Heritage Protection were more up-front:

> In relation to your request about mines that are closed and/or undergoing rehabilitation, this a very broad request for data that is not either centrally held or currently available on any public register.
>
> As I believe [a colleague has] previously advised, there is a cost to the department in time and resourcing to enable us to provide this information and the only avenue for your request to be considered is through the [freedom of information] process.[2]

As the resources boom subsides and many mining projects come under financial pressure, Australian governments and communities need information to ensure that mine rehabilitation and closure arrangements do not place the public at financial and environmental risk. Currently, much basic information is not available. This report collates what information is available and is hopefully a step towards improving this situation.

[2] Correspondence by email with the Department of Environment and Heritage Protection, 14 March 2016.

National results

This section aggregates the data collected from each state. These results give a broad picture of how little information is available on mine site rehabilitation and closure. Many of the data points include a high and a low estimate, reflecting different sources or different definitions. These are explained in subsequent state-based chapters.

MINES IN OPERATION

How many mines are currently operating in each state? This apparently simple question leads to divergent and inclusive figures, as shown by the high and low estimates in Table 1 below:

Table 1: Mines in operation – all states

	Low	High
Queensland	147	1,207
Western Australia	151	661
New South Wales	85	109
South Australia	9	783
Northern Territory	6	7
Victoria	47	162
Tasmania	15	15
Total	**460**	**2,944**

Source: State government departments, TAI analysis

One hurdle in calculating the total number of Australian mines is definitional. What is an operating mine? Is a farmer extracting gypsum for fertiliser on their property a mining operation? What about a small gravel quarry? At the other end of the scale, is the huge Mount Thorley-Warkworth coal mining complex in the Hunter Valley one mine or several?

What does it mean to be operational? Is a small mine operated by amateur prospectors on some weekends operational? Or a larger mine that operates for only part of the year due to northern Australia's wet season?

In many states, the low figure is based on counts of "significant" or "major" mines, while the higher number is based on databases of development approvals, mining leases or mine site features. Problems arise with the question of what constitutes a "major" mine, a question officials concede is subjective, and the cause of sometimes

contradictory estimates. The higher figure often includes small operations that may not be operational, in some cases for many years.

MINES IN CARE AND MAINTENANCE

Mines often cease operations when prices are low or when a technical problem arises. If prices recover or the problem is resolved, the mine may start again. While not operating, the site is referred to as being in "care and maintenance". The site and mine are maintained and kept safe, but no minerals are extracted. As with mines in operation, estimates of how many mines are in care and maintenance vary widely, as shown in Table 2 below:

Table 2: Mines in care and maintenance

	Low	High
Queensland	19	129
Western Australia	44	438
New South Wales	NA	123
South Australia	8	151
Northern Territory	4	Unknown
Victoria	122	122
Tasmania	9	9
Total	*206+*	*972+*

Source: State government departments, TAI analysis

As with mines in operation, lower estimates tend to be of "major" or "significant" mines, while higher estimates include much smaller operations. A further difficulty in estimating how many mines are in care and maintenance is establishing which have genuine intention to re-open and which are left in care and maintenance to avoid or postpone the often considerable expenses associated with final rehabilitation. Mines are often left in care and maintenance for decades avoiding final closure. Northern Territory officials cited an example of a mine that ceased production in the 1920–30s that is not yet fully rehabilitated.

Some states track non-operational mines but do not distinguish between authentic care and maintenance and use of care and maintenance to avoid rehabilitation. For example, NSW data describes 123 "suspended operations", but it is not clear which of these are in care and maintenance and which require final closure.

To estimate what sites are genuinely in care and maintenance and which are avoiding closure, we asked departments how many mines had gone into care and maintenance over the last 5, 10, 20 and 30 years. With the exception of Tasmania, no states were

able to provide this data. The implications of this are serious: Australian governments and communities do not have the information to assess which and how many mine sites are likely to remain unrehabilitated and possibly abandoned. Given the widespread problem of abandoned mines and the costs this imposes on the environment and state taxpayers, this shortcoming should be urgently addressed.

MINES UNDERGOING FINAL CLOSURE

Little information is available on how many mines are currently being closed and rehabilitated. While state officials provided some examples and estimates, many had no data. Most low estimates in Table 3 below are a count of specific examples provided rather than a formal estimate.

Table 3: Mines undergoing final closure

	Low	High
Queensland	0	Unknown
Western Australia	Unknown	1,137
New South Wales	1	Unknown
South Australia	1	Unknown
Northern Territory	Unknown	Unknown
Victoria	2	Unknown
Tasmania	4	11
Total	*8*	*Unknown*

Source: State government departments, TAI analysis

The high figure from Western Australia is a count projects that have one or more mine site features that are “shut”. The same spreadsheet identifies 17,548 mine site features that are “shut”. It does not, however, mean that these sites are being actively rehabilitated and many are likely to be effectively abandoned.

The serious consequence of the data in Table 3 is that very few major or significant mines are being closed anywhere in Australia. In Queensland, a state with hundreds of mines, including at least 19 significant mines in care and maintenance, it appears that none are being formally closed and rehabilitated. The one NSW example was recently granted approval to expand its operations, stretching the definition of final closure. Victoria’s examples are mineral sand mines, one of which is now used to dump radioactive material. South Australia’s example is the Leigh Creek Coal mine, which closed as a result of the end of coal fired electricity in the state.

CLOSED, REHABILITATED, RELINQUISHED

The NSW Minerals Council website states:

> The final stage in mining is mine closure and lease relinquishment, when mining equipment is decommissioned and removed and rehabilitation is completed. [3]

However, this final stage is rarely reached in Australia. There are very few examples of mines, large or small, being fully rehabilitated, as shown in Table 4 below:

Table 4: Mines closed, rehabilitated and relinquished

	Low	High
Queensland	0	Unknown
Western Australia	Unknown	Unknown
New South Wales	1	Unknown
South Australia	18	Unknown
Northern Territory	0	Unknown
Victoria	1	Unknown
Tasmania	1	6
Total	*22+*	*Unknown*

Source: State government departments, TAI analysis

As shown in Table 4, relinquishments of mine sites that are fully rehabilitated and suitable for alternative further use are extremely rare. No examples or statistics could be found of relinquishment of major mine sites in the big mining states of Western Australia or Queensland. One relatively small underground coal mine has been relinquished in NSW and an old sand quarry is now a botanical garden near Melbourne in Victoria.

South Australia has 18 mines listed as rehabilitated, although only 14 are mineral mines. Eight of those were barite mines; of the remaining six, most are from the 19th Century and one is only "partially rehabilitated".

This should be of major concern to governments, communities and the mining industry. There is no single example of a rehabilitated and relinquished large, open cut mine in Australia. Given the number of such mines currently operating or in care and maintenance, serious attention should be given to whether rehabilitation is possible and ensuring it can be paid for by mine operators. The alternative is abandonment of major mine sites, with the taxpayer on the hook for rehabilitation, an outcome that is unfortunately very common.

[3] NSW Minerals Council (2016) *Rehabilitation and Mine Closure,* http://www.nswmining.com.au/environment/rehabilitation-mine-closure

ABANDONED MINES

There are nearly 60,000 abandoned mines in Australia, with no data available for the Northern Territory. Many of these are small, very old mines, some dating back to the gold rushes of the 1800s.

Table 5: Abandoned mines

	Low	High
Queensland	Unknown	15,000
Western Australia	9,870	17,000
New South Wales	112	410
South Australia	681	3,255
Northern Territory	Unknown	Unknown
Victoria	25	19,010
Tasmania	Unknown	4,200
Total	*Unknown*	*58,875*

Source: State government departments, TAI analysis

Data on abandoned mines mostly comes from Unger et al's 2012 study,[4] which itself drew upon state databases. That study discusses extensively the incompleteness of this data, and in particular the fact that different definitions used by different states make a national total of "abandoned mines" essentially impossible to calculate.

Abandonment of mines is often referred to as a historical or legacy problem, and it appears the majority of mines were abandoned some time ago. However, abandonment is not limited to distant history. In 2015 the Western Australian government took on responsibility for a diamond mine and a nickel mine that had been abandoned in the last two years. Last year Queensland taxpayers became liable for a silver mine abandoned in 2015 and a tin mine that produced until at least 2008. On average one mine is abandoned per year in Victoria, including the Benambra gold mine, which has already cost Victorian taxpayers $7 million. This year the NT government dropped charges against the owners of the failed Redbank copper mine that operated in the 1990s and has polluted water ever since.

As the owners of the largest mines come under financial pressure, such as the bankrupt coal company Peabody, close attention needs to be paid to the ongoing phenomenon of mine abandonment in Australia. This represents a massive subsidy to

[4] Unger et al (2012) *Mapping and Prioritising Rehabilitation of Abandoned Mines in Australia*, https://www.researchgate.net/publication/236900961_Mapping_and_Prioritising_Rehabilitation_of_Abandoned_Mines_in_Australia

the mining industry, paid by taxpayers and the community through a degraded environment.

ENVIRONMENTAL BONDS

Just as owners of apartments require their tenants to pay a bond to cover potential damage to the apartment, most governments require mine owners to pay a bond to ensure taxpayers are not left to cover rehabilitation costs in the event of abandonment or other failure of the company. Estimates of these bonds are shown in Table 6 below:

Table 6: environmental bonds held by governments

Queensland	$4,450 million[5]
Western Australia	N/A
New South Wales	$2,100 million
South Australia	$131.4 million
Northern Territory	$1,300 million
Victoria	$160 million
Tasmania	$55 million
Total	$8,196.4 million

Source: State government departments, TAI analysis

These bonds may be insufficient to cover the rehabilitation liabilities of operating mines. Large open cut mines can cost hundreds of millions or even billions of dollars to rehabilitate. Departments and Auditors General in several states have expressed concern that states face serious liabilities.

The exception to this system is Western Australia, which paid back over $1 billion dollars' worth of bonds to the mining industry, replacing them with a much lower non-refundable levy. While applauded by the industry, this scheme has already seen several companies receive millions in refunds just before abandoning their mines and leaving taxpayers with sizeable liabilities.

REHABILITATION LIABILITIES

Despite the warnings of Auditors General that bonds held may be insufficient to cover liabilities, there are few estimates available of what these liabilities may be. Some estimates are shown in Table 7 below:

[5] At time of writing a media report included a quote from the Queensland Environment Minister that bonds had reached "almost $7 billion". See Queensland chapter for details

Table 7: Estimates of rehabilitation costs of current mines

	Low	High
Queensland	Unknown	Unknown
Western Australia	$4,800 million	Unknown
New South Wales	Unknown	Unknown
South Australia	Unknown	Unknown
Northern Territory	Unknown	Unknown
Victoria	$160 million	>$938 million
Tasmania	Unknown	Unknown
Total	Unknown	Unknown

Source: State government departments, TAI analysis

These estimates are very uncertain. The Western Australian figure is calculated based on the department's claim that the $1.2 billion in bonds held represented 25 percent of liabilities.

The Victorian low figure is the sum of the bonds it holds. The high figure comes from the Hazelwood Mine Fire Inquiry, which commissioned an independent study to assess the remediation liability of the state's three brown coal mines. That study found that the mines represented up to $938 in rehabilitation liabilities, much more than the $45 million of bonds that they had paid. This figure does not take into account the state's other 44–159 operating mines.

Most of these estimates do not include costs associated with cleaning up abandoned mines. The Queensland audit office estimated the cost for Queensland's abandoned mines at up to $1 billion in 2013. No estimates of this nature appear to have been made by other states, although most have an ongoing abandoned mines program. A spokesperson from the relevant Tasmanian department did say that the currently budgeted $150,000 per annum is insufficient and the NSW audit office said the same thing about that state's budget of a few million dollars per annum.

Queensland

Table 8: Queensland section summary

Category	Low	High
Mines in operation	147 (significant)	1,207 (total)
Mines in care and maintenance	19	129
Mines closed and undergoing final rehabilitation	0	Unknown
Mine sites rehabilitated and relinquished or sold	0	Unknown
Abandoned mines	Unknown	15,000
Rehabilitation bonds held	$4.45 billion	$7 billion
Estimate of total current rehabilitation liabilities	Unknown	Unknown
Estimate of liabilities for abandoned mines	$1 billion	Unknown

INTRODUCTION

Queensland is a major coal mining state. If it were a country, it would be the world's second biggest coal exporter.[6] Most coal is mined in the Bowen Basin and is shipped out of ports such as Hay Point, Gladstone and Abbot Point, and through the Great Barrier Reef Marine Park. Queensland also has significant bauxite mines on Cape York and copper, lead, zinc and gold mines in other areas, particularly the northwest.

The mining industry employs 59,500 people in Queensland, 2.5% of the total workforce.[7] The state government has budgeted for royalties of $1.9 billion dollars in financial year 2016-17, representing 3.6% of total revenue.[8]

The administration and regulation of mining and rehabilitation in Queensland is split between two departments. The Department of Natural Resources and Mines (DNRM) is responsible for mine compliance, land access and abandoned mines, while the

[6] Campbell (2014) *The mouse that roars: Coal in the Queensland economy*, http://www.tai.org.au/content/mouse-roars-coal-queensland-economy

[7] ABS (2016) *6291.0.55.003 Labour Force, Australia, Detailed, Quarterly, Table 05. Employed persons by State, Territory and Industry division of main job (ANZSIC),* http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6291.0.55.003Nov%202015?OpenDocument

[8] Queensland Government (2016) *Queensland Budget 2016-17, Budget Strategy and Outlook, Budget Paper Number 2,* http://budget.qld.gov.au/budget-papers/

Department of Environment and Heritage Protection (DEHP) is responsible for environmental management of operating mines and overseeing site rehabilitation.[9]

MINES IN OPERATION

DNRM's database contains 1,207 mines as operational, as categorised in Table 9 below:

Table 9: Operational mines in Queensland

Mineral	Classification	Number of mines
Coal	Underground	11
	Surface	41
Non-coal		
	Quarries	245
	Tourist mines	7
	Surface	153
	Underground	750
Total		1,207

Source: Correspondence with DNRM 5 August 2016

Publications on DNRM's website largely focus on the state's "significant" mines, summarised in Table 10 below:

Table 10: Significant mines operating in Queensland

Type of mine	Mines operating and under construction
Metals	**35**
Industrial minerals and rocks	**53**
Gemstones	**11**
Mineral sands	**1**
Coal	**47**
Total	**147**

Source: Queensland's mineral, coal and petroleum operations and resources (July 2016).[10]

[9] DNRM (nd) *About us*, https://www.dnrm.qld.gov.au/our-department/about-us/about-us , DEHP (nd) *Resource activities including petroleum, geothermal and greenhouse gas storage*, http://www.ehp.qld.gov.au/land/mining/index.html

[10] DNRM (2016) *Queensland's significant mineral mines, advanced mineral projects and new intersections,* https://www.dnrm.qld.gov.au/__data/assets/pdf_file/0004/238225/significant-mineral-mines.pdf ; DNRM (2016) *Queensland coal – mines and advanced projects,* https://www.dnrm.qld.gov.au/__data/assets/pdf_file/0011/238079/coal-mines-advanced-projects.pdf and Queensland's mining and petroleum industry overview, p 2,

The definition of what constitutes a significant mine is "subjective", according to a DNRM spokesperson, but relates to volumes and/or the value of production.

MINES IN CARE AND MAINTENANCE

According to DNRM's database there are 121 mines in care and maintenance in the state:

Table 11: Total mines in care and maintenance in Queensland

Mineral	Classification	Number of mines
Coal	Underground	3
	Surface	6
Non-coal		
	Quarries	46
	Tourist mines	1
	Surface	53
	Underground	12
Total		121

Source: Correspondence with DNRM 5 August 2016

DNRM's publications on significant mines show 19 sites that have "ceased production/care and maintenance":

Table 12: Mines ceased production/care and maintenance in Queensland

Type of mine	Ceased production/ Care and maintenance
Metals	**7**
Industrial minerals and rocks	**5**
Gemstones	**1**
Mineral sands	**0**
Coal	**6**
Total	**19**

Source: Queensland's mineral, coal and petroleum operations and resources (July 2016).[11]

No information is available on how long mines have been in care and maintenance in Queensland. Despite extensive correspondence with both DNRM and DEHP, no data was provided as it is "either not centrally held or currently available on any public

https://www.business.qld.gov.au/invest/investing-queenslands-industries/mining/resources-potential/mineral-resources/metalliferous-industrial-minerals

[11] DNRM (2016) *Queensland's mining and petroleum industry overview*, https://www.business.qld.gov.au/invest/investing-queenslands-industries/mining/resources-potential/mineral-resources/metalliferous-industrial-minerals

register."[12] To obtain this data, "the only avenue … is through the [Right to Information] process", for which the department may charge the applicant a considerable amount.

While DNRM's database does track mines in care and maintenance, DEPH does not as:

> [The] term 'care and maintenance' is not defined within the EP Act or environmental Protection Regulation 2008, the Department of Environment and Heritage Protection does not hold information against this terminology.[13]

DEHP is therefore unconcerned with the length of time mines are left in care and maintenance as long as financial assurances are in order, relevant fees are paid and approval conditions are complied with.

SHUT-DOWN, FINAL REHABILITATION AND RELINQUISHMENT

Neither DNRM nor DEHP provided data on how many mines are being closed and undergoing final rehabilitation. In correspondence the DEHP stated:

> There have been two areas progressively certified [as rehabilitated] under these mechanisms [the relevant legislation]. No large scale mining activities have had their [environmental authority] surrendered in full.[14]

In Queensland no mine sites have been successfully rehabilitated and relinquished to the state or sold to third parties. Just two have had any areas of rehabilitation officially completed. One of these areas appears to be the Kestrel coal mine, where owners Rio Tinto have "successfully applied for and been granted progressive certification for rehabilitation on a part of their mining lease." [15] While part of the Kestrel mine site's rehabilitation has been certified, the mine is not closed and according to the company's website is still operational.[16]

Neither department was able to provide an example of a closed and fully rehabilitated mine site. Dr Peter Erskine, a member of the University of Queensland's Sustainable Minerals Institute who is employed by NSW and Queensland mining companies to

[12] DEHP (2016) Correspondence by email 14 March
[13] DEHP (2016) Correspondence by mail 31 August
[14] DEHP (2016) Correspondence by mail 31 August
[15] DEHP (2016) Correspondence by email 1 March
[16] Rio Tinto (nd) Kestrel Mine, http://www.riotinto.com/australia/rtca/kestrel-mine-10423.aspx

assess their rehabilitation work, says that "in Queensland there hasn't been a mine closed for the past 33 years."[17]

MINE ABANDONMENT

The problem of abandoned mines in Queensland has been highlighted by the Queensland Audit Office, which estimated in 2013 that there are 15,000 abandoned mines in the state, representing a liability of up to $1 billion.[18] While sometimes described as a historic problem, mines continue to be abandoned to this day. According to a DEHP spokesperson, two mines were abandoned in 2015 and the Queensland Government became liable for them.

The first was the Texas silver mine, formally abandoned in 2015, leaving contamination that risks discharging into the local lake and water systems. [19] The other was the Collingwood tin mine which operated until at least 2008. [20] Serious water contamination issues remain at the abandoned site.[21]

BONDS

As of August 2016, the state holds "almost" $7 billion in financial assurances for mining, gas and petroleum activities. [22] This is up from the $4.45 billion in mining financial assurances that the Queensland Audit Office (QAO) found in 2013,[23] although the latter figure does not include gas and petroleum.

[17] Main and Schwartz (2015), *Industry insider warns taxpayers may foot bill for mine rehabilitation unless government, industry step up*, http://www.abc.net.au/news/2015-09-19/taxpayers-may-foot-bill-for-mine-rehabilitation/6787954

[18] Queensland Audit Office (2013) *Environmental regulation of the resources and waste industries*, https://www.qao.qld.gov.au/reports-parliament/environmental-regulation-resources-and-waste-industries

[19] DEHP (2016) *Texas Silver Mine*, https://www.ehp.qld.gov.au/management/texas.html and Willacy (2015) *Environmental catastrophe feared from abandoned Queensland silver mine's cyanide ponds,* http://www.abc.net.au/7.30/content/2015/s4322068.htm

[20] ABC (2008) *Metals X to close Collingwood mine*, http://www.abc.net.au/news/2008-04-03/metals-x-to-close-collingwood-mine/2392194

[21] DEHP (2016) *Collingwood Tin Mine*, https://www.ehp.qld.gov.au/management/collingwood.html

[22] Willacy (2016) *Taxpayers exposed to $3b clean-up bill of Queensland's coal mines, Government report warns,* http://www.abc.net.au/news/2016-08-04/taxpayers-exposed-to-multi-billion-clean-up-of-coal-mines-report/7685760

[23] Queensland Audit Office (2013) *Environmental regulation of the resources and waste industries,* p 43, https://www.qao.qld.gov.au/reports-parliament/environmental-regulation-resources-and-waste-industries

In July 2016, an internal Department of Environment and Heritage Protection document was leaked to the media. The document, completed in January 2016, assessed 15 of the state's 58 coal mines to determine if their financial assurances matched their potential rehabilitation liability. It found that 13 of them contained "significant errors", representing a cumulative $839.8 million dollar shortfall for the 15 mines. Extrapolated for the state's other coal mines, this represents a $3.2 billion dollar shortfall for the state's coal mining industry[24] (the state's non-coal mines were not assessed, and may also represent a substantial shortfall).

This follows a 2013 QAO review of Queensland's environmental regulation.[25] The review identified environmental remediation being paid for by the miners who did the damage as "an unrealised aspiration", finding that "the state is left with an increasing legacy of sites that are not rehabilitated". Bonds are frequently inadequate to cover the costs of rehabilitation, and companies may send a mine into care and maintenance to avoid rehabilitation.

The leaked document backed up the QAO's report, finding that preliminary rehabilitation has fallen from 28% of disturbances in 2006 to 22.5% in 2016, well behind comparable coal sites in other states, and that rates of progressive rehabilitation are unrelated to coal prices.[26] Only 0.003% of disturbed land has been certified by the department as "acceptable" rehabilitation.[27]

QAO gives the split in responsibilities between the DEHP and the DNRM as one reason why there is no clear record of bonds held by the state. In some cases, public servants in one department did not know if the other had requested, received or retained the bond. However, the 2016 document found that this split was not responsible for a significant discrepancy in the amount of bonds held versus the bonds requested.[28]

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[24] Department of Environment and Heritage Protection (2016) *Report of Targeted Compliance Program,* p 1, http://www.abc.net.au/news/2016-08-04/taxpayers-exposed-to-multi-billion-clean-up-of-coal-mines-report/7685760

[25] Queensland Audit Office (2013) *Environmental regulation of the resources and waste industries,* p 43, https://www.qao.qld.gov.au/reports-parliament/environmental-regulation-resources-and-waste-industries

[26] Department of Environment and Heritage Protection (2016) *Report of Targeted Compliance Program,* p 1, http://www.abc.net.au/news/2016-08-04/taxpayers-exposed-to-multi-billion-clean-up-of-coal-mines-report/7685760

[27] Department of Environment and Heritage Protection (2016) *Report of Targeted Compliance Program,* p 7, http://www.abc.net.au/news/2016-08-04/taxpayers-exposed-to-multi-billion-clean-up-of-coal-mines-report/7685760

[28] Department of Environment and Heritage Protection (2016) *Report of Targeted Compliance Program,* p 1, http://www.abc.net.au/news/2016-08-04/taxpayers-exposed-to-multi-billion-clean-up-of-coal-mines-report/7685760

The QAO did indicate that the DEHP has recently made an effort to dramatically increase bonds held, and The Australia Institute was told by an DEHP spokesperson that there has been a new financial assurance calculator introduced since the report to make the calculations more accurate.[29] However, the calculators used by the Queensland mining industry were the subject of several recommendations in the 2016 document.[30]

Another change following the QAO report is that from October 2015 GST is no longer included in calculations, and companies can apply to have the GST paid on previous deposits refunded.[31] The Queensland Resources Council welcomed the move, and said that it was the result of its close work with the government.[32]

[29] Source: Correspondence by email and phone with a spokesperson for the EHP 1st of March, 2016.

[30] Department of Environment and Heritage Protection (2016) *Report of Targeted Compliance Program,* p 4, http://www.abc.net.au/news/2016-08-04/taxpayers-exposed-to-multi-billion-clean-up-of-coal-mines-report/7685760

[31] Queensland Government (2016) *Financial assurance security deposit for an environmental authority*, https://www.business.qld.gov.au/business/running/environment/licences-permits/financial-assurance-rehabilitation/financial-assurance-security-deposit

[32] Schwartz (2015) *Queensland miners get GST reprieve on rehabilitation bonds from State Government,* http://www.abc.net.au/news/2015-11-25/queensland-miners-get-gst-reprieve-on-rehabilitation-bonds/6974494

New South Wales

Table 13: NSW section summary

Category	Low	High
Mines in operation	85	109
Mines in care and maintenance	NA	123
Mines closed and undergoing final rehabilitation	1	Unknown
Mine sites rehabilitated and relinquished or sold	1	Unknown
Abandoned mines	112	410
Rehabilitation bonds held	$2.2 billion	$2.2 billion
Estimate of total current rehabilitation liabilities	>$2.9 billion[33]	Unknown
Estimate of current rehabilitation liabilities for abandoned mines	Unknown	Unknown

INTRODUCTION

NSW is best known for mining coal. Newcastle is the world's largest export coal port, exporting 155 million tonnes in 2013–14, sourced from the Hunter Valley, Newcastle coalfield and mines further west.[34] Coal is also mined in the Illawarra and the Lithgow area. In the far west of the state, Broken Hill has a long history of mining as the original home of what is now BHP Billiton. Gold and mineral sands are mined in various areas through the state, particularly around Cobar.

Mining employs 32,500 people in NSW, 0.8% of employment, but accounts for 2.5% of Gross State Product.[35] In 2016–17, the state government expects $1.3 billion in royalties, 1.7% of state government revenue.[36]

[33] This figure is the combined costs of filling in the Mt Thorley-Warkworth coal mine and Maules Creek coal mine voids. There are many other mines in the state for which the liabilities are unknown.

[34] NSW Division of Resources and Energy (2015) *NSW Coal Industry Profile 2014 Vol 2*, http://www.resourcesandenergy.nsw.gov.au/investors/investment-opportunities/coal/coal-profile

[35] ABS (2016) *6291.0.55.003 Labour Force, Australia, Detailed, Quarterly*, http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6291.0.55.003May%202016?OpenDocument and ABS (2015) *5220.0 - Australian National Accounts: State Accounts, 2014-15*, http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/5220.02014-15?OpenDocument

[36] NSW Government (2016) *Budget Statement 2016-17 Budget paper No.1*, http://www.budget.nsw.gov.au/__data/assets/pdf_file/0003/128568/2016-17_Budget_Paper_1_-_Budget_Statement.pdf

The main government agency overseeing mining in NSW is the state Division of Resources and Energy ("DRE"), within the Department of Industry. DRE is responsible for authorising mining exploration and production and keeping the environment safe during exploration and mining activities.[37] On 1 July 2016, the Department for Industry also introduced a Resources Regulator responsible for compliance and enforcement in the resources sector. The regulator is intended to create a formal separation between regulatory oversight teams and industry development teams, and its officers report directly to the Secretary of the Department of Industry.[38]

MINES IN OPERATION

The DRE indicates that there were 109 operating mines in the state as at 31 August 2015: 62 mineral mines, 46 collieries and one petroleum operation.[39]

This information contrasts with figures from Geoscience Australia's Australian Mines Atlas, that there were 85 operating mines in NSW in February 2015 (56 collieries and 29 other mines).[40]

The substantial difference in these figures seems to reflect different definitions and methodologies. Geoscience Australia's methodology appears to exclude some small minerals mines and quarries, and treat different parts of some large mines as being separate. For example, the atlas lists the Mt Thorley–Warkworth mine as two mines, while DRE and other NSW government departments such as Department of Planning and Environment often treat the complex as one mine.

MINES IN CARE AND MAINTENANCE

The DRE indicates that, as at 31 August 2015, there were 123 mines in "suspended operations" (68 minerals mines and 55 collieries).[41]

The DRE did not indicate which of these suspended mines are in care and maintenance and which are unlikely to operate again. The DRE was unable to provide any information on how long these mines have been out of operation. The DRE was

[37] NSW Division of Resources and Energy (2016) *About us,* http://www.resourcesandenergy.nsw.gov.au/about-us

[38] NSW Division of Resources and Energy (2016) *Resources Regulator for NSW,* http://www.resourcesandenergy.nsw.gov.au/about-us/news/2016/resources-regulator-for-nsw

[39] Correspondence with the Division of Resources and Energy, 30 September 2015 and 20 June 2016.

[40] Geoscience Australia (2016) *Australian Mines Atlas,* http://www.australianminesatlas.gov.au/mapping/downloads.html

[41] Correspondence with the Division of Resources and Energy, 30 September 2015.

contacted multiple times by phone and email for this information, from January to June 2016.

SHUT-DOWN, FINAL REHABILITATION AND RELINQUISHMENT

The DRE's data on how many mines have been closed and had their final rehabilitation completed is not readily available. In response to this request the DRE wrote:

> In regards to the number of mines that have been successfully signed-off, DRE does not have an existing database that [easily] collates this information together. Whilst this information would exist as part of DRE's records, work is underway to collate this information into a database to make this information more accessible.[42]

DRE noted that "very few mines have closed since the introduction of modern rehabilitation policies", although it indicated that progressive rehabilitation is expected even of mines in care and maintenance.[43] The only examples of closure provided were Glencore's New Wallsend Mine (closed and relinquished) and Yancoal's Tasman Underground Mine (closed, but rehabilitation still being monitored).[44]

New Wallsend was a small underground coal mine that closed in December 2002. The Tasman Underground Mine ceased production in the September Quarter of 2013, despite receiving approval to expand in March 2013. Yancoal annual reports also state that the site has been rehabilitated, but also:

> Development approvals were received in 2013 for the Tasman Extended project and the Abel Modification … Yancoal will consider the appropriate time and market conditions to commit to developments.[45]

This suggests that while the site has been rehabilitated to some extent, the company still has the option to develop an expansion and is not working to complete rehabilitation in order to relinquish the site.

The NSW Minerals Council website states:

[42] Correspondence with the Division of Resources and Energy, June and September 2016.
[43] Correspondence with the Division of Resources and Energy, June and September 2016.
[44] Correspondence with the Division of Resources and Energy, June 2016.
[45] Yancoal (2013) *Yancoal Australia Ltd Annual Report 2013*, http://www.yancoal.com.au/content/Media/FINAL%2013314_Yancoal_AR13.pdf

> The final stage in mining is mine closure and lease relinquishment, when mining equipment is decommissioned and removed and rehabilitation is completed. A mining lease is only relinquished when all legal obligations have been satisfied and the appropriate end land use has been achieved, in line with the rehabilitation plan laid out before mining begins.[46]

When contacted multiple times between April and May 2016 by The Australia Institute, the Minerals Council was unable to provide information on how many mines have achieved final closure in the last 5, 10 or 20 years, or provide an example of a major former mine area being relinquished.[47]

MINE ABANDONMENT

In 2011, the NSW Auditor-General found that there are "many thousands of hectares of degraded and contaminated lands", and that "that the few million dollars allocated annually to this program are substantially inadequate" to cover the liability.[48] The Auditor-General concludes that:

> the Derelict Mine Program may represent the largest category of contamination liability for the New South Wales Government.[49]

A further audit in 2014 by the NSW Auditor-General estimated that there were 112 derelict mine sites on Crown Land and:

> Amongst the 38 high risk sites, [Department of Industry] is aware that seven large scale derelict mines on Crown land are potentially high risk to the environment and public health, and may need to be notified to the EPA. These are Conrad, Woodsreef, Captains Flat, Sunny Corner, Ottery, Cowarra Gold and SCA Cobar.[50]

[46] NSW Minerals Council (2016) *Rehabilitation and Mine Closure,* http://www.nswmining.com.au/environment/rehabilitation-mine-closure

[47] Correspondence with the NSW Minerals Council, May 2016.

[48] NSW Auditor-General (2011) *Auditor-General's Report: Financial Audit Volume 6*, p 13, http://www.audit.nsw.gov.au/publications/financial-audit-reports/2011

[49] NSW Auditor-General (2011) *Auditor-General's Report: Financial Audit Volume 6*, p 13, http://www.audit.nsw.gov.au/publications/financial-audit-reports/2011

[50] NSW Auditor-General (2014) *Report to Parliament: Managing contaminated sites,* p 24, http://www.audit.nsw.gov.au/news/managing-contaminated-sites

This contrasts with a 2011 study identifying 410 abandoned mines across the state, although this may include sites not on Crown Land.[51]

While some of these mines were abandoned many years ago, others have operated into the 1980s and 1990s. For example, the Woodsreef asbestos mine mentioned above operated up to 1983.[52]

Derelict mines represent a serious and ongoing liability for the NSW community and there is a risk that many of the current mines in care and maintenance or otherwise "suspended operations" could also become the responsibility of the state. The final voids currently planned also represent a long term environmental and potential financial risk to the state.

BONDS

According to the DRE, all current mines, even if they are in care and maintenance, have "full 100% security coverage in the event they may default to the state".[53] DRE reports that as of July 2016 the NSW Government holds approximately $2.2 billion in security deposits to cover potential rehabilitation liabilities.[54]

This figure is small relative to some of the costs that might be involved in rehabilitation, depending on the standards of rehabilitation required. For example, it would not cover the costs of filling in the voids created by two coal mines – Mt Thorley-Warkworth and Maules Creek, which would cost $2.1 billion and $813 million respectively. Other mines would likely also cost hundreds of millions for the voids to be filled. [55]

The DRE stresses that filling the void is not a requirement of the development consent of these mines,[56] but these figures serve to emphasise the immense potential costs involved with these mines relative to the size of the bonds that the state has collected.

[51] Unger et al (2012) *Mapping and Prioritising Rehabilitation of Abandoned Mines in Australia*, p 262, https://www.researchgate.net/publication/236900961_Mapping_and_Prioritising_Rehabilitation_of_Abandoned_Mines_in_Australia

[52] Minerals Policy Institute (2016) *Woodsreef*, http://www.mininglegacies.org/mines/nsw/woodsreef/

[53] Correspondence with the DRE, September 2016.

[54] Correspondence with the DRE, September 2016.

[55] Proponent estimates compiled in Walters (2016) *The Hole Truth: The mess coal companies plan to leave in NSW*, http://downloads.erinsights.com/reports/the_whole_truth_LR.pdf

[56] Correspondence with the DRE, September 2016.

Northern Territory

Table 14: NT section summary

Category	Low	High
Mines in operation	6	7
Mines in care and maintenance	4	Unknown
Mines closed and undergoing final rehabilitation	Unknown	Unknown
Mine sites rehabilitated and relinquished or sold	1	Unknown
Abandoned mines	Unknown	Unknown
Rehabilitation bonds held	$1.3 billion	$1.3 billion
Estimate of total current rehabilitation liabilities	Unknown	Unknown
Estimate of current rehabilitation liabilities for abandoned mines	Unknown	Unknown

INTRODUCTION

The Northern Territory's mines include gold, iron ore, zinc, lead and silver among other commodities. It has also been well known for uranium projects, such as Rum Jungle, Ranger and the Jabiluka proposal. Mining has often been controversial in the Territory – the Jabiluka proposal attracted international attention in the 1990s and 2000s before it was halted, while and Glencore's McArthur River zinc, lead and silver mine, was recently in the headlines for pollution and improper waste management.[57]

Mining employs 5,500 people in the NT; 4.2% of the total workforce and 5.2% of all full-time employees.[58] Royalties make up 2.6% ($168 million) of 2015-2016 state budget revenues.[59]

The Northern Territory Department of Mines and Energy (DME) is responsible for geoscience information, titles, remediation, compliance, policy and legislation and community engagement.[60]

[57] Bardon (2016) *The race to avert disaster at the NT's McArthur River Mine,* http://www.abc.net.au/radionational/programs/backgroundbriefing/the-race-to-avert-disaster-at-the-nts-mcarthur-river-mine/7159504

[58] ABS (2015) *6291.0.55.003 Labour Force, Australia, Detailed, Quarterly, Table 05. Employed persons by State, Territory and Industry division of main job (ANZSIC),* http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6291.0.55.003Nov%202015?OpenDocument

[59] Northern Territory Government (2016) *Budget Papers 2015-16, Budget Paper 2*, p. 16, https://budget.nt.gov.au/2016-17-budget-papers

MINES IN OPERATION

According to the DME, the Northern Territory has six mines and one limestone quarry in operation as of August 2016.[61] These are shown in Table 15 below:

Table 15: Operating mines in Northern Territory listed in both STRIKE and on map

Mines	Minerals
Ranger	Uranium
Cosmo Deeps	Gold
McArthur River	Zinc, lead, silver
Gove	Bauxite
Mataranka	Limestone
Callie	Gold
Gemco	Manganese

Source: Mineral Projects of the Northern Territory map and on STRIKE.

The DME publication *Mineral Projects of the Northern Territory*,[62] shows nine operating mines. A spokesperson for DME explained that one of these, Spinnifex Bore (aka Harts Range) is under development and not operating, while another, Union Reefs, does not actually mine, but processes ore from the nearby Callie mine.

DME's online program, STRIKE, shows tenure and geoscience information. It lists 18 operational mines. [63] This, however, refers not to mines but to deposits, of which there may be several within a single mine.

MINES IN CARE AND MAINTENANCE

No comprehensive estimate of mines in care and maintenance is available. The map *Mineral Projects of the Northern Territory*,[64] says there are only four mines in care and maintenance. The Department's online program STRIKE however, lists nine mines as being in care and maintenance, as shown in Table 16 below:

[60] NT Department of Mines and Energy (2016) *About us,* https://minerals.nt.gov.au/about
[61] Correspondence with the department, August 2016
[62] CORE (2016) *Mineral Projects of the Northern Territory June 2016,* http://www.core.nt.gov.au/Content/File/InvestmentAlert/MineralProjectsMap.pdf
[63] NT Department of Mines and Energy (2016) *STRIKE,* http://strike.nt.gov.au/
[64] CORE (June 2016) *Mineral Projects of the Northern Territory,* http://www.core.nt.gov.au/Content/File/InvestmentAlert/MineralProjectsMap.pdf

Table 16: Mines in care and maintenance in the Northern Territory

Listed on map		Listed in STRIKE spreadsheet	
Mine	**Mineral**	**Mine**	**Mineral**
Frances Creek	Iron ore	Punchbowl	Copper
Roper Bar	Iron ore	Lethbridge Bay	Mineral sands
Roper River	Iron ore	Azurite	Copper
Warrego Tailings	Iron ore, gold	Toms Gully	Gold
		Peko	Gold
		Andranangoo	Mineral sands
		Roman Nose	Copper
		Bluff Cu	Copper
		Browns	Copper–Cobalt–Nickel

Source: *Mineral Projects of the Northern Territory* map and STRIKE.

A DME spokesperson explained that several of the STRIKE references refer to parts of the former Redbank copper mine. This mine in the north-east of the NT ceased operations in the 1990s after only three years of production. The site has been responsible for major environmental damage. The status of the Redbank site is unclear, sometimes referred to as being in care and maintenance, other times as being taken over by the NT government for rehabilitation.[65]

The spokesperson explained that two projects in the STRIKE database and shown in Table 16 have 'ceased operations', Lethbridge Bay and Peko. Lethbridge Bay has been "fully rehabilitated back to its natural state" according to DME, while Peko Mine may have been abandoned since 1981.[66]

Tom's Gully is in care and maintenance, as are two other sites near it, Rustler's Roost and Quest 29.

One point to note is that the entire iron ore industry of the NT is in care and maintenance. This should be of concern to NT taxpayers as the Territory government

[65] James (2016) *Redbank copper mine off the hook as EPA drops charges*, http://www.abc.net.au/news/2016-05-16/redbank-copper-mine-off-the-hook-as-nt-epa-drops-charges/7419566

[66] Bonzle (2016) *Peko Mine, NT,* http://www.bonzle.com/c/a?a=p&p=254826

spent $40.9 million on port facilities between 2008-09 and 2011-12 to cater for the iron ore industry.[67]

While the Territory's iron ore mines are listed as being in care and maintenance, most of the companies that own these mines have gone into administration or been wound up.

- Frances Creek is a small iron ore mine near Pine Creek that went into care and maintenance in late 2014–January 2015.[68] Noble Group subsidiary, Territory Iron appears to have been wound up as a company.[69]
- Roper Bar closed in 2014 and has been in care and maintenance since. It is unclear who is now responsible for the mine. The company that was responsible, Western Desert Resources, has gone into liquidation.[70]
- Roper River is another small iron ore mine east of Katherine, which has ceased operations. Owners Sherwin Iron went into administration in 2014.[71]

The Department appears to have little other information available on how many mines are in care and maintenance and, more importantly, how long they have been in care and maintenance. Representatives of the Department said they could provide information on which mines had gone in and out of care and maintenance over the last five years, but no information was provided despite 10 separate phone calls and two different email requests and four follow-up emails to those two requests in total over a total period of one and a half months. The department said that information on mines going into care and maintenance more than five years ago could be accessed, but would cost "thousands of dollars" in access fees.[72]

Part of the difficulty in assessing which mines are in care and maintenance and which have been abandoned is the way abandonment is defined in the Territory. A spokesperson for the department says that Northern Territory policy is to not treat a mine as abandoned while a mineral lease is in effect over the area. As long as the lease

[67] Peel, Campbell and Denniss (2014) *Mining the Age of Entitlement: state government assistance to the minerals and fossil fuel sector*, www.tai.org.au/content/mining-age-entitlement

[68] Brann (2015) *Iron ore production in the Northern Territory grinds to a sad and costly halt*, http://www.abc.net.au/news/2015-01-27/iron-ore-production-stops-in-the-northern-territory/6043172

[69] deListed (2016) *Territory Iron Ltd,* http://www.delisted.com.au/company/territory-iron-limited

[70] Chambers (2015) *Roper Bar mine wind-up: native titleholders seek royalty payments,* http://www.theaustralian.com.au/business/mining-energy/roper-bar-mine-windup-native-titleholders-seek-royalty-payments/news-story/0c78282fe4388c328db28fea98539072

[71] Hagemann (2014) *Sherwin Iron gives up the ghost, no future for Roper River iron*, http://www.australianmining.com.au/News/Sherwin-Iron-gives-up-the-ghost-no-future-for-Rope

[72] Correspondence with the department, February–March 2016.

is in effect the site is considered in care and maintenance, regardless of what activity occurs at the site. Sites can lie unused and unrehabilitated for many years. Sometimes new technology results in mining operations being re-developed, notably at historic gold mining sites.[73]

SHUT-DOWN, FINAL REHABILITATION AND RELINQUISHMENT

As with information on mines in care and maintenance, data on mines undergoing final rehabilitation was not provided despite extensive correspondence.

Mine sites in the Northern Territory are rarely fully rehabilitated. The only example of full rehabilitation that a spokesperson of the Department of Mines and Energy gave was of the Lethbridge Bay deposits of the Matilda mineral sands mine .[74] DME also said at an earlier date that there are very few sites that are fully rehabilitated and do not need more attention.[75]

Another representative said that mines either go into care and maintenance or remediation takes a very long time, giving the example of a project that has been undergoing remediation since the 1920s–30s.[76]

MINE ABANDONMENT

As discussed above, some mines that the department identified as undergoing care and maintenance appear to actually be abandoned. Unlike the states, the Northern Territory did not have mine abandonment data in Unger et al's 2012 study.[77]

The Mining Legacies website shows 33 sites in the Territory as "Historic mines", although many of these sites may not have been abandoned.[78]

A spokesperson for the department says a Legacy Mines Team has operated in the department since 2013–2014. Its responsibilities include establishing a register of

[73] Correspondence with the department, August 2016.
[74] Correspondence with the department, August 2016.
[75] Correspondence with the department, February–March 2016.
[76] Correspondence with the department, February 2016.
[77] Unger et al (2012) *Mapping and Prioritising Rehabilitation of Abandoned Mines in Australia*, https://www.researchgate.net/publication/236900961_Mapping_and_Prioritising_Rehabilitation_of_Abandoned_Mines_in_Australia
[78] Minerals Policy Institute (2016) *Mining Legacies*, http://www.mininglegacies.org/map/

legacy sites in the Northern Territory and environmental issues that need to be addressed.[79]

SITE INSPECTIONS

The Northern Territory conducted 296 site inspections in the financial year 2014–2015.[80] This is a very high amount given the Territory has only seven operating mines. Site inspections include operating mines, exploration operations, extractive mining operations and legacy mines. Visits can include environmental audits, routine periodic inspections, close out inspections, incident investigations and environmental monitoring tasks. A spokesperson for the department stresses that site inspections always involve a physical visit to the site.[81]

BONDS

The Northern Territory held $1.3 billion in February 2016 according to a department representative. This figure fluctuates because receipts and partial or full repayments happens daily.[82] Since 2005, the Northern Territory has required 100% of liabilities to be covered with bonds; before then, bonds were either "inadequate or non-existing".[83] Bonds are in the form of unconditional and open-dated guarantees, which can be drawn even if the parent company fails.[84]

The system for calculating securities is found on the department's website.[85] A publicly available Excel spreadsheet calculates the total rehabilitation cost after the company fills out the details of their mine site. The department then verifies the result against its own assessment of the estimated security, based on the cost of equivalent earthworks or activities.[86] Where the estimated amount is $250,000 or more, a

[79] Correspondence with the department, August 2016.
[80] Department of Mines and Energy (2015) *Annual report 2014–2015,* p 54, http://www.nt.gov.au/d/Minerals_Energy/annualreport/1415/documents/Chapter%204%20-%20Performance%20Reporting.pdf
[81] Correspondence with the department, August 2016.
[82] Correspondence with the department, February 2016.
[83] NT Department of Mines and Energy (2015) *Addressing Legacy Mining Issues in the Northern Territory,* http://www.nt.gov.au/d/Minerals_Energy/?header=Legacy%20Mines
[84] Correspondence with the department, August 2016.
[85] NT Department of Mines and Energy (2012) *Security Management,* http://www.nt.gov.au/d/Minerals_Energy/index.cfm?header=Mining#security_management
[86] Correspondence with the department, August 2016.

Security Assessment Board sets the level of the security.[87] Securities can be paid in cash, by credit card, cheque, money order or bank guarantee, [88] but the majority are in the form of bank guarantees. These must be provided by an Australian deposit-taking institution, as defined by APRA.[89]

$1.3 billion is high considering the number of operating mines the state has, perhaps although the bond figure does include the extractives industry and minerals exploration, as well as minerals mining. However, it does not include the Ranger uranium mine bond, which is held by the federal government per the *Atomic Energy Act*.[90]

The size of each individual bond is secret. The *Mining Management Act*[91] prohibits the department from disclosing individual bonds. This contrasts with Victoria which publishes specific bonds on its website.

[87] Correspondence with the department, August 2016.
[88] NT Department of Mines and Energy (2012) *Security Calculation Procedure Guide,* http://www.nt.gov.au/d/Minerals_Energy/index.cfm?header=Mining#security_management
[89] Correspondence with the department, August 2016.
[90] Correspondence with the department, August 2016.
[91] *Mining Management Act* (NT) part 10, s 90.

South Australia

Table 17: South Australia section summary

Category	Low	High
Mines in operation	351 (9 major)	783
Mines in care and maintenance	151 (8 major)	151 or more
Mines closed and undergoing final rehabilitation	1 major	Unknown
Mine sites rehabilitated and relinquished or sold	18	Unknown
Abandoned mines	3,255	3,255
Rehabilitation bonds held	>$100 million	$131.4 million
Estimate of total current rehabilitation liabilities	$151.2m[92]	Unknown[93]
Estimate of current rehabilitation liabilities for abandoned mines	Unknown	Unknown

INTRODUCTION

South Australia's best known mine is the Olympic Dam project operated by BHP Billiton, which produces copper, gold, uranium and silver. The state has a long history of uranium and radium mining and the state's iron ore industry played a major role in Australia's planning during World War II.

Mining employs 8,600 people in South Australia, accounting for 1.1% of all employment.[94] According to 2015–16 budget estimates, mining royalties contributed 1.7% of state government revenue in 2015–16.[95]

Mine site closure and rehabilitation in South Australia is the joint responsibility of the Environmental Protection Agency and the Department of State Development (DSD),[96]

[92] Total bonds and Extractive Areas Rehabilitation Fund holdings at 2015.
SA Department of State Development (2015) *Annual Report 2014-15,*
http://www.statedevelopment.sa.gov.au/about-us/publications-and-reports

[93] The government is currently reviewing bonds. Independent external review not found.

[94] Australian Bureau of Statistics (2015) *ABS Cat no. 6291.0.55.003 Labour Force, Australia, Detailed, Quarterly, Table 05. Employed persons by State, Territory and Industry division of main job (ANZSIC)*,
http://www.abs.gov.au/ausstats/abs@.nsf/mf/6291.0.55.003

[95] Government of South Australia (2015) *Budget Statement - 2015-16 Budget Paper 3*, pp 36, 55,
http://servicesa.cdn.on.net/releases2015/2015-16%20BP3%20-%20Budget%20Statement.pdf

in particular DSD's Mine Completion Group. A spokesperson from the Group provided information. There are also a number of data sources on the DSD website.

MINES IN OPERATION

There are a total of 351 mines currently in operation in South Australia, according to a DSD spokesperson.[97] This includes a wide range of minerals, opal mines, and mine construction materials. The majority are quarries and many of these mines are small.

A government database, SARIG, shows 452 deposits with operating mines, as of 20 February 2015.[98] SARIG also shows 331 'seasonal' mines which operate intermittently. A summary of SARIG results is in Table 22 at the end of this section on South Australia.

The DSD website reports the status of 'major' mines, quarries and construction materials sites.[99] According to this information, there are eleven major mines currently in operation, summarised in Table 18 below:

Table 18: Major Mines in Operation in South Australia

Mine	Commodity
Four Mile Uranium Mine, Beverley Mine and Beverley North Mine (as a unit)	Uranium
Golden Grove Extractive Industries Zone	Sand, shale, clay
Jacinth-Ambrosia Mineral Sand Project	Heavy mineral sands
Kanmantoo	Copper, gold, silver
Middleback Ranges	Iron ore
Olympic Dam	Copper, uranium, gold, silver
Penrice Mine	Chemical grade limestone
Prominent Hill (Ankata and Malu)	Copper, gold, silver
White Dam	Gold
Challenger	Gold
Portia	Gold

[96] Government of South Australia (2013), *Administrative arrangements between the EPA and the Department of State Development's Mineral Resources Division*, http://minerals.statedevelopment.sa.gov.au/__data/assets/pdf_file/0012/187887/DMITRE_MRD_and_EPA_Administrative_Arrangement.pdf

[97] Correspondence with the department.

[98] SARIG, (2015) *All Mines and Deposits, exported layer,* https://sarig.pir.sa.gov.au/Map

[99] SA Department of State Development (2014) *Summary of major operating and approved mines and quarries* http://www.minerals.statedevelopment.sa.gov.au/mining/mines_and_quarries#mines

Source: Correspondence with DSD, August 2016; see also *Summary of major operating and approved mines and quarries,* which differed in some respects as at August 2016.[100]

It is unclear what criteria DSD uses to determine 'major' mines in contrast to others. In addition, DSD indicates there are two major mines that have approval, one seeking approval and one under construction.[101]

February 2015 data from GeoScience Australia lists 22 operating mines in South Australia. [102] However, a number of the mines listed are currently in care and maintenance according to other sources.

MINES IN CARE AND MAINTENANCE

A DSD spokesperson explained that mines "often stop mining for a period (often many years) and then with better technology are reopened again". They did not provide current figures for total mines in care and maintenance in South Australia. There is no formal time limit on staying in care and maintenance, but the spokesperson said "If it is clear that the mine will cease then active rehabilitation is pursued with the miner."[103]

SARIG shows 151 mines, quarries and treatment sites in care and maintenance, as of 20 February 2015. Some of the sites were last mined many decades ago but it is unclear how long they have been care and maintenance. For example, Martins Well is a barite mine last in production in 1993; it is now in care and maintenance. Mutooroo is a copper, gold, cobalt and sulphur mine that is listed as in care and maintenance; it was last mined in 1953, but exploration began again from 2005 onwards. Aroona zinc and lead mine last produced in 1999; it is listed in SARIG as in care and maintenance, although the DSD website says it was rehabilitated in 2000.[104]

SARIG also lists 108 sites that have 'ceased'. In these cases, "regulatory obligations are unknown or have not been satisfied". This includes, for example, Iron Knob, the first mine for iron ore used to make steel in Australia, and the nearby Iron Princess mine. Iron Knob is currently open for tours. The nearby Iron Monarch mine reopened in 2010, by the company that became Arrium Steel, but is now in care in maintenance.

[100] SA Department of State Development (2016) *Summary of major operating and approved mines and quarries,* http://www.minerals.statedevelopment.sa.gov.au/mining/mines_and_quarries#mines
[101] SA Department of State Development (2014) *Summary of major operating and approved mines and quarries* http://www.minerals.statedevelopment.sa.gov.au/mining/mines_and_quarries#mines
[102] GeoScience Australia (2015) *Australian Mines Atlas – Operating Mines*, http://www.australianminesatlas.gov.au/mapping/downloads.html
[103] Correspondence with the department, February and March 2016.
[104] SA Department of State Development (2014) *Lead – Zinc,* http://minerals.statedevelopment.sa.gov.au/geoscience/mineral_commodities/lead_-_zinc

Other examples of 'ceased' sites are the Mindarie A2 heavy minerals mine, near the town of Mindarie, and the Ingomar trial coal pit. The description for some of the ceased sites indicates they are "awaiting rehabilitation", for example, Littlehampton shale and clay pit which ceased production in 2005.

The DSD website lists five 'major' mines in care and maintenance, shown in Table 19.

Table 19: Major mines in care and maintenance in South Australia

Mine	Commodity
Angas Zinc Mine	Zinc, lead, silver, gold, copper
Beltana: Flinders Zinc Project	Zinc
Cairn Hill	Magnetite, copper, gold
Honeymoon	Uranium
Peculiar Knob	Iron ore (hematite)

Source: Correspondence with DSD, August 2016; see also *Summary of major operating and approved mines and quarries,* which differed in some respects as at August 2016.[105]

SHUT-DOWN, FINAL REHABILITATION AND RELINQUISHMENT

A DSD spokesperson did not provide figures for mines currently undergoing final rehabilitation but did provide the number of 'surrendered mining leases' in South Australia over the past 30 years. The government deems leases 'surrendered' only after rehabilitation, as the 2014–15 DSD Annual Report states:

> For new [mining] activities, it is a lease condition that rehabilitation be undertaken by the leaseholder before a lease is surrendered. The department's responsibility is to ensure that a lease is not surrendered before appropriate rehabilitation has occurred, thus minimising the likelihood of future environmental risks to government.[106]

The numbers of leases surrendered are presented in Table 20.[107] Note leases are different sizes and many mines have more than one lease.

[105] SA Department of State Development (2016) *Summary of major operating and approved mines and quarries,* http://www.minerals.statedevelopment.sa.gov.au/mining/mines_and_quarries#mines

[106] Emphasis added, SA Department of State Development (2015) *Annual Report 2014-15,* p 104, http://www.statedevelopment.sa.gov.au/about-us/publications-and-reports

[107] Correspondence with the department, March 2016.

Table 20: Surrendered mining leases in South Australia over 30 years

	Leases Surrendered	Per year
1986-1989	252	50
1990-1994	143	29
1995-1999	115	23
2000-2004	93	19
2005-2009	43	9
2010-2014	122	24
2015-2016*	37	30

Source: to March 2016, * x 0.25 year; Correspondence with DSD, 17 March 2016.

On the DSD website for major mines, the Leigh Creek coal mine was recently listed as undergoing rehabilitation, following the closure of the Port Augusta power plant. It is the only 'major mine' in this category, [108] although a spokesperson for the DSD said that Mindarie is also in the final stages of rehabilitation. [109] The Port Augusta power plant is also to be rehabilitated. However there are concerns the site is not being appropriately maintained; residual fly ash has been filmed spreading from the site, where it is stockpiled in large amounts, and the ash could pose health risks. [110]

The SARIG database lists 423 mine sites that have been rehabilitated. A further 55 are listed for recreational use. Table 21 outlines selected data about rehabilitated sites.

Table 21: Selected information about South Australian rehabilitated mine sites

Site type		Site Size		Commodity	
Mine	18	**Insignificant**	324	**All construction materials**[111]	408
Pit	268	**LOC**	89	**Barite**	8
Prospect	1	**SA**	10	**Coal**	1
Quarry	136			**Copper**	1
				Gold	1
				Lead, Copper, Gold, Silver, Zinc, Arsenic	1
				Sulphur	1
				Talc, Albite	1

[108] SA Department of State Development (2014) *Summary of major operating and approved mines and quarries* http://www.minerals.statedevelopment.sa.gov.au/mining/mines_and_quarries#mines

[109] Correspondence with the department, August 2016.

[110] Southern Cross News SA (2016) *Facebook video, 28 July* https://www.facebook.com/SCNewsSA/videos/986405068124791/

[111] Basalt, Calcrete, Clay, Dolomite, Gneiss, Granite, Gravel, Ironstone - construction materials, Kaolin, Limestone, Marble, Quartzite, Sand, Sandstone, Schist, Shale, Shell grit, Silica sand, Siltstone, Slate.

Source: South Australian Resources Information Geoserver (SARIG), export of layer "All Mines and Mineral Deposits", last updated 20 Feb 2015

The 423 mines sites classified as rehabilitated include 324 classified as being an "insignificant" size. Most are 'pits' or 'quarries' and only 18 are classified as mines. Most produced construction materials.

Only 14 of the rehabilitated sites once produced minerals. 8 of these were barite mines. Most of the remaining mines are from the 19th Century. Weal Ellen mined a range of metals in the first half of the 19th Century and is now listed as rehabilitated. The one rehabilitated coal mine listed in the state, at Montifoire Hill, was opened in the 1860s in what is now North Adelaide, and is covered by park and a golf course. The Rainsford heavy minerals pit is described as "partially rehabilitated in 1973". Brukunga is listed as rehabilitated in the database, although it is listed on the DSD website as a "Major Rehabilitation Project".[112]

MINE ABANDONMENT

SARIG shows there are over three thousand abandoned mines in South Australia. Most of these are small mines, some as small one mine shaft. There are also 40 mines categorised as 'unknown', again mostly smaller historic copper and gold mines.

The DSD spokesperson stated there is no formal program for dealing with these abandoned mines. Where "an abandoned mine is causing an environmental impact a case may be made to spend money on preventing this environmental damage but as this would require Government funding such cases are very rare." The Extractive Areas Rehabilitation Fund (EARF) has been used for this purpose on occasion.[113]

A small number of sites categorised as 'abandoned' are nonetheless described as 'rehabilitated' in the site description field.

BONDS

Companies proposing to mine for commodities must first lodge a bond to DSD equal to the full expected costs of rehabilitation.[114] The bond can be in cash or as a bank guarantee.

[112] DSD (2016) *Former Mines,* http://www.minerals.statedevelopment.sa.gov.au/mining/former_mines
[113] Correspondence with the Department, February 2016.
[114] SA Department of State Development (n.d.) *South Australian Mining Investment Guide,* p 30, http://www.statedevelopment.sa.gov.au/upload/investment-and-trade/mining-investment-guide.pdf

The required bond is estimated by the proponent in the PEPR. The government may accept this estimate; if not, the government produces their own. The two parties conduct "discussion and review" to determine correct amount. On some occasions a third party is commissioned to produce another estimate.

Bonds may be reviewed on a site by site basis to make sure that they are still accurate. For major bonds this review is annual. An overall review of data is currently underway to ensure old bonds that have not been reviewed due to low site activity are still accurate.

There is no public register of bonds. DSD explained they range between a few thousand to over $10 million, totalling in early 2016 at "just over $100 million".[115] The 2014-2015 annual report shows that in June 2015 rehabilitation bonds were $4.4 million in cash and $127 million in bank guarantees.[116]

The DSD spokesperson said:

> There is no example that I can think of in recent times when the Government has had to fund rehabilitation of private mines where there has been a rehabilitation failure. Only very rarely has the bond been called upon to fund rehabilitation.[117]

Several examples exist, however, of government funded rehabilitation and management. The open pit Brukunga mine was mined for iron sulphides from 1955.[118] A substantial amount of sulphur waste was accumulated on site. When mining ceased in 1972, acidic waste water collected on site, dissolving heavy metals into ground and surface water. In 1977 the government took over responsibility for rehabilitation. Rehabilitation work continues today, including a 'neutralisation plant', site revegetation and multiple diversions of a contaminated creek.

The Port Pirie treatment plant involved uranium and rare earths.[119] The Radium Hill mine produced uranium.[120] Both were previously government operated. The government is taking responsibility for remediation.

[115] Correspondence with the Department.
[116] SA Department of State Development (2015) *Annual Report 2014-15,* pp 92, 104, http://www.statedevelopment.sa.gov.au/about-us/publications-and-reports
[117] Correspondence with the department, February 2016
[118] SA Department of State Development (2014) *Brukunga Mine Site,* http://minerals.statedevelopment.sa.gov.au/mining/former_mines/brukunga_mine_site
[119] SA Department of State Development (2014) *Port Pirie treatment plant,* http://minerals.statedevelopment.sa.gov.au/mining/former_mines/port_pirie_treatment_plant

EXTRACTIVE AREAS REHABILITATION FUND (EARF)

'Private mines' and mines producing construction materials such as clay and sandstone ('extractive minerals') typically do not need to lodge a bond. Instead, they are covered by the Extractive Areas Rehabilitation Fund (EARF).[121] The EARF is intended to ensure that the state has sufficient funds to cover rehabilitation when needed, at any stage of mining. The EARF functions in a similar way to the MRF in Western Australia.

The EARF is funded from royalty payments. Extractive minerals production incurs a royalty, currently 55 cents per tonne, from which 25 cents is allocated to the EARF by the Minister. The department can spend up to a total of 4 cents per tonne (from the 25 cents allocation) on ensuring extractive mining operations are rehabilitated in accordance with the requirements under the Act.[122]

In June 2015 the EARF held $19.8 million in cash. In the year to June 2015 it received $2.4 million and spent $1.7 million.[123]

[120] SA Department of State Development (2014) *Radium Hill mine,* http://minerals.statedevelopment.sa.gov.au/mining/former_mines/radium_hill_mine

[121] SA Department of State Development (2014) *Extractive Areas Rehabilitation Fund (EARF),* http://minerals.statedevelopment.sa.gov.au/exploration/tenement_information/extractive_areas_rehabilitation_fund_earf

[122] SA Department of State Development (2014) *Extractive Areas Rehabilitation Fund (EARF) – Information Sheet,* http://www.pir.sa.gov.au/__data/assets/pdf_file/0019/222157/EARF_Information_Sheet_-_Eligibility_and_Application_process_July_2014.pdf

[123] SA Department of State Development (2015) *Annual Report 2014-15,* p 112, http://www.statedevelopment.sa.gov.au/about-us/publications-and-reports

Table 22: All Mines and Mineral Deposits in South Australia (via SARIG)

Category	Number	Description
Active	452	Mining or treatment is currently operating
Seasonal	331	Mining intermittently on a part time basis with stockpiling over short periods of the year
Care	151	Mining has been temporarily suspended or put on care and maintenance
Ceased	108	Mining has ceased but regulatory obligations are unknown or have not been satisfied. Used for post-1972 operations
Unknown	40	Where the exploration activity is either unknown, has not been field checked or has not been evaluated from available records
Rehabilitated	423	Mining has ceased and all regulatory obligations have been satisfied
Recreation	55	An abandoned site which is now a historic site, museum, walking trail etc
Abandoned	3255	[Description not provided]
Not worked	2150	No mining activity

Source: South Australian Resources Information Geoserver (SARIG), export of layer "All Mines and Mineral Deposits", last updated 20 Feb 2015; Descriptions were quotes from layer metadata, accessed May 2016.

Tasmania

Table 23: Tasmania section summary

Category	Low	High
Mines in operation	15	15
Mines in care and maintenance	9	9
Mines closed and undergoing final rehabilitation	4 in last 10 years	11 in last 30 years
Mine sites rehabilitated and relinquished or sold	1 in last 10 years	≥6
Abandoned mines	681	4,200
Rehabilitation bonds held	$55 million	$55 million
Estimate of total current rehabilitation liabilities	Unknown	Unknown
Estimate of current rehabilitation liabilities for abandoned mines	Unknown	Unknown

INTRODUCTION

The first European to reach Tasmania, Abel Tasman, did so because of its mineral resources. An onshore iron ore mass played havoc with his compass in 1642, alerting him to the presence of land.[124] The state now has eight major operating mines: a copper mine, a silver, lead and zinc mine, a tin mine, three iron ore mines and a gold mine. The state's other mineral resources include bauxite, tin-tungsten and scheelite.[125] Mining has contributed to the state's development, particularly in the west, but has also had environmental and social effects. For example, a century of digging at the Mt Lyell copper mine has "killed" the King and Queen rivers and created a 400 hectare delta of toxic sludge.[126]

Despite the then-minister for resources Paul Harriss saying that mining is a "key strength" of the state,[127] mining is not a significant part of the Tasmanian economy.

[124] Tasmanian Government (2014) *The mining and mineral processing industry in Tasmania,* p 2, http://cg.tas.gov.au/__data/assets/pdf_file/0020/123374/INVEST14001_IG_Mining_and_Minerals_En_20150617_Web.pdf

[125] Mineral Resources Tasmania (2016) *Tasmania's Mineral Industry,* http://www.mrt.tas.gov.au/portal/mining

[126] Blackwood (2004) *Acid Mine,* http://www.abc.net.au/stateline/tas/content/2003/s1125095.htm

[127] Harriss (2014) *180 jobs created as Bald Hill Mine opens*, http://www.premier.tas.gov.au/releases/180_jobs_created_as_bald_hill_mine_opens

Only 2,300 people are employed, part- or full-time, in Tasmanian mining.[128] This represents 0.9% of all Tasmanian employment and 1.5% of full-time employment, significantly less than the Australian averages of 1.8% and 2.6% respectively. The state is projected to collect $28 million in mining royalties in the 2015–2016 financial year. This is 0.5% of budgeted state revenue.[129]

Mineral Resources Tasmania, a division of the Department of State Growth, is responsible for implementing government policy in relation to minerals and petroleum resources, including collecting and publishing information, issuing legal titles, regulating exploration, environmental appraisal and management and setting and monitoring standards.[130]

MINES IN OPERATION

Tasmania makes more mining data available than other states do. According to the Tasmanian Department of State Growth, there are 15 operating mines, shown in Table 24 below:

Table 24: Operating mines in Tasmania May 2016

Company	Mine	Mineral
Naracoopa Mineral Sands	Naracoopa	Heavy mineral sands
Circular Head Dolomite	Smithton	Dolomite
Tasmanian Advanced Minerals	Blackwater River	Silica flour
Tasmanian Advanced Minerals	Hawkes Creek	Silica flour
Grange Resources	Savage River	Iron ore
Tasmanian Advanced Minerals	Corinna	Silica flour
Bluestone Mines	Renison Bell	Tin, copper

[128] Australian Bureau of Statistics (2015) *6291.0.55.003 Labour Force, Australia, Detailed, Quarterly, Table 05. Employed persons by State, Territory and Industry division of main job (ANZSIC)*, http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6291.0.55.003Nov%202015?OpenDocument

[129] Tasmanian Government (2015) *Budget Papers 2015-16, Budget Paper Number 1*, pp 82, 102, http://www.treasury.tas.gov.au/domino/dtf/dtf.nsf/a6c28ced64705388ca256f0700810896/3425a94f1d3894baca257e49000ff529?OpenDocument

[130] Mineral Resources Tasmania (2016) *About Mineral Resources Tasmania,* http://www.mrt.tas.gov.au/portal/about-mrt

MMG	Rosebery	Zinc, lead, gold, silver, copper
Cresswells Transport	Eddy Creek	Dolomite
Cornwall Coal	Kimbolton	Coal
Sibelco Lime Tasmania	Mole Creek	Limestone
Cornwall Coal	Blackwood	Coal
Cornwall Coal	Cullenswood	Coal
Cornwall Coal	Huntsman	Coal
Tasmania Mines	Kara	Iron ore, tungsten

Source: Major Mining and Mineral Processing Operations map from the Department of State Growth dated May 2016, exported 13 July 2016.[131]

Two iron ore mines, Savage River and Kara, remain in operation despite the collapse in the iron ore price.[132]

MINES IN CARE AND MAINTENANCE

Tasmania was the only state able to provide information on mines going into care and maintenance and closure over time, summarised in Table 25 below:

Table 25: Mining in Tasmania over 30 years

Mines that…	2011 - 2015	2006 - 2010	1996 - 2005	1986 - 1995
Went into care and maintenance	9	4	0	Unknown
Were relinquished and handed back to the state	1	0	2	3
Abandoned by company without full rehabilitation	1	0	0	0
Were closed and final rehabilitation begun	3	1	6	1

Source: Correspondence by phone and email 28th of January to 8th of March.

The mines currently in care and maintenance are summarised in Table 26 below:

[131] Mineral Resources Tasmania (2016) *Tasmanian Mining Infrastructure,* http://www.mrt.tas.gov.au/portal/1-500000-geology

[132] Diss (2015) *Fresh iron ore price slump hits mining companies, State Government royalties,* http://www.abc.net.au/news/2015-11-18/fresh-iron-ore-price-slump-tests-junior-miners-and-wa-budget/6953168 and Curtain (2016) *Six mines remain operational in Northern Territory, as companies struggle with low ore prices,* http://www.abc.net.au/news/2016-02-16/six-mines-remaining-nt-mining-industry-downturn/7121396

Table 26: Mines in care and maintenance in Tasmania May 2016

Company	Mine	Mineral
Shree Minerals	Nelson Bay River	Iron ore
Bluestone Mines	Mt Bischoff	Tin
MMG	Avebury	Nickel
CMT	Mt Lyell	Gold, silver, copper
Bass Metals	Que River	Zinc, lead, gold, silver, copper
Bass Metals	Fossey	Zinc, lead, gold, silver, copper
Australian Bauxite	Bald Hill[133]	Bauxite
Webb Mining	Mangana	Gold
Unity Mining	Henty	Gold

Source: Major Mining and Mineral Processing Operations map from the Department of State Growth dated May 2016, exported 13 July 2016.[134]

The Bald Hill bauxite mine went into care and maintenance in January 2016 after failing to find a buyer for its first shipment of bauxite.[135] The mine began operations in late 2014 amid considerable fanfare; a media release from Minister for Resources Paul Harriss in 2014 stated that:

> Bald Hill is Australia's first new bauxite mine in more than 35 years and comes at the perfect time for Tasmania, with the emergence of China as a major consumer of the type of bauxite Tasmania produces, which is in short supply worldwide.[136]

TasRail, a company owned by the state of Tasmania, tendered for a $7 million dollar George Town facility to cater to Bell Bay exports.[137] The project was funded by a $5.2 million dollar federal government grant with the balance paid for by the Tasmanian

[133] Gibson (2016) *Tasmanian bauxite mine suspends production after first shipment stalls,* http://www.abc.net.au/news/2016-01-14/new-bauxite-mine-suspends-production-after-first-shipment-stalls/7089722

[134] Mineral Resources Tasmania (2016) *Tasmanian Mining Infrastructure,* http://www.mrt.tas.gov.au/portal/1-500000-geology

[135] Gibson (2016) *Tasmanian bauxite mine suspends production after first shipment stalls,* http://www.abc.net.au/news/2016-01-14/new-bauxite-mine-suspends-production-after-first-shipment-stalls/7089722

[136] Harriss (2014) *180 jobs created as Bald Hill Mine opens*, http://www.premier.tas.gov.au/releases/180_jobs_created_as_bald_hill_mine_opens

[137] TasRail (2015) *Annual Report,* pp 3, 20, http://www.tasrail.com.au/client-assets/downloads/annual_reports/2014-2015_Annual_Report_(with_financials).pdf

government.[138] The decision to build the facility seems at least partly driven by TasRail's contract with Australian Bauxite to freight over a million tonnes of bauxite to Bell Bay, which will go unfulfilled now that the mine is in care and maintenance.

The non-executive chair of Australian Bauxite is a former premier of Tasmania, Paul Lennon.[139]

SHUT-DOWN, FINAL REHABILITATION AND RELINQUISHMENT

An apparent trend over the last twenty years is an increase in mines going into care and maintenance, from none in the decade 1996–2005 to thirteen in the decade 2006–2015 (four in 2006–2010, nine in 2011–2015). At the same time, there is an apparent downward trend in mines that were closed and rehabilitation began, from six in 1995–2005 to four in 2006–2015, and mines where rehabilitation was concluded and they were handed back to the state, from two in 1996–2005 to one in 2006–2015.

The department did not provide care and maintenance figures for 1986–1995, so a comparison of that decade is not possible.

The department did indicate that three mines were relinquished and handed back to the state in 1986–1995. However, a spokesperson for the department indicated that the government only started "taking rehabilitation bonds seriously from the 1980's … in line with changing community expectations around environmental disturbance", before the *Mineral Resources Development Act 1995* tightened controls on environmental performance.[140] It is not clear if these three mine sites would have been rehabilitated to current standards.

MINE ABANDONMENT

Tasmania has a number of abandoned mines or mine features, distributed across the entire state. One estimate puts the figure at over 4,200 mines.[141] In 2013 the

[138] TasRail (2014) *Major Contract Awarded to Local Company,* http://www.tasrail.com.au/blog/2014/11/18/major-contract-awarded-to-local-company/

[139] Australian Bauxite Ltd (2016) *Board of directors,* http://www.australianbauxite.com.au/Board-of-Directors.htm

[140] Correspondence with the department, February 2016.

[141] Unger et al (2012) *Mapping and Prioritising Rehabilitation of Abandoned Mines in Australia*, p 262, https://www.researchgate.net/publication/236900961_Mapping_and_Prioritising_Rehabilitation_of_Abandoned_Mines_in_Australia

Tasmanian Minerals Conference put the figure at 681 abandoned mines, 215 of which contain potentially acid-producing rock.[142]

Part of mining company royalties is paid into a Rehabilitation of Mining Lands Trust Fund to pay for the rehabilitation of abandoned mines.[143]

A representative for the Department of State Growth said that the budget for rehabilitation of abandoned mines is $150,000 a year and that is "a miniscule part of what is needed."[144]

One example of an abandoned mine is the Scotia tin mine near Gladstone, Tasmania. Its owner, Van Dieman Mines, went into administration in 2009 and was liquidated in 2010–11, mainly as a result of low tin prices.[145] In 2013, environmental groups said that the government planned to release a billion litres of liquid from the abandoned mine's tailings dam into the Ringarooma River.[146]

BONDS

The department indicates that it only holds $55 million in bonds (as at February 2016),[147] to cover the liabilities from 22 mines in operation or in care and maintenance. It appears that security deposits have been consistently undervalued.

A bond is meant to cover the whole rehabilitation liability.[148] While bonds are calculated on the basis of risk, a "smaller mining lease" is generally:

- $200 per hectare for lease area if on Crown Land.
- $5,000 per hectare for quarries which have good access.
- $10,000 per hectare for more remote or larger sites.
- $20,000 per hectare for contaminated sites, sensitive environments, etc. [149]

[142] LEAD Action News (2013) *In Tasmania, they came, they mined, they left … 681 times,* http://www.lead.org.au/lanv13n3/lanv13n3-2.html

[143] Mineral Resources Tasmania (2016) *Rehabilitation Trust Fund,* http://www.mrt.tas.gov.au/portal/rehabilitation-trust-fund

[144] Correspondence with the department, March 2016.

[145] ITRI (2009) *Van Dieman Mines goes into administration,* https://www.itri.co.uk/tin-explorers/van-dieman-mines-goes-into-administration and Correspondence with the department, March 2016.

[146] LEAD Action News (2013) *Planned tailings dam release to contaminate Ringarooma RAMSAR wetland,* http://www.lead.org.au/lanv13n3/lanv13n3-10.html

[147] Correspondence with the department, February 2016.

[148] Mineral Resources Tasmania (2013) *The Tasmanian security deposit system for mining and exploration tenements,* p 2, http://www.mrt.tas.gov.au/portal/documents/10184/21260/UR2013_05_Security_Deposits.pdf

Security deposits are payable in stages as the project progresses.

Calculations of "larger mining leases" are more complicated and the department has not provided examples of typical costs.

The state does not always hold security deposits large enough to cover the total liability:

> The security deposits on most of the larger operators are insufficient to cover the cost of the current on-site liabilities, in the form of both current disturbance and historical legacies. It is thought that the liabilities at some sites may amount to $20–30 million, while the security deposits which are held are only for $2–3 million. Clearly, it will be impossible for a company to increase the security deposit ten-fold over a short period of time. [150]

For these reasons, the Tasmanian government does not expect security deposits to be increased to the real cost of future rehabilitation. Instead the government wants to make a new estimation of the cost with "an understanding that this sum will not be paid as a security deposit".[151] It further states that the company "may elect an additional sum"[152] that can be added to the security deposit total.

[149] Mineral Resources Tasmania (2013) *The Tasmanian security deposit system for mining and exploration tenements,* p 3, http://www.mrt.tas.gov.au/portal/documents/10184/21260/UR2013_05_Security_Deposits.pdf

[150] Mineral Resources Tasmania (2013) *The Tasmanian security deposit system for mining and exploration tenements,* p 3, http://www.mrt.tas.gov.au/portal/documents/10184/21260/UR2013_05_Security_Deposits.pdf

[151] Mineral Resources Tasmania (2013) *The Tasmanian security deposit system for mining and exploration tenements,* p 3, http://www.mrt.tas.gov.au/portal/documents/10184/21260/UR2013_05_Security_Deposits.pdf

[152] Mineral Resources Tasmania (2013) *The Tasmanian security deposit system for mining and exploration tenements,* p 4, http://www.mrt.tas.gov.au/portal/documents/10184/21260/UR2013_05_Security_Deposits.pdf

Victoria

Category	Low	High
Mines in operation	47	162
Mines in care and maintenance	122	122
Mines closed and undergoing final rehabilitation	2	Unknown
Mine sites rehabilitated and relinquished or sold	1	Unknown
Abandoned mines	Average one per year	19,010
Rehabilitation bonds held	$160 million	$160 million
Estimate of total current rehabilitation liabilities	$160 million	>$938 million
Estimate of current rehabilitation liabilities for abandoned mines	Unknown	Unknown

INTRODUCTION

Mining is a small part of Victoria's economy, although historically its resources have been of national significance. The state's goldfields were the site of the gold rush of the 1850s and 60s, and several commercial mines and many recreational prospecting sites still operate. Victoria's 430 billion tonne resource represents over 20% of the world's recoverable brown coal. Three brown coal mines, Hazelwood, Loy Yang and Yallourn, serve power plants responsible for most of the state's electricity generation.[153] Base metals and mineral sands are also mined in the state.

Mining is responsible for just 0.2% of the state's employment (7,000 people), and 0.4% of its full-time employment.[154] Royalties, accounting for an increase in the brown coal royalty rate, were expected to bring in $85 million in revenue in financial year 2016–2017. This is 0.1% of total revenue.[155]

[153] Victorian Department of Economic Development, Jobs, Transport and Resources (2016) *Lignite/Brown Coal,* http://www.energyandresources.vic.gov.au/earth-resources/victorias-earth-resources/coal and Geoscience Australia (2016) *Brown Coal,* http://www.australianminesatlas.gov.au/aimr/commodity/brown_coal.html

[154] Australian Bureau of Statistics (2016) *6291.0.55.003 Labour Force, Australia, Detailed, Quarterly Table 05. Employed persons by State, Territory and Industry division of main job (ANZSIC),* http://www.abs.gov.au/Ausstats/abs@.nsf/mf/6291.0.55.003

[155] Victorian Government (2016) *2016–17 Budget Papers, Budget Paper 5: Statement of Finances,* pp 6, 164, https://www.budget.vic.gov.au/budget-papers

The Energy and Earth Resources division of the state's Department of Economic Development, Jobs, Transport and Resources is responsible for developing policy, attracting and facilitating investment, responsibly managing earth resources, supporting investment in technological development and providing an efficient regulatory framework that effectively manages potential risks.[156]

MINES IN OPERATION

The Victorian Department of Economic Development, Jobs, Transport and Resources (DEDJTR) has a database of mining operations in the state. In late 2015 the DEDJTR database had 162 mines registered as operational, broken down in Table 27 below:

Table 27: Operational mines Victoria

Type	Number
Gold	91
Gypsum	48
Coal and peat	6
Base metals	5
Kaolin	5
Mineral sands	4
Other	2
Total	**162**

Source: Department of Economic Development, Jobs, Transport and Resources.

The Department emphasises that the majority of gold and gypsum mines are "very small scale". It seems likely that many of these mines are different parts of the same mine, or not actually operational.

While the DEDJTR database contains 91 gold mines, the same department's GeoVic mapping application lists only five – Balmain Gold, Unity Mining, Fosterville Gold Mine, Mandalay Resources Costerfield Operations and Stawell Gold Mine. These five mines accounted for over 99 percent of Victorian gold production in 2013, with 30 others reporting some production.[157] Victoria, with its long history of gold mining, has an

[156] Victorian Department of Economic Development, Jobs, Transport and Resources (2016) *About Energy and Earth Resources,* http://www.energyandresources.vic.gov.au/about-us

[157] Victorian Department of Economic Development, Jobs, Transport and Resources (2013) *Earth Resources Regulations – 2012/13 Statistical Report,* table 3.3C, http://earthresources.efirst.com.au/product.asp?pID=1131&cID=46

active small scale and hobbyist fossicking community.[158] The Department's statistics make it difficult to understand the scale and nature of the mines in the state.

Similarly, while the Department's database says there are 48 operating gypsum mines, the National Gypsum Miners Association website says there are only 20 commercial gypsum mines in Victoria.[159]

MINES IN CARE AND MAINTENANCE

DEDJTR's database does not distinguish between mines that have been closed temporarily and those that will not open again. According to the database there are 122 mines that are either in care and maintenance or undergoing final rehabilitation.

Table 28: Non-operational mines in Victoria

Type	Number
Gold	99
Gypsum	15
Coal and peat	2
Kaolin	2
Mineral sands	2
Total	**122**

Source: Department of Economic Development, Jobs, Transport and Resources.

As with estimates of operational mines, numbers of non-operational mines include substantial numbers of very small gold and gypsum mines. The DEDJTR database does have data on when mines went into 'non-operational' status, shown in Table 29 below:

Table 29: Mines go into non-operational status in Victoria

Year of closure	Number
2011-2015	68
2006-2011	17
2005 and before	37
Total	**122**

Source: Department of Economic Development, Jobs, Transport and Resources.

These numbers are also dominated by hobbyist gold mines and small-scale gypsum mines. Regardless of scale, the database shows that 37 mines have been non-operational in Victoria for at least a decade without being fully rehabilitated.

[158] See, for example, Prospectors and Miners Association of Victoria (2016) *Welcome,* http://www.pmav.org.au/#

[159] NGMA (2009) *Gypsum Mining in Victoria,* http://www.gypsum.asn.au/gypsum_mining.htm

SHUT-DOWN, FINAL REHABILITATION AND RELINQUISHMENT

The DEDJTR database has data on approved final rehabilitation, but does not differentiate between mines handed back to the state and mines on private property found to be fully rehabilitated. As with other statistics in Victoria, they are dominated by very small gold and gypsum mines. Data is only available since 2013:

Table 30: Final rehabilitation in Victoria

Type	2013-2015
Gold	34
Gypsum	6
Coal and peat	1
Kaolin	1
Mineral sands	2
Total	**44**

Source: Department of Economic Development, Jobs, Transport and Resources.

A representative of DEDJTR gave some examples of final rehabilitation projects – the Douglas mineral sand mine near Horsham, other mineral sand mines owned by the same company near Ouyen, the Wemen mineral sands mine and the Cranbourne Sand Quarry. [160] While the Douglas mine has received approval as being fully rehabilitated, it is now proposed to be used as a dump for radioactive mining waste.[161] The Ouyen mines are still being rehabilitated, a project that may take up to seven years.[162]

The Cranbourne Sand Quarry was closed in the 1960s and has operated as part of the Royal Botanical Gardens since 2006.[163] While a good example of successful rehabilitation to a productive use, this hardly qualifies as a recent example.

[160] Correspondence with the department, February and August 2016.

[161] Hollingworth (2016) *EPA defends time taken to assess Douglas mine works approval application,* http://www.abc.net.au/news/2016-05-09/epa-defends-time-taken-to-assess-iluka-mine-works-approval-bid/7395048

[162] ABC News (2015) *Mildura' Garraway Group wins $35m contract to rehabilitate Iluka mineral sands mine near Ouyen,* http://www.abc.net.au/news/2015-04-02/mildura-firm-wins-35m-contract-to-rehabilitate/6367038

[163] Casey-Cardinia Library Corporation (2014) *Quarries and sand mines,* http://caseycardinialinkstoourpast.blogspot.com.au/2014/05/quarries-and-sand-mines.html and Royal Botanic Gardens Victoria (2016) *Visit Cranbourne,* https://www.rbg.vic.gov.au/visit-cranbourne

MINE ABANDONMENT

Victoria's long mining history has resulted in a large number of small abandoned mines or mine features. One estimate of this largely historical legacy puts the figure at over 19,000 mines, mainly in the goldfields region.[164]

More recently, DEDJTR reports that over the past 25 years, an average of around one mine per year is abandoned by the operator and the state has used bonds paid to remediate the site. No abandonments have been recorded in the last two years. As with most other statistics provided by the department, the majority of these mines are small scale gold and gypsum mines.

One example cited by the Department was the Benambra mine in the east of the state. It operated for only four years in the 1990s before being abandoned by its owner, Denehurst. The Victorian government spent around $7 million on remediation, apparently far more than was held as a bond.[165] There is a current proposal to reopen the mine, despite the considerable controversy around its earlier incarnation.[166]

BONDS

Bonds are supposed to cover the entire mine rehabilitation cost[167] and according to the Department of Economic Development, Jobs, Transport and Resources this is reassessed every two to ten years depending on the risk associated with the operation.[168] The Australia Institute has been unable to find an assessment of all mines

[164] Unger et al (2012) *Mapping and Prioritising Rehabilitation of Abandoned Mines in Australia*, https://www.researchgate.net/publication/236900961_Mapping_and_Prioritising_Rehabilitation_of_Abandoned_Mines_in_Australia

[165] The Australian (2006) *Bailieu linked to mine debacle,* http://www.theaustralian.com.au/news/nation/baillieu-linked-to-mine-debacle/story-e6frg6nf-1111112492922 and Mining Legacies (2016) *Benambra,* http://www.mininglegacies.org/mines/vic/benambra/

[166] IGO (2016) *Stockman Project,* http://www.igo.com.au/irm/content/stockman.aspx?RID=304

[167] Victorian Department of Economic Development, Jobs, Transport and Resources (2016) *Establishment and Management of Rehabilitation Bonds for the Mining and Extractive Industries,* http://www.energyandresources.vic.gov.au/earth-resources-regulation/licensing-and-approvals/minerals/guidelines-and-codes-of-practice/establishment-and-management-of-rehabilitation-bonds-for-the-mining-and-extractives-industries

[168] The matrix is publicly available: Victorian Department of Economic Development, Jobs, Transport and Resources (2016) *Establishment and Management of Rehabilitation Bonds for the Mining and Extractive Industries,* Appendix II, http://www.energyandresources.vic.gov.au/earth-resources-regulation/licensing-and-approvals/minerals/guidelines-and-codes-of-practice/establishment-and-management-of-rehabilitation-bonds-for-the-mining-and-extractives-industries; see also Victorian

in Victoria and whether the bonds actually cover the estimated rehabilitation costs. However, the independent inquiries that have been made have found serious shortcomings in the size of the bonds and how they are assessed.

The government's second inquiry into the 2014 fire at the Hazelwood brown coal mine (held in 2015) scrutinised, among other things, the adequacy of the rehabilitation bonds for all three brown coal mines in Victoria. An independent report to the inquiry found that rehabilitation bonds were seriously inadequate. At that time, the three coal mines had each paid approximately $15 million in security bonds. But the independent report estimated Yallourn's rehabilitation costs to be between $167 million and $262 million, Loy Yang's to be between $221 million and $319 million, and Hazelwood's to be between $264 million and $357 million; for a total of between $652 million and $938 million.[169]

The mines have subsequently paid more into their bonds: as at June 2016, Yallourn's bond now stands at $34.25 million, Loy Yang's at $56 million and Hazelwood's at $36.7 million.[170] This is 50% of the mines' self-assessed liabilities, and by 31 December 2016 they should have paid bonds equal to 100% of the self-assessed liabilities.[171] The amounts will be independently reviewed in 2017.[172]

Before the bond revision, the independently-assessed liability was more than ten times as much as the government held in bonds. Even now, the bonds only cover 14–19% of the total liability. The mines' self-assessed liability is half what the independent assessment of their liability is. The state and ultimately Victorian tax payers are at risk of taking on a large liability if one or more of these brown coal companies default.

Figure 1 below summarises the difference between original bonds paid by companies and the subsequent estimates of liabilities:

Department of Economic Development, Jobs, Transport and Resources (2013) *Earth Resources Regulations – 2012/13 Statistical Report,* http://earthresources.efirst.com.au/product.asp?pID=1131&cID=46

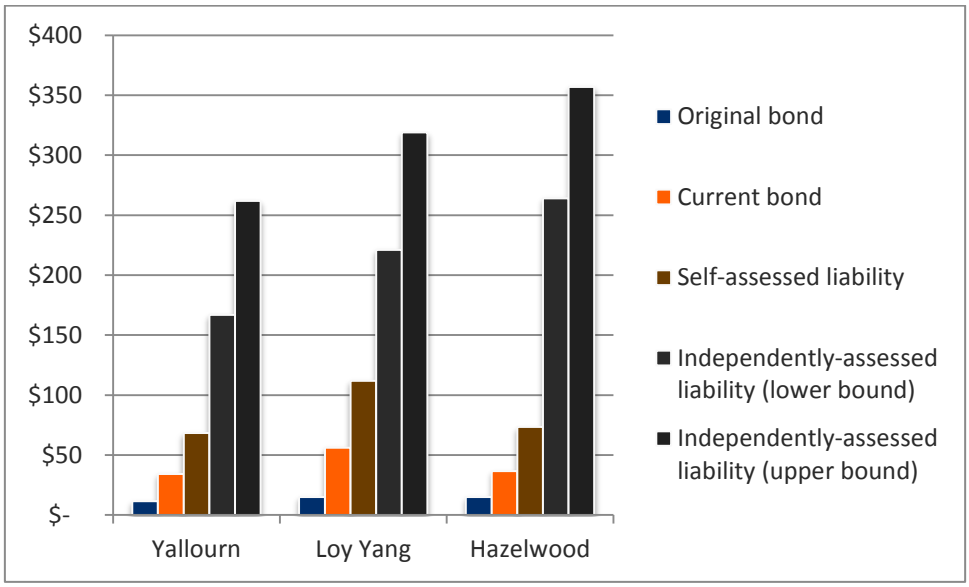
[169] Hazelwood Mine Fire Inquiry (2015) *Report 2015/2016 Volume IV – Mine Rehabilitation,* p 105, http://hazelwoodinquiry.vic.gov.au/wp-content/uploads/2015/09/Hazelwood-Mine-Fire-Inquiry-Report-2015-2016-Volume-IV-%E2%80%93-Mine-Rehabilitation-web.pdf

[170] Correspondence with the department, August 2016.

[171] Victorian State Government (2016) *Hazelwood Mine Fire Inquiry: Victorian Government Implementation Plan,* p 72, http://www.dpc.vic.gov.au/index.php/news-publications/hazelwood-mine-fire-inquiry-implementation-monitor

[172] Correspondence with the department, August 2016.

Figure 1 Comparison of bonds and liabilities ($ millions)



Victorian State Government (2016) *Hazelwood Mine Fire Inquiry: Victorian Government Implementation Plan,* p 72 and Hazelwood Mine Fire Inquiry (2015) *Report 2015/2016 Volume IV – Mine Rehabilitation,* p 105.

The Hazelwood Mine Fire Inquiry found that the department had deficiencies in skills to properly assess rehabilitation costs and had serious concerns that the current bonds paid by the brown coal mine were far too low.[173] It recommended the department acquire the necessary skills and reassess to size of the bonds. The government has since allocated money to implement the recommendations of the Hazelwood mine fire inquiry, and issued an implementation plan and an annual progress report. The implementation plan does include a commitment to review the qualifications of its current audit team.[174]

Most bonds are typically very small and the large part of the almost $160 million in bonds[175] is from a handful of mines (the data pre-dates the brown coal bond adjustments; the figure will presumably be higher now). Table 31 shows that the top ten mine bonds in Victoria accounts for a little bit more than $145 million out of the

[173] Hazelwood Mine Fire Inquiry (2015) *Report 2015/2016 Volume IV – Mine Rehabilitation,* parts 11, 12, http://hazelwoodinquiry.vic.gov.au/wp-content/uploads/2016/04/Hazelwood-Mine-Fire-Inquiry-Report-2015-2016-Volume-IV-%E2%80%93-Part-11-12.pdf

[174] Victorian State Government (2016) *Hazelwood Mine Fire Inquiry: Victorian Government Implementation Plan,* p 73, http://www.dpc.vic.gov.au/index.php/news-publications/hazelwood-mine-fire-inquiry-implementation-monitor

[175] Victorian Department of Economic Development, Jobs, Transport and Resources (2013) *Earth Resources Regulations – 2012/13 Statistical Report,* p 23, http://earthresources.efirst.com.au/product.asp?pID=1131&cID=46

$160 million the state hold in bonds. It is therefore very important that these large mines' bonds are assessed correctly.

Table 31: Top 10 bonds for mines in Victoria

Company	Bond
Basin Minerals Holdings Pty Ltd	$34,824,000
Basin Minerals Holdings Pty Ltd	$25,050,000
Basin Minerals Holdings Pty Ltd	$24,580,000
AGL LYP 3 Pty Ltd	$15,000,000
Hazelwood Power Corporation Pty Ltd	$15,000,000
Yallourn Energy Pty Ltd	$11,460,500
Fosterville Gold Mine Pty Ltd	$6,757,000
Stawell Gold Mines Pty Ltd	$4,803,000
Unity Mining Ltd	$3,934,000
Balmaine Gold Pty Ltd	$3,800,000
Top ten total	**$145,208,500**

Source: Geovic database. Note that this pre-dates the 30 June 2016 increase in bonds from the brown coal plants.[176]

The three coal mines were first assessed in the 1990s.[177] Yallourn's bond was reduced to $11,460,500 in 2004.[178] This would appear to have been a mistake when we consider the AECOM independent report that suggests the cost of rehabilitation should be between $167 million and $262 million, and even the Yallourn self-assessment says that the liability is $68.5 million. However, a spokesperson from the department emphasised that the 2004 bond reduction is not directly comparable to either other figure as it is a result of a different methodology with different unit rates directed at achieving a different outcome.[179]

Nonetheless, the independently-assessed liability for just one coal mine is greater than the total bonds held by the state for all mines.

[176] Department of Economic Development, Jobs, Transport and Resources (2016) *Geovic*, http://er-info.dpi.vic.gov.au/sd_weave/anonymous.html

[177] Hazelwood Mine Fire Inquiry (2015) *Report 2015/2016 Volume IV – Mine Rehabilitation,* p 33, http://hazelwoodinquiry.vic.gov.au/wp-content/uploads/2016/04/Hazelwood-Mine-Fire-Inquiry-Report-2015-2016-Volume-IV-%E2%80%93-Part-11-12.pdf. Note that Victorian electricity privatisation occurred in the 1990s.

[178] Hazelwood Mine Fire Inquiry (2015) *Report 2015/2016 Volume IV – Mine Rehabilitation,* p 33, http://hazelwoodinquiry.vic.gov.au/wp-content/uploads/2016/04/Hazelwood-Mine-Fire-Inquiry-Report-2015-2016-Volume-IV-%E2%80%93-Part-11-12.pdf

[179] Correspondence with the department, August 2016.

Victoria provides a breakdown by mine of rehabilitation bonds paid – something no other state does. Despite the attention paid to the brown coal mines, the largest bonds currently held relate to mineral sand mines, as shown in Table 31 above.

The three largest bonds (prior to the upward adjustment of the brown coal bonds) all belong to the same company, Basin Minerals Holdings. These bonds are for three mineral sand mines that produce zircon, rutile and ilmenite. Their production accounts for about 15 per cent of Victoria's mineral production by value, behind brown coal (45 per cent) and gold (30 per cent).[180] The bonds were assessed and paid between 2002 and 2010, and the largest bond is the one assessed most recently. It is unclear whether the actual rehabilitation cost of these mines is comparable to that of the three brown coal mines. It may be that the mineral sands bonds are higher because they were assessed more recently, or according to a different methodology.

[180] Victorian Department of Economic Development, Jobs, Transport and Resources (2013) *Earth Resources Regulations – 2012/13 Statistical Report,* http://earthresources.efirst.com.au/product.asp?pID=1131&cID=46

Western Australia

Category		
Mines in operation	151	661
Mines in care and maintenance	44	438
Mines closed and undergoing final rehabilitation	Unknown	1,137
Mine sites rehabilitated and relinquished or sold	Unknown	Unknown
Abandoned mines	9,870	17,000
Rehabilitation bonds held	N/A	N/A
Estimate of total current rehabilitation liabilities	$4.8 billion	Unknown
Estimate of current rehabilitation liabilities for abandoned mines	Unknown	Unknown

INTRODUCTION

WA has extensive iron ore, gold, alumina and nickel resources. The Pilbara, in the north of the state, is the source of most of Australia's iron ore, although there are iron ore mines in other parts of the state as well. The state's goldfields are typically in the south-west, with Kalgoorlie having been mined since the gold rush of the 1880s and 1890s.

Mining employs 7.2% of Western Australia's workforce, more than any other state.[181] It also receives more royalties than other states; they make up an estimated 14% ($3.7 billion) of 2015–16 state budget revenue.[182]

Western Australia's Department of Mines and Petroleum (DMP) is responsible for the state's resources sector, including ensuring health and safety and environmental standards are kept, collecting royalties and providing geoscientific information.[183]

[181] Australian Bureau of Statistics (2015) *6291.0.55.003 Labour Force, Australia, Detailed, Quarterly, Table 05. Employed persons by State, Territory and Industry division of main job (ANZSIC)*, http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6291.0.55.003Nov%202015?OpenDocument

[182] Government of Western Australia (2015) *2015-16, Budget Paper No. 3*, pp 76, 89, 115, http://static.ourstatebudget.wa.gov.au/15-16/2015-16-wa-state-budget_bp3.pdf

[183] WA Department of Mines and Petroleum (2016) *About DMP,* http://www.dmp.wa.gov.au/About-Us-Careers/About-DMP-1422.aspx

MINES IN OPERATION

As is the case in many states, estimates vary on how many mines are operating in Western Australia. The highest figure, 1,694 currently operating mines, comes from the Mine Sites spreadsheet provided by DMP. However, these are better understood as mine site features. For example, the spreadsheet lists 16 open pit "mines" in the Paraburdoo/Rio Tinto "project". The entire project is often referred to as a single mine.[184] When the Mine Sites spreadsheet is limited to projects, rather than mines, it indicates that 661 projects have one or more operating mines.

Another figure provided in earlier correspondence with DMP in late 2015 was 414 mines in operation. Another estimate obtained from analysis of the DMP Statistics Digest lists 151 mines as currently having employees, so presumably in operation.[185] Both estimates are broken down by commodity in Table 32 below:

Table 32: Operational mine estimates, WA

DMP statement, operating mines Nov 2015		The Australia Institute analysis of Statistics Digest,	
Alumina	8	**Bauxite–Alumina**	2
Base metals	9	**Base metals**	6
Coal	5	**Coal**	2
Industrial mineral	38	**Heavy mineral sands**	9
Iron	147	**Iron ore**	35
Precious metal	147	**Gold**	77
Diamond	1	**Diamonds**	2
Specialty metal (HM, Ta, Li)	12	**Tin–Tantalum–Lithium**	6
Steel alloy metal (Chromite, Mn, Ni)	47	**Manganese**	7
		Salt	5
Total	414		151

Sources: DMP statement obtained through Correspondence, DMP (2016) *Statistics Digest*.

These discrepancies are likely to be the result of different classification of mines, mine features and projects, as well as different assessments of what mines are 'significant' enough to be included in each estimate. Regardless, no definitions or clarifications are published by the department, making it difficult to assess the size and nature of mining operations in the state.

DMP provided information on the number of operating mines over time, summarised in Table 33 below:

[184] See for example mining-technology.com (2016) *Paraburdoo Iron Ore Mine, Pilbara, Australia*, http://www.mining-technology.com/projects/paraburdoo-iron-ore-mine-pilbara/

[185] WA Department of Mines and Petroleum (2016) *Statistics Digest,* http://www.dmp.wa.gov.au/About-Us-Careers/Statistics-Digest-3962.aspx

Table 33: Mines operating, Western Australia

Mines operating as at	Total
2015	414
2010	336
2005	468
1997	335

Source: Department of Mines and Petroleum.

Table 33 shows that numbers of mines operating in WA increased through the early years of the new millennium, but then apparently declined substantially between 2005 and 2010. While this period included the global financial crisis, it seems unlikely that such a large decline occurred as a result of that slowdown. The apparent decline was largely driven by changes in the number of "precious metal" mines. In other states, notably Victoria, there are large numbers of small gold mines that could be classified as either operational or closed depending on definition. Given that WA has extensive goldfields, this may also be the case here.

MINES IN CARE AND MAINTENANCE

Estimates on number of mines in care and maintenance in WA also vary widely. The Mine Sites spreadsheet lists 970 "mines" (mine site features) in care and maintenance, but only 316 projects had one or more mines in care and maintenance.

The DMP provided different estimates in correspondence, of 158 and 438.[186] The Statistics Digest does not specifically identify mines as being in care and maintenance, but it lists 44 mines as having zero employees in 2014–15, as shown in Table 34 below:

Table 34: Mines with zero employees 2014-15 in the WA Statistics Digest

	Mines (0 employed only)
Bauxite-Alumina	1
Base metals	1
Coal	0
Diamonds	0
Gold	21
Heavy mineral sands	1
Iron ore	12
Manganese	8
Salt	0
Tin-Tantalum-Lithium	0
Total	44

[186] Correspondence dated 19 November 2015 and 18 February 2016

Source: Department of Mines and Petroleum.

DMP also provided estimates of number of mines in care and maintenance in different years, showing a similar trend to mines in operation. These estimates are summarised in Table 35 below:

Table 35: WA mines in care and maintenance 1997-2015

Mines put into care and maintenance as at	Total
2015	438
2010	351
2005	169
1997	337

Source: Department of Mines and Petroleum.

As with the changes in numbers of operating mines in Table 33 in the previous section, the changes in Table 35 are primarily caused by changes in numbers of precious metal mines, likely small gold mines.

While estimates of the number of mines in care and maintenance in different years may assist in understanding some trends, no information is available on how long mines have been in care and maintenance. Mines that have been non-operational for many years risk being abandoned and imposing environmental costs on the community.

SHUT MINES: REHABILITATED OR ABANDONED

Like estimates of operating mines and mines in care and maintenance, there are widely varying estimates of how many mines are being closed or have successfully completed rehabilitation. The Mine Sites spreadsheet lists 17,548 mine site features that are “shut” of which there are 1,137 projects with one or more shut “mines”.

DMP also provided estimates of numbers of mines “shut” over time. Results are summarised in Table 36 below:

Table 36: WA mines shut 1997-2015

Mines shut down as at	Total	Coal	Mineral/metal
2015	2,388	37	2,351
2010	2,080	36	2,044
2005	1,503	35	1,468
1997	619	27	592

Source: Department of Mines and Petroleum

However, a "shut" mine is not necessarily one that has completed rehabilitation or been relinquished by its owner. In late 2015, a spokesperson for the department described the registration of a mine as "shut" as representing a project "unlikely to be re-mined/reopened", with the next stage likely being a "move to total rehabilitation".

It is not clear how many, if any, of the shut mines have been rehabilitated. It is likely that many mines and mine features considered "shut" by DMP are considered abandoned by other parties. Western Australia was reported to have 9,870 abandoned mines in 2011,[187] while a 2014 government estimate put that figure at 17,000 abandoned mine sites.[188]

While abandoned mines are often claimed by the mining industry to be a problem related only to historic mines, WA has several examples of recent abandonments. The Ellendale Diamond mine was abandoned in 2015, the Bulong Nickel Project was abandoned in 2013 and the Pro Force Gold Mine was abandoned in 2004.[189] All are now being managed by the WA government.

BONDS AND THE MINING REHABILITATION FUND (MRF)

Western Australia changed its rehabilitation bond system in 2013. The over $1 billion in bonds that were held by the state was estimated to cover only a quarter of the total outstanding rehabilitation liability of Western Australian mines.[190] With the end of the bond system, the $1.2 billion of bonds were paid back to mining companies.[191]

[187] Unger et al (2012) *Mapping and Prioritising Rehabilitation of Abandoned Mines in Australia*, p 262, https://www.researchgate.net/publication/236900961_Mapping_and_Prioritising_Rehabilitation_of_Abandoned_Mines_in_Australia

[188] Marmion (2014) *Expired bonds yield $20,000 to kick off Coolgardie site rehabilitation,* https://www.mediastatements.wa.gov.au/Pages/Barnett/2014/07/Expired-bonds-yield-$20,000-to-kick-off-Coolgardie-site-rehabilitation.aspx

[189] Evans (2015) *Liquidators try to dump mine*, https://au.news.yahoo.com/thewest/wa/a/29861758/liquidators-try-to-dump-mine/#page1, DMP (2016) Improving Community Safety at the Pro-Force Plant Site, http://www.dmp.wa.gov.au/Documents/Environment/Pro-Force.pdf; Tomlin and Bamford (2016) *Greens say WA taxpayers could be left liable for $60 million mine clean-up bill*, http://www.abc.net.au/news/2016-04-14/trouble-plagued-goldfields-nickel-project-leaves-big-bill/7310480

[190] WA Department of Mines and Petroleum (2016) *Register for Mining Rehabilitation Fund,* http://www.dmp.wa.gov.au/Environment/Register-for-Mining-4991.aspx

[191] WA Department of Mines and Petroleum (2016) *Mining Rehabilitation Fund Yearly Report 2015,* p 1, http://www.dmp.wa.gov.au/Documents/Environment/MRF_yearly_report_2015.pdf

In place of the bond system, the state introduced the Mining Rehabilitation Fund. Each year mining companies pay a non-refundable levy into the fund, to be spent on rehabilitating existing abandoned mines as well as well as any mines that are abandoned in the future. Mining companies are still responsible for rehabilitating the mines that they own.[192]

A spokesperson for the department claimed that the bond system, which was set up in the 1980s, was intended to cover the full cost of rehabilitation. However, rehabilitation expectations rose so the bonds ended up being only a quarter of the total rehabilitation cost, implying estimated rehabilitation liabilities of $4.8 billion.[193] Given the size of operations at Western Australia's large mines, particularly in the Pilbara, this seems a conservative estimate.

The bonds were also difficult for the state to access as they were held as bank securities by a financial institution, rather than deposited with the government. Companies could object to the bond being used, even for emergency situations. The bond calculation also did not cover administration or transportation costs and did not provide an incentive for progressive rehabilitation. The levy, being non-refundable, is the government's to spend and can be accessed quickly in emergency situations.

However, the new system has proven controversial and arguably increases the incentive for operators to abandon their liabilities to the state. The Ellendale diamond mine, which went into liquidation last year, is reported to have been refunded $12.1 million in bonds, paid back $820,000 to the MRF. Its owners then abandoned the site leaving behind rehabilitation costs estimated at $40m.[194]

[192] WA Department of Mines and Petroleum (2016) *Mining Rehabilitation Fund Yearly Report 2015,* http://www.dmp.wa.gov.au/Documents/Environment/MRF_yearly_report_2015.pdf

[193] Correspondence with the department, February 2016.

[194] Williams (2015) *State picks up $40m Ellendale bill*, https://au.news.yahoo.com/thewest/wa/a/29978898/state-government-picks-up-40m-ellendale-bill/#page1 and WA Department of Mines and Petroleum (2015) *Ellendale first site to be gazetted under the Mining Rehabilitation Fund Act,* http://www.dmp.wa.gov.au/News/Ellendale-first-site-to-be-17225.aspx; Evans (2015) *Liquidators try to dump mine,* https://au.news.yahoo.com/thewest/wa/a/29861758/liquidators-try-to-dump-mine/#page1

Conclusion and recommendations

The stakes are high in Australia's mining clean up boom. The Australian public stands to incur billions of dollars in rehabilitation costs through either use of taxpayer funds or a degraded environment if rehabilitation is not well managed and regulated. This would represent a huge subsidy to the mining industry. The large number of historical and modern abandoned mines compared with the handful of fully rehabilitated sites shows that the mining industry does not have a good record at cleaning up after itself.

The last ten years have seen an increase in public attention paid to mining activity, with community groups and NGOs playing a key role in working with and monitoring the mining industry. Provision of better data on mines in each state, their status and history, would empower the community, the industry and the public service to ensure that sites are properly rehabilitated.

Appendix

Initial contact with state government departments was based around the following questions:

1. How many operational mines are in the State?
2. Can you provide a breakdown of what these mines are producing?

3. How many mines are currently in care and maintenance? Of these, how many went into care and maintenance in the last:
    (a) 5 years
    (b) 10 years
    (c) 20 years
    (d) 30 years

4. How many mines have closed and are undertaking final rehabilitation? How many began this process in the last:
    (a) 5 years
    (b) 10 years
    (c) 20 years
    (d) 30 years

5. How many mines have had rehabilitation completed and been relinquished back to the state or sold to third parties for other use? How many in the last:
    (a) 5 years
    (b) 10 years
    (c) 20 years
    (d) 30 years

6. How many mines have been abandoned without full rehabilitation? How many in the last:
    (a) 5 years
    (b) 10 years
    (c) 20 years
    (d) 30 years

7. How much is being held in rehabilitation/environmental bonds?
8. Can you provide an estimate of current rehabilitation liabilities in the state?