

For Hume the bell tolls

Local economic impacts of the Hume Coal project

The economy of the Southern Highlands is focused on agri-tourism and other service industries. The Hume Coal project is contrary to local economic planning and local business owners claim it would have a detrimental effect on their businesses.

Briefing note

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Summary

The Southern Highlands has a diverse economy, with its band of towns and its proximity to major cities giving it an economic structure similar to NSW as a whole, but with a special focus on tourism, agriculture and manufacturing.

Local businesses and community members are concerned about the potential effects of the proposed Hume Coal Project on the region. This report is based on interviews with a range of businesses and other stakeholders in the Southern Highlands region.

These interviews revealed a deep concern that most of the Hume Coal Project's effects will be negative, including threatening the water supply, and that uncertainty around the mine is already reducing business investment.

The Southern Highlands have a tradition of setting out local development frameworks in collaboration between community members, the Chamber of Commerce and the local council. The most recent framework is an ambitious plan for 2031 and beyond, with carbon-neutral energy sources, intensive agriculture and high-quality health care. One idea that emerged from the framework process, for food and wine clusters around each town, has already been implemented. Each cluster provides a distinctive and full experience for tourists, giving them a reason to return to the region to explore a different cluster on each trip.

Coal mining is conspicuously absent from the local development framework.

The Southern Highlands economy depends heavily on groundwater reserves, which would be diminished by the Hume Coal Project. Most businesses we spoke to relied on water, whether for crops, livestock, native vegetation or gardens. Bore water is also useful in times of hardship for drinking water and household use. Of the 14 organisations interviewed, 11 raised water as a specific concern.

The mine also threatens the region's reputation as "clean and green". The Southern Highlands is a "breathing space between Sydney and Canberra", with its agriculture and scenery attractive to residents and visitors alike. Because local businesses and property owners benefit from native vegetation, historic buildings and Indigenous heritage, maintaining these public goods is a core practice of these businesses. Were they to shrink or shut down because of the mine, the region's heritage and environment would suffer. Seven of the 14 interviewees raised amenity as a concern.

Uncertainty around the mine is already causing economic harm to the region. Six of the 14 interviewees had delayed or cancelled plans for tens or hundreds of thousands

of dollars of investments until they know whether the mine is going ahead. Two more referred to other businesses that had deferred investment, with one business owner declaring that he had already “gambled” on the mine not going ahead.

Participation in the mine’s stakeholder dialogue consumes time and energy that could be spent elsewhere. The stress also weighs on the mental health of some community members.

The Southern Highlands’ government, industry and community have a long-term plan for the region’s economy which would take advantage of its environment, location and people, and maintain its natural environment and heritage. Coal is not a part of that plan. It threatens the groundwater that the region depends upon, and the region’s “clean and green” image. Investment in the region will be suppressed as long as there is a possibility that the mine could be built.

The economic impacts discussed in this report are ignored by the economic assessment commissioned by Hume coal. Hume’s assessment is based entirely on desktop analysis. The authors appear not to have visited the region or spoken to any local business owners. The Hume economic assessment is not up to the standard required for planners and the NSW community to plan for the future of the Southern Highlands.

Introduction to the Southern Highlands and Hume Coal project

The Southern Highlands is a region of NSW centred 100 km from Sydney, 140 km from Canberra and 70 km from Wollongong, including towns such as Mittagong, Bowral, Moss Vale, Bundanoon and Berrima. Its rural setting, large stretches of environmentally protected area and proximity to major cities makes it a popular agri-tourism destination. The region's main local government area (LGA) is Wingecarribee Shire.¹

The Hume Coal Project is a proposal for an underground mine in the Southern Highlands. The mine head and mine surface facilities will be within 4 kilometres of the historic village of Berrima and the mine will extend under the Hume Highway and the district of Sutton Forest.

The mine would produce up to 3 million tonnes per annum (Mtpa), 55% soft metallurgical coal and 45% thermal coal for power generation. All coal will be railed past New Berrima to Port Kembla (near Wollongong) and exported.

The project proponent is Hume Coal, a wholly-owned subsidiary of Korean steelmaker POSCO.

The Hume Coal project has been contested by community groups since 2010, when the first legal challenge was brought.² Since then, there have been various protest and legal actions. In August 2016 the area's MP, NSW minister Pru Goward, tabled a 16,000-signature petition calling on the state government to protect the Southern Highlands from mining.³

A key reason for local opposition to the coal project is the impact the mine could have on other industries and the economy of the Southern Highlands. Local businesses

¹ Some of the data referenced in this report is from the Australian Bureau of Statistics' SA3 Southern Highlands region, which overlaps but is slightly different to Wingecarribee LGA.

ABS (2016) *National Regional Profile 2014*

² Kennedy and McDonald (ABC News) *Five Southern Highlands families win appeal against Hume Coal accessing their land*: <http://www.abc.net.au/news/2016-05-10/southern-highlands-families-win-appeal-against-hume-coal/7402054>

³ Goward (2016) *No coal mining in Southern Highlands*, <http://www.prugoward.com.au/Media/MediaReleases/tabid/93/articleType/ArticleView/articleId/583/No-Coal-Mining-in-Southern-Highlands.aspx>

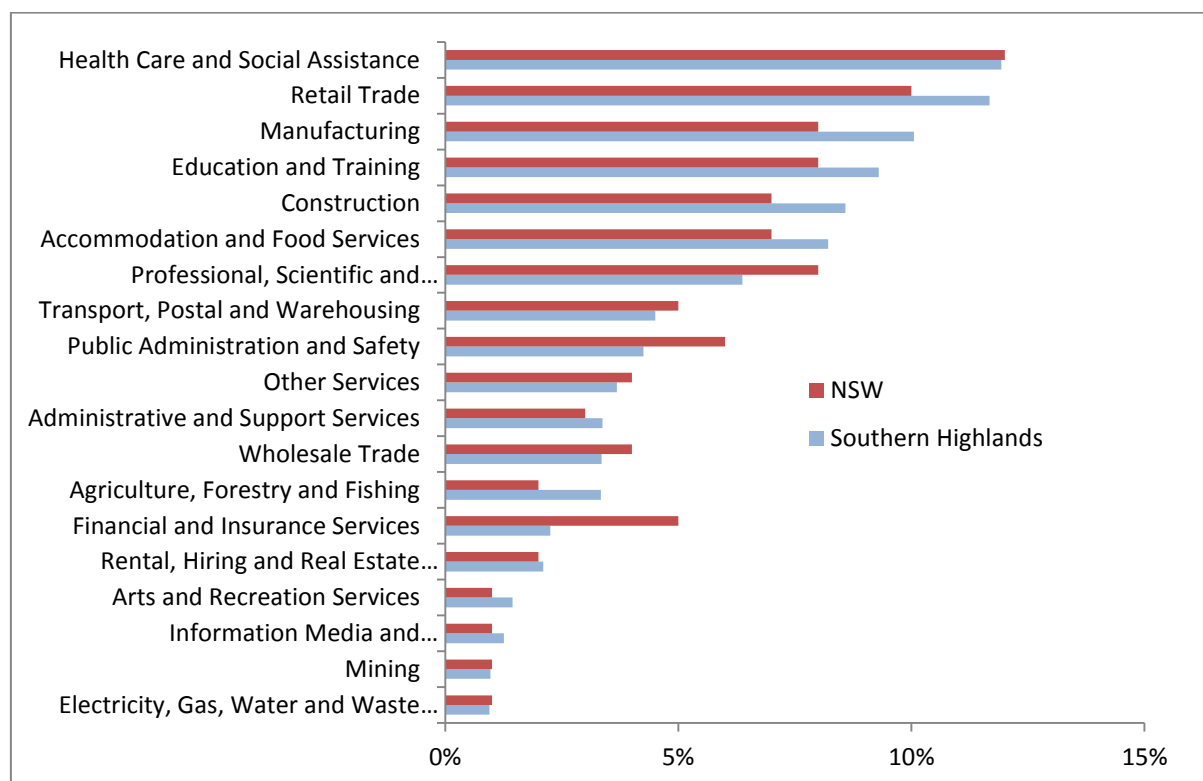
interviewed for this report anticipate that most of the mine's effects will be negative, including threatening the groundwater resources on which businesses rely, and undermining the region's reputation as scenic and environmentally rich.

Impacts such as these are rarely considered in economic assessments of coal projects and are not considered in the assessment prepared by Hume Coal.⁴

ECONOMY OF THE SOUTHERN HIGHLANDS

The region's proximity to major cities and the number and size of its commercial towns provide a range of employment options, resulting in an employment profile very similar to that of NSW as a whole, with health care the largest employer, followed by retail trade, manufacturing, education and construction, shown in Figure 1 below:

Figure 1 Employment in NSW and the Southern Highlands



Source: ABS 2011 Census, accessed through TableBuilder Basic

Figure 1 shows that the Southern Highlands have more employment than the NSW average in Retail Trade and Accommodation and Food Services. These are the ABS

⁴ BAEconomics (2017) Economic impact assessment of the Hume Coal Project, <https://majorprojects.affinitylive.com/public/ae3dde5cb124ded4de87b197405f2132/99.%20Hume%20Coal%20Project%20EIS%20Appendix%20Q%20-%20Economic%20Impact%20Assessment.pdf>

industry categories most closely associated with tourism. Tourism is not separately defined in census data as it draws on several sectors, such as Retail, Accommodation and Food Services and Transport. The strength of these sectors in Figure 1 reflects the strong tourism industry in the Southern Highlands.

Figure 1 also shows the relative strength of agriculture in the Southern Highlands relative to NSW. While this may be expected from a regional area, it is important to note that many agricultural enterprises in the Southern Highlands are closely linked to tourism. Vineyards, berry farms, olive groves and other paddock-to-plate style enterprises represent rural agri-tourism.

Figure 1 shows that mining is one of the smallest employers of Southern Highlands residents, with only 186 residents employed in mining in 2011. This is likely to have declined since the census with the closure of Berrima Colliery and downturn in the coal mining industry generally: ABS labour force data suggests the coal industry nationally has reduced employment by around 20,000 over the last two years. The NSW Minerals Council estimated in 2016 that mining employs only 91 residents in Wingecarribee Shire.⁵

Dr Vince Roche has described the attraction of the Southern Highlands for health care. People from the South Coast, Wollondilly and Camden often travel to the Southern Highlands for elective surgery. The region has public and private hospitals and medical centres. Dr Roche is one of the doctors at the Southern Medical Centre, which operates in Moss Vale and Bundanoon. Dr Roche is also the founder of the Berrima Horse Trials, described elsewhere in this paper.

LOCAL ECONOMIC PLANNING

The Southern Highlands Development Framework is an initiative by Wingecarribee Shire Council, the Southern Highlands Chamber of Commerce and Industry and the Moss Vale Rural Chamber of Commerce. Established in 2015 through a process involving 250 community members, it provides an economic framework for the region out to 2031, based on an earlier Community Plan developed in 2011.⁶

⁵ Lawrence Consulting (2016) Economic Impact Assessment 2014/15, http://www.nswmining.com.au/NSWMining/media/NSW-Mining/Economic%20Report%202015/NMC0228_Economic-Impact-Report-2016_Final_HiRes_for-web-1.pdf

⁶ Southern Highlands Development Framework (n.d.) <http://www.southernhighlandsdevelopment.com/>. Other information in this section is from an interview with Councillor and former Mayor Larry Whipper and Council Economic Development Officer Noel Ferguson.

The Framework focuses on ten sectors, water, food, shelter, energy, transport, technology, arts, recreation, business and learning. Business emphasis is placed on tourism development strategy, business start-up initiatives, mentoring and connection for local businesses. The Energy sector focuses on decentralised and carbon-neutral energy sources. The Hume Coal project or other coal mining is not included in the Framework.

The majority of the council opposes the Hume Coal project, fearing damage to water, agriculture and the amenity of the shire. Council sees the area as a “Breathing space between Sydney and Canberra”. They’re supportive of food and wine clusters and are “critically concerned” about potential water impacts.

The council plans to develop the other high-employing industries highlighted in Figure 1 above. Health Care and Social Assistance is a priority, with Bowral hospital to be upgraded. Retirement and aged care are seen as not only social issues but as “growing industries” for the region given its rural setting and convenient location. Several retirement villages and aged care facilities already exist and more could be developed.

The council places a high emphasis on education. Young people generally leave the region for education and some return later in life to have families. The council hopes to work with the existing University of Wollongong and Illawarra Tafe to revamp facilities and develop a nursing course to further develop health and aged care capacity.

Manufacturing is important for employment, with the region containing the Boral Berrima Cement Works, Joy Global’s Australian headquarters, and smaller businesses focusing on construction supplies and engineering, among others. The Berrima Cement Works employ 130 people to manufacture over 60% of the ACT and NSW’s cement products. It was originally powered by a specialised adjacent colliery, but that operation transitioned to care and maintenance in 2013. Joy Global manufactures specialist underground mining equipment for domestic use and export. Its Australian head office is in Moss Vale, where hundreds are employed. Among the smaller businesses are Dux, which manufactures its water heaters in the Southern Highlands.

In addition to these Southern Highlands industries, many residents working in Manufacturing commute outside the area, particularly to Wollongong or Campbelltown.

Over 100 businesses in the region, mostly farmers and producers, have formed the Southern Highlands Food and Wine Clusters. This initiative of the Moss Vale and Rural Chamber of Commerce has the support of Destination NSW (a state government

tourism initiative) and Wingecarribee Shire (the local government).⁷ Each of the nine clusters is centred on a different town, each with a distinct microclimate and environment. Local businesses offer accommodation, dining, shopping, on-farm education and tourist activities.

The hub idea emerged from the work of Brigid Kennedy (whose business, The Loch, is described later in this paper) with Sydney's Vivid Festival. Because tourists can only experience one or two clusters on a holiday, the cluster model gives tourists a reason to return to the Southern Highlands several times. The idea was first presented by Kennedy at the Wingecarribee Economic Summit that developed the 2031+ Development Framework. In the first six months of its operation, the Joadja Cluster created 24 jobs according to Ms Kennedy.

Ms Kennedy says that having the Hume Coal Project operate in the region would undermine the cluster model, which is bringing people to the district for both living and visiting. Destination NSW has given the Moss Vale and Rural Chamber of Commerce a target of doubling overnight stays in the region, which would be impossible if the Hume project proceeds, creating a perception that the Southern Highlands is a "dirty district".

ECONOMIC ASSESSMENT OF COAL PROJECTS IN THE NSW PLANNING PROCESS

Despite local opposition, the Hume Coal Project is advancing through the NSW planning process. Like most coal projects in NSW, Hume is required to prepare an assessment of economic impacts as part of their Environmental Impact Statement (EIS). Since December 2015 economic assessments of coal projects are required to include a Local Effects Analysis (LEA), which requires analysis of local employment and other economic impacts. The relevant guidelines note:

Even where there are no direct links, such as purchases of goods and services or through the spending of additional labour earnings, the development or extension of a mining project can have effects on other local industries. Some of the most important ways in which this can happen are:

- Displacement of a specific land use, where the mining project uses land that would otherwise be used for other purposes;

⁷ <http://southernhighlandsfoodandwine.com.au/whats-on/food-and-wine-festival>

- Where the mining project affects choices by external parties, particularly tourism and business travel.⁸

While the guidelines require ‘qualitative discussion’ of these points, they do not require analysts to visit local areas or discuss the proposal with local businesses when conducting Local Effects Analysis. The LEA prepared by Hume Coal appears to be based entirely on desktop research with no input from local businesses.

Worse still, the Department of Planning and Environment guidelines permit consultants to use economic models that omit these sorts of negative impacts. In particular, “input–output” models are accepted by the Department despite these models being described as “biased” by the Australian Bureau of Statistics⁹ and “abused” by the Productivity Commission.¹⁰

Hume Coal’s economic assessment uses input–output modelling in the LEA of the project and presents a misleading analysis of the local economy. That modelling exercise will be further examined in The Australia Institute’s submission on the Hume EIS.

As Hume Coal’s consultants did not discuss the impacts of their project with local businesses in the Southern Highlands, Coal Free Southern Highlands commissioned The Australia Institute to conduct interviews with a range of local businesses.

⁸ Department of Planning and Environment (2015) *Guidelines for the economic assessment of mining and coal seam gas proposals*, http://www.planning.nsw.gov.au/Policy-and-Legislation/Mining-and-Resources/~/_media/C34250AF72674275836541CD48CBEC49.ashx, p23

⁹ <http://www.abs.gov.au/AUSSTATS/abs@.nsf/Previousproducts/5209.0.55.001Main%20Features4Final%20release%202006-07%20tables?opendocument&tabname=Summary&prodno=5209.0.55.001&issue=Final%20release%202006-07%20tables&num=&view=>

¹⁰ <http://www.pc.gov.au/research/supporting/input-output-tables>

Interviews with Southern Highland businesses

THE LOCH

Interview with proprietor Brigid Kennedy

The Loch is a guesthouse near historic Berrima, which offers accommodation, high-quality dining, on-farm grown produce and restored antiques and furniture.

Brigid Kennedy, a professional chef and author, and her partner, Kevin Nott, a landscaper and furniture restorer, established the Loch in 2013. It caters for farm stays and small conferences, with dining, farm produce and antique side of the business open to house guests and walk-ins alike. The farm produces meat, egg, berries, dam trout and yabbies, flowers and vegetables.

Key to Ms Kennedy and Mr Nott's decision to set up in the Southern Highlands is the region's character, and access to water, and the clean image of being in a water catchment area that makes the farm business possible. They have heard of many businesses in the area that are thinking of selling or are putting off expansions due to the uncertainty the Hume proposal is creating in relation to water supply and amenity around Berrima.

Ms Kennedy is also the driving force behind the Southern Highlands Food and Wine Clusters and Chair of the Moss Vale and Rural Chamber of Commerce, discussed elsewhere in this paper.

BERRIMA HORSE TRIALS

Interview with founder and president Doctor Vince Roche

The Berrima Horse Trials is an equestrian club that has operated on the Roche family property since 1989. It caters to dressage, cross country and show jumping with two to three major events a year, each bringing around 350 competitors over a weekend. As each entrant brings one or more grooms and family members, and with spectators and officials also attending, each event brings 1,500 to 1,800 people to the Southern Highlands for a weekend.

The Trials also host smaller fundraiser weekends two or three times a year, with around 150 people, and the grounds are used by the local horse and pony clubs and schools. The Trials are used for equestrian training, including for Olympians: most people who ride for Australia have trained at the Berrima Horse Trials. Horses are typically stabled at the Moss Vale Showgrounds, with owners paying between \$100 and \$300 (for stabling) and each horse bringing (on average) about \$850 into the district each event in terms of accommodation, stabling, meals, shopping, fuel, entries etc. The Trials make a substantial contribution to Australian sport and society.

The Trials depend on water for washing down horses, for drinking by horses and for water obstacles. Most of this is drawn from groundwater. The Trials have already suffered water shortages in El Nino years, which have affected jumping areas and trees. Water drawdowns by the coal project could exacerbate these problems.

Uncertainty around the mine has led the Trials to delay investment. Plans to laser level a dressage area of five to six hectares, a \$20,000 to \$30,000 investment, were put off. For three or four years, top equestrian coaches have been moving to the Southern Highlands for coursing and training, but the development of the Hume Coal Project might jeopardise that.

The founder of the Trials, Dr Roche, works as a doctor, and some of his comments about health care in the Southern Highlands are provided elsewhere in this paper.

COMFORT HILL HISTORIC PROPERTY

Interview with manager Doug Graham

Comfort Hill is a historic, 200-hectare Sutton Forest farm, with a heritage listed residence that was built in the 1830s. It was sold to the Grundy family in 2007 for \$15 million, which remains a record for the region.

Comfort Hill operates as a cattle farm, with 150 breeders and calves. It also has areas of native vegetation, including endangered ecological communities where koalas can be found. Both the cattle and the native vegetation depend on water, and the property has two bores with drinkable water. Mr Graham is concerned that global warming will affect the region's long term environmental, agricultural and tourist viability, even without the mine's additional drawdown on water supplies.

A flora and fauna study of the property held in 2007–2008 found Indigenous groove stones and historical quarry sites. Part of the maintenance of Comfort Hill includes protecting and preserving the significant environmental, Indigenous and historical sites on the property.

The Grundy family have considered diversifying by growing crops on site, including potatoes, but won't do so while the mine proposal makes their water supply uncertain. Community engagement regarding the mine carries an opportunity cost, with letter writing, participating on the water committee and other activism taking time that could be spent developing the property and its agricultural potential.

Mr Graham is not convinced that the mine will have many positive impacts on the region. He has worked in coal mines in the Appin and Hunter regions and believes the geologically difficult nature of the mine means that it will require experienced staff that cannot be recruited locally. He gave the example of the Boral factory in the region, which hired few locals – most employees were drive-in drive-out from Wollongong.

Mr Graham expressed disappointment with the way that the Hume Coal Project has treated the agricultural land that it acquired. He claims there was no tender process for managing the land, and locals working on the farms were sacked in favour of managers brought in from Goulburn.

ESCHALOT RESTAURANT

Interview with proprietor Richard Kemp.

Eschalot is well-known restaurant in the town of Berrima, attracting around 10,000 visitors per year to dine in the restaurant and attend functions at their venue. The business has been growing at a rate of 10–15% per annum consistently over the last 10 years as Berrima has come to prominence as a tourism destination. Mr Kemp describes his business as a “destination restaurant” that is important for attracting visitors to the village of Berrima.

Eschalot has a focus on local produce, with its own garden providing some ingredients and spending around \$250,000 per year on local produce. The business employs 10 staff and three apprentices, all local people. Mr Kemp estimates spending around \$260,000 per year on wages.

Located in the middle of Berrima, Eschalot is approximately 4 km from the proposed mine head. Mr Kemp has concerns around air quality and the possible effect of coal dust on his garden, but is far more concerned about the impact on the character of the town and tourism numbers. He estimates that one in three out-of-town diners asks about the mine proposal.

Mr Kemp has been running the Eschalot business for 13 years and says that if the mine is approved he will consider selling the business, but if it is rejected he will stay. He is

delaying a decision on expanding the restaurant and investing in a new kitchen due to the uncertainty around the Hume proposal.

Eschalot is located in an historic building dating to the 1850s. The owner of the building has an interest in heritage and collaborates with Mr Kemp to ensure the heritage values of the buildings are maintained. Mr Kemp feels that the ongoing success of Eschalot is important for the maintenance of the buildings.

BENDOOLEY ESTATE

Interview with proprietor Paul Berkelouw

The Berkelouw family have expanded a long-established book retailer into a major local business employing 60 people, around half of which are full time. In addition to the bookstore, the estate also has an a la carte restaurant, a vineyard and function facilities. The estate has several historic buildings and attractive gardens that are important for functions.

Since hosting their first wedding 4 years ago, weddings have become the central focus of the business. They host three to four per week with a total of around 300 visitors, who stay in Berrima and utilise accommodation, food, hairdressing and other services. Mr Berkelouw is clear about the importance of weddings for Bendooley:

The business is built on weddings. And we have weddings because we have water. Weddings are all about photos, and if the setting can't provide the perfect backdrop for those photos, then they'll go somewhere else.

The gardens at Bendooley Estate feature perennials, large European trees, a rose garden and manicured lawns, all of which require water, much of which comes from an on-site bore. Without access to the same volume and consistency of water supply, Mr Berkelouw says the gardens could not be maintained.

The importance of the water resource goes beyond the wedding side of the business. The profit centre of the business is in weddings, supporting the vineyard, cellar door, café and a la carte restaurant. While less profitable, these parts of the business are important for providing full time jobs to key staff. Mr Berkelouw says that the Southern Highlands labour market is difficult for hospitality businesses because there are few university students, backpackers, etc., for work that is transient and physical. The non-wedding parts of the business allow them to offer full time employment to keep reliable staff.

While unemployment can be high in the region, Mr Berkelouw says that responses to job advertisements vary depending on the type of job being offered. When they advertise for low-skilled jobs, such as Monday to Friday cleaners, there are many applicants. Gardener and administration positions are also easy to fill. Skilled hospitality positions, however, attract few responses. Unskilled positions for just weekend shifts also do not attract many jobseekers. Keeping good staff is contingent on offering well-paid full time work, which requires running lower-profit businesses to provide the skilled hospitality staff to host the profitable weddings. Which in turn depend on the water for the gardens.

Mr Berkelouw says that being around 6 kilometres from the mine site he is not particularly concerned about air quality changes or other impacts. He is not delaying any particular investments as he feels he has already “gambled” on the Hume project not going ahead.

In addition to the gardens at Bendooley Estate, the property also has the historic farmhouse, which has been restored. Mr Berkelouw says “I desperately wanted to restore and maintain my family’s farm to the extent it needs, but there was no way we could afford to pay the hundreds of thousands of dollars required without commercialising the property”. Without the business that Bendooley Estate is now bringing in, this historic building would become dilapidated.

MONTROSE BERRY FARM

Interview with owner Bruce Robertson

Montrose Berry Farm is a diversified business farming berries and apples over 13 hectares and with development approvals for a sheep-dairy and cheese shop on a larger 67 hectare site. All of these activities rely significantly on groundwater resources. In berry picking season the berry farm brings significant family visitations to the farm site and region.

The berry farm also has heritage-listed gardens, a homestead and a wedding reception venue which hosts weddings on a weekly basis. Mr Robertson estimates that each week wedding receptions generate between 150–180 bed nights for local hospitality businesses. He estimates that 60 to 70 percent of other services such as flowers, catering, decorating, hairdressing, car and taxi hire are sourced from local businesses. Mr Robertson estimates that weddings and the agri-tourism business at his venue generate around \$8 million of economic value per year within the local economy.

Mr Robertson is a former supervising geologist of coal operations in the Bowen Basin, Queensland and has worked in both open cut and underground mines. A veteran of the industry, he has major concerns about the mine's impact on water resources:

I strongly support the mining industry, but I also think that just because it's there, doesn't mean it needs to be mined, especially where the proposed Hume Coal Development has substantial inherent economic and operational risks. The piezometric head in the operation will likely be around 150-200 psi and the mine will undoubtedly be connected to the world class aquifer immediately above the coal measures by either undetected low angle reverse thrust faults or transcurrent faults. Neither style of faulting has significant displacement of the coal. As there is no substantial displacement of the coal seam these styles of faulting cannot be detected from surface but offer extraordinary conduits with significant head pressures from the aquifer to the mine.

Mr Robertson believes the Hume project would result in a loss of water for his business. He believes the mine would have a negative impact on the value of his business both due to water impacts, and by "changing the look and feel of the area significantly."

Mr Robertson believes that an increasing number of people are moving to the Southern Highlands from the Hunter Valley because of the impact coal mining has had on air quality, groundwater and noise pollution up there. As the first major mine in the Southern Highlands, Hume's project would have an impact on the area far more than that of an incremental mine in regions with established coal industries, like the Hunter or Bowen Basin. He believes this would "seriously impact" the Southern Highland's agri-tourism industry.

FOOD AND WINE ASSOCIATION

Interview with wine distributor Robert Kay, former president of Southern Highlands Food & Wine Association

Robert Kay is a wine distributor and former president of Southern Highlands Food & Wine Association. He has a keen understanding of the region's agricultural and tourist profile.

The region's agricultural industry consists mostly of small landholdings of 25 to 100 acres, which are best used for intensive, high-value crops which require irrigation from reliable groundwater. A combination of hobbyists, semi-professionals and fully

commercial operations work well together, with businesses often shifting from hobby farm to commercial farm depending on the owner.

The region's ecology and agriculture are different from even nearby areas, which makes it attractive to tourists – as does its proximity to major population centres. This tourism supplements many agricultural operations in the Southern Highlands.

In Mr Kay's assessment, the Hume Coal project threatens the region on two grounds: water issues and perception.

Intensive crops on small holdings, the kind of agriculture that suits the region and the interests of tourists, depend on groundwater. Any threat to groundwater would undermine this development.

The Southern Highlands are also perceived as “nicer than the Hunter”, according to Mr Kay, which draws investors, residents and tourists. The ambience and the ecology of the region reinforce this perception.

REAL ESTATE

Interview with real estate agent and auctioneer Tony Fountain

Tony Fountain is a real estate agent and real estate and cattle auctioneer in the Southern Highlands. He says that the Southern Highlands depend on their natural beauty and good agricultural soil, a reputation that is threatened by the Hume Coal project.

Buyers in the Sutton Forest/Berrima area always ask where the mine is in relation to the property on sale. Unfortunately, the region's most valuable properties are also nearest the proposed mine head, and typically downwind from the proposed mine during the south-westerly winter winds, according to Mr Fountain.

He estimates that transporting the coal would require four trains per day in each direction, which risk causing a rail bottleneck on the Southern Highlands line.

The mine's effect on groundwater concerns prospective buyers. The region's crops depend on reliable groundwater.

The region is actually benefiting from coal mining in other regions, with horse studs moving from the Hunter Valley to the Southern Highlands in part because the Southern Highlands are perceived as less polluted.

Properties may also be affected by mine subsistence, a problem that affected the region when the Berrima colliery operated.

SUTTON FOREST OLIVES

Interview with proprietor Kym Burrows

Kym Burrows and her husband Matt run Sutton Forest Olives, the largest olive grove in the Southern Highlands. The business produces around 15 tonnes of oil a year from trees that have been growing for up to 16 years. Apart from pressing the olives, which is done in Collector, all other steps to process or up-scale the oil are done on site, including bottling, labelling, soap making and cake making. Mrs Burrows is also a member of the Olive Association and a judge of olive oil competitions.

Year round, Sutton Forest Olives employs Mrs Burrows full time and four other staff part-time. Many more staff are brought on for harvest time, assisted by harvesting machines. The products are sold in local shops and the IGA, to tourists who visit the grove, and – pending negotiations – in a major supermarket. Southern Highlands groves are smaller than the big Victorian groves, and therefore more dependent on sales to tourists.

The grove depends on water from an 80-metre bore on their property. Because the bore's water is of drinking quality, it can also provide for the family – during the last drought, the Burrows directed bore water to their house.

If Hume Coal's proposed mine affected groundwater, Sutton Forest Olives' grove would become unviable. Five years ago, the Burrows joined several other local families to blockade their private road, keeping Hume from accessing their properties. Their blockade was overruled in the courts, and years of fighting Hume Coal and worrying about their business' water supply has affected the family's morale.

While the threat to water is the Burrows' greatest concern, the mine has already affected their business in other ways. Hume Coal's heavy trucks damaged the property's private road by using it during rain. Legal action eventually forced Hume Coal to compensate the Burrows for the damage done to their road.

The Burrows have built up Sutton Forest Olives with a shopfront, sheds, housing, machinery and the olive trees. They were planning to build a showroom and work shed, plant more trees, and employ more staff in higher-skill roles, but will not do so while the coal mine remains a possibility. Instead, they built a much smaller shed and sales area and would expand "straight away" if the mine were cancelled.

ROSCOE PARK LIMOUSIN STUD

Interview with proprietors Margaret and Ross Alexander

Roscoe Park is a cattle stud, breeding Limousin cattle, a muscular beef cattle breed, for sale to other farmers or as veal meat. They also run a commercial herd of 80 to 100 cross bred breeding cows. The stud's 26 paddocks each have water troughs fed by a water bore drilled by the Alexanders.

Other improvements from the 15 years the Alexanders have owned the property include more fencing, a farmhouse, electricity, expanding the farm's original three dams to eight and extensive pasture improvement – which requires laying 250 cubic metres of turkey manure at a time.

Hume Coal's proposed mine is already affecting the Roscoe Park stud through damaging exploration processes and lowering property prices, and the Alexanders are worried that if the mine goes ahead it will drain their groundwater and damage the endangered ecological communities that are present on their property. The Alexanders have worked hard to restore the endangered shale woodlands.

Roscoe Park is a target of Hume Coal's exploration plans. At one point, the company wanted to drill 25 holes on the property, although they currently only plan to drill six. Hume Coal did not explain to the Alexanders why this figure seems to change year by year. Exploration would see noisy trucks cross the stud, causing erosion and damage to pasture and disturbing the cattle, which are easily stressed by noise, a particular concern for a stud farm.

According to the Alexanders, the proposed mine has lowered property prices in the area. This has not yet affected them personally, as they have no plans to sell, but they claim that older people in the area are struggling as they retire or pay bonds to enter age care.

The property is on a hill, so any effect on groundwater levels from the mine would make their bore inoperable and, by extension, make it impossible to keep the stud in its present condition. The Alexanders put it more bluntly: without the bore, "we're finished".

Concerns over the coal proposal have stopped the Alexanders from investing further in their property. They have cancelled plans to build a farm stay property, more cattle shelters, bring on more cattle and employ more people for pasture improvement, aeration and fencing. They know of neighbours who have also stopped other construction projects unless the mine is cancelled.

TRUFFLE FARM

Interview with owner Peter Martin

Peter and Kim Martin own a property in Sutton Forest directly above the proposed mine. They have planted a commercial scale truffiere covering 6 hectares with a total of 2,400 oak trees. They plan to produce Perigord black truffles. The trees were planted 7 years ago and have been available for harvesting for the past 2 years. However, their intensive involvement in community opposition to the coal mine proposal has resulted in the harvest being deferred until the coal mining issue is resolved. The Martins are registered as primary producers by the ATO and currently grow and sell Lucerne.

The property has a large dam which holds approximately 45 megalitres of water and which is used to irrigate the property, particularly the truffiere. The property also has bore fed dams and decorative ponds acting as a natural filtration system. The water is pumped from the highly productive Hawkesbury sandstone aquifer 80 metres underground. The coal seam sits right under the aquifer, approximately 150 metres under the ground in that location.

The Martins have been told by Hume Coal that their bore would be drawn down significantly if mining were to occur and it would not recover for many years. Hume proposes drilling a new bore to a lower level. Company representatives stated that if that failed, water would be 'piped' into the property. Given the uncertainty as to how this would occur and whether it is plausible, the Martins fear that the loss of groundwater would be unable to be rectified and would have a major impact on the productivity of the property, destroy the truffle production business and significantly diminish the value of the property.

The property has been extensively improved over the past 15 years with the planting of over 30,000 native trees. A critically endangered segment of Southern Highlands shale woodland is also on the property and is being restored. The Martins built what was intended to be temporary weekend accommodation but have had plans for a number of years to build a farm house on the property. These plans were put on hold in 2010 when they became aware of the proposed Hume Coal mine in the area.

SOUTHERN HIGHLANDS CHAMBER OF COMMERCE AND INDUSTRY

The Southern Highlands Chamber of Commerce and Industry (SHCCI) is the main organisation representing local businesses. It has 198 members, including Hume Coal, from among the 5,000 businesses registered in the local government area.¹¹ The SHCCI supports all its members including Hume Coal, with former chair Mr Kurt Newman citing the potential for 400 jobs at the mine as a key point for support during a phone interview for this report.

In more recent correspondence with the Chamber, it notes that Mr Newman is the former chair and that his opinions held in 2016 may not reflect the opinions of all SHCCI members or board. The SHCCI wrote an open letter to NSW Premier Gladys Berejiklian and other state leaders in April 2017. It was critical of what it considered the Government's favourable treatment of Hume during the planning process and asked for a longer EIS submission period. The letter noted the "bitter" divisions within the Chamber.¹²

ARGYLE PROFESSIONALS

Phone interview with Suzie Oukes, Human Resources professional

Argyle Professionals is a Chartered Account, Business Advisers and HR Specialists firm, with Mrs Oukes providing HR services relating to training, coaching, leadership and advice on recruiting. Argyle's accountancy practice clients are mainly Southern Highlands businesses, while Mrs Oukes works mainly with firms in Sydney and some local manufacturing, electrical and hospitality businesses.

Mrs Oukes said that Hume could be a good client for her HR practice although firms as large as Hume usually have their own HR departments and may not use Argyle's services.

Recruiting staff in the Southern Highlands region can offer "slim pickings". When Argyle has tried to recruit accounting staff suitable applications were mainly from

¹¹ Australian Bureau of Statistics (2014) *Wingecarribee Regional Profile*, http://stat.abs.gov.au/itt/r.jsp?RegionSummary®ion=18350&dataset=ABS_REGIONAL_LGA&geocode=REGION&maplayerid=LGA2014&measure=MEASURE&datasetASGS=ABS_REGIONAL_ASGS&datasetLGA=ABS_REGIONAL_LGA®ionLGA=REGION®ionASGS=REGION

¹² Horton and Campbell (2017) *A 'fair go' for the Highlands*, <http://www.southernhighlandnews.com.au/story/4587960/whats-on-your-mind/>

other areas, including some from interstate. Local applications largely lacked the right qualifications.

Hume could have similar trouble recruiting, according to Mrs Oukes. Hume could recruit 400 staff within 45 minutes of the site, although she is not sure how many people are looking for jobs in Southern Highlands at the moment.

Mrs Oukes is from a mining region in Quebec, Canada, so has experienced life and work in a mining region and has seen the employment benefits. She says the project would be a good thing for local employment, particularly younger generations – there are a lot of retirees in the region, younger people often have to leave the area. Hume would provide reasons for them to stay.

Mrs Oukes feels that the project could be like a “refresh” of the local jobs market re-invigorating the local employment market, but points out that agriculture, manufacturing and tourism businesses could lose employees. This comes at a cost to these businesses who lose trained, experienced employees. There are some costs to employers of recruiting and training someone new after losing experienced staff. The project could cause issues like this locally according to Mrs Oukes, who has seen a similar process in Canada.

HUME COAL AND JOY MINING

Hume Coal did not participate in this research, despite several invitations from The Australia Institute. We asked Hume to suggest businesses in the local economy that they currently work with, or would like to work with if the project proceeds. Hume suggested we speak to Joy Mining, an international mining equipment manufacturer with some local operations. Joy Mining representatives did not return our calls.

Conclusion

During the writing of this report, the Environmental Impact Statement (EIS) for the Hume Coal Project was published. The Economic Impact Assessment commissioned by the proponent concludes that the project will bring net benefit to the local economy.

The economic assessment contains numerous misinterpretations of the Southern Highlands economy. These will be addressed in submissions on the EIS, but one point is important to make here – the Hume economic assessment is based entirely on desktop analysis. The authors have not been to the region or spoken to local business owners. There is no mention of the Southern Highlands Development Framework, the Wingecarribee Economic Summit or any other aspects of local economic planning.

Perhaps most revealingly, the EIS discussion of local tourism states that there are only 20 tourism establishments in Wingecarribee and just four in Berrima. This error is apparent from an internet search. The EIS claims that the mine would generate:

*additional demand for short-term accommodation...and would benefit local accommodation providers.*¹³

There are many problems with the authors' reasoning, not least the assumption that tourism is only related to accommodation, excluding hospitality, retail and transport. More importantly, this shows a fundamental misunderstanding of the local economy, perhaps inevitable without talking to anyone who runs a business in the region.

This report shows that there would be considerable negative economic impacts from the Hume Coal project, particularly if it impacts water resources. Local businesses intend to reduce or delay investment if the project goes ahead, or remains a possibility. The EIS ignores this reality.

The disconnect between economic assessment and economic reality is a problem not just for the Southern Highlands and the Hume Coal project, but also for the wider NSW planning system and economic consulting industry. Economic assessments of coal projects have been heavily criticised, prompting NSW Planning to rewrite economic assessment guidelines. The material in this report and in the Hume Coal EIS show that the new guidelines are failing to deliver the standard of assessment that decision makers and the NSW community requires to plan for the future of the state.

¹³ BAEconomics (2017) *Economic Impact Assessment of the Hume Coal project*, <https://majorprojects.accelo.com/public/ae3dde5cb124ded4de87b197405f2132/99.%20Hume%20Coal%20Project%20EIS%20Appendix%20Q%20-%20Economic%20Impact%20Assessment.pdf>



The **Australia Institute**
Research that matters.

Economic assessment of the Hume Coal project

Development of an underground coal mine in NSW's Southern Highlands is not economically viable and presents risks to the environment, existing industries and landowners.

Discussion paper

Rod Campbell and Richard McKeon
June 2016

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Summary

The Hume Coal Project is a proposal to build an underground mine in the Southern Highlands of New South Wales, near Berrima on the Hume Highway, southwest of Sydney. The mine would produce around 3 million tonnes of metallurgical and thermal coal each year for almost 20 years. Hume Coal is owned by South Korean steelmaker POSCO.

The project is controversial. The community, other industries and the local government are worried that the mine will consume groundwater that local residents, businesses and farms depend on. “Water not Coal” signs are common on fences, gates and businesses throughout the district.

This research has been commissioned by Coal Free Southern Highlands. Hume Coal were approached to participate, but provided only limited assistance. Key data sources are Hume Coal’s Preliminary Environmental Assessment and a groundwater study commissioned by Southern Highlands Coal Action Group. Local stakeholders were interviewed in two field trips to the Southern Highlands in April–May 2016.

This report is a cost benefit analysis prepared in line with the NSW *Guidelines for the economic assessment of mining and coal seam gas proposals*, and uses the draft Cost Benefit Analysis Workbook that accompanies the Guidelines. As this is the first full assessment to use these resources it provides a working example of how they can be further developed.

Our cost benefit analysis estimates that at a global level the project has net present value of negative A\$556 million. Key assumptions in this estimate are a coal price of A\$112 per tonne, operating costs of A\$97 per tonne, a 7% discount rate and groundwater inflow of 9.7 gigalitres per year.

The project as proposed is almost certain to represent a large financial loss to the proponent. Under our central assumptions, producer surplus – a basic estimate of profit – is estimated at negative A\$539 million. This means that, if approved, the project is unlikely to proceed as proposed unless there is a major increase in coal price.

If it did proceed despite the financial loss to the proponent, we estimate the project would be liable for royalties worth A\$118 million in present value terms. While this represents a substantial benefit to the NSW community, our central estimate of the cost of groundwater impacts is A\$131 million. Beyond this likely cost there are many

unquantified impacts that make it very unlikely that the project represents an improvement in economic welfare for the NSW community.

Sensitivity analysis shows that to reach a positive net present value, coal prices would need to increase by 43 percent. For the project as proposed to make a reasonable level of profit for the proponents we estimate an increase in coal price of 58 percent is necessary. Importantly, this increase would need to be maintained through the life of the project. Such high prices have only been observed for short periods in the last 30 years.

Alternatively, the project could become viable for the proponent with a 38 percent reduction in operating costs. However, part of the reason for the high operating costs of the mine is the methods adopted to reduce environmental impacts. Any move to reduce operating costs is likely to increase environmental externalities, particularly impacts on groundwater.

The project is unlikely to proceed as proposed under current conditions or prices as forecast by Commonwealth Treasury. If approved, the project is likely to remain on hold indefinitely. This imposes considerable costs on the local economy, which has been affected by the uncertainty over the project. These impacts are further considered in the local effects analysis, presented in a separate document.

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List of acronyms

BCR	Benefit Cost Ratio
CHPP	Coal Handling and Processing Plant
CO2-e	Carbon dioxide equivalent
EIS	Environmental Impact Statement
FTE	Full time equivalent
GHGs	Greenhouse gases
GL	Giga-litre – 1 billion litres
IMC	Illawarra Metallurgical Coal
MIA	Mine Infrastructure Area
ML	Mega-litre – 1 million litres
Mtpa	Mega-tonnes per annum
NSW DPE	NSW Department of Planning and Environment
PEA	Preliminary Environmental Assessment
PKCT	Port Kembla Coal Terminal
TAI	The Australia Institute

All values are in 2016 Australian dollars unless otherwise stated

Introduction

The Hume Coal Project is a proposal for an underground mine in the Southern Highlands region of New South Wales (NSW). The site is located approximately 130 kilometres southwest of Sydney and 160 kilometres northeast of Canberra, near the village of Berrima.

The mine would produce 3 million tonnes per annum (Mtpa) of mainly metallurgical coal. Thermal coal for power generation would also be produced. All coal would be railed to Port Kembla near Wollongong and exported.

The project proponent is Hume Coal, a subsidiary of Korean steelmaker POSCO. POSCO owns 100 percent of Hume Coal.

The project area is not a major coal mining area. While a colliery operated nearby for many years, the local economy is dominated by services. Being close to Sydney and Canberra, the employment profile for the area closely reflects that of NSW more broadly. Agriculture and tourism-related sectors (such as accommodation and food services and retail) are relatively large employers in the Southern Highlands. The region's tourism is linked closely to agricultural activities and scenery, as well as heritage buildings and ambiance.

As a result, the Hume Coal Project has faced considerable local opposition. The local Wingecarribee Shire Council officially opposes the project and anti-mine signs can be seen on fences and shopfronts throughout the area. Opposition is mainly focused on potential damage to groundwater resources and other local industries.

This report is an economic assessment of the Hume Coal Project, commissioned by Coal Free Southern Highlands. It is the first such assessment commissioned by a community group in NSW. It consists of a cost benefit analysis (CBA) and local effects analysis (LEA). The CBA compares the economic, environmental and social costs and benefits of a policy or project to assess whether the proposal is in the best interests of the NSW community. The LEA focuses on the local economy, particularly on employment effects.

Both the LEA and CBA adhere closely to the NSW *Guidelines for the economic assessment of mining and coal seam gas proposals* ("the Guidelines" or "2015 Guidelines"), published in December 2015. The Guidelines were developed through 2014–15 with industry and public consultation and are intended to improve the standard of economic assessment of mining projects, following serious criticism by the

NSW Land and Environment Court, the Planning Assessment Commission (PAC) and public submissions of some proponent-commissioned assessment.

The 2015 Guidelines have been finalised but supporting worksheets are still in draft form. These worksheets are intended to help standardise economic assessment and ensure assessments are comparable and consistent. The worksheets are to be further developed by Department of Planning and Environment (the Department) during 2016. This assessment uses some of these worksheets and is intended to contribute to the development process.

This is the first assessment of a new coal mine under the 2015 Guidelines and the first to use the supporting worksheets. Coal Free Southern Highlands and The Australia Institute intend to work with the Department and other stakeholders to ensure that this assessment sets the bar for compliance with the Guidelines and provides useful feedback as to how they can be updated and supporting worksheets improved.

Cost benefit analysis

REQUIREMENTS UNDER 2015 GUIDELINES

The December 2015 NSW *Guidelines for the economic assessment of mining and coal seam gas proposals* refer to “key steps”, “key features” and “tasks” of CBA.

The following are identified as key steps in CBA:¹

- Establish the base case
- Define the project
- Quantify the changes
- Estimate the monetary value of changes
- Estimate net present value
- Undertake sensitivity analysis
- Assess distribution of costs and benefits

The Guidelines also set out “key features” of a CBA:

- Scope
- Discount rate
- Timeframe
- Risk and uncertainty
- Unquantified factors

The Guidelines also set out a list of tasks:

- Estimate royalties payable
- Estimate company income tax
- Estimate net producer surplus: Identify the direct costs and benefits to the producer
- Quantify direct benefits and direct costs to the producer and estimate the total direct net benefit to the producer
- Estimate net producer surplus attributable to NSW
- Estimate indirect benefits to NSW
- Estimate indirect costs to NSW

¹ See Box 1.1 of the Guidelines, page 3.

All of these points are important and the key steps, features and tasks are not all discrete tasks or points. All are addressed in this assessment, with the initial steps and features in the following sections.

ESTABLISHING THE BASE CASE AND THE PROJECT

The benefits and costs of a project must be measured against a “base case”, or how things would be in the absence of the project. This isolates the impact of the project compared to the status quo.

The Base Case

The base case for this CBA is that no mining is occurs at the proposed mining site, and that all factors of production continue to be used in their existing fashion, or at their highest non-mining utility.

Since the Hume Coal Project is a greenfield development, the base case is more straightforward than other projects, which might involve trade-offs between a ramp down of production and immediate rehabilitation, or the extension of production and delay of rehabilitation.

Under the base case, the impact of any current externalities must be considered. For example, there will be some level of greenhouse gas (GHG) emissions associated with any current livestock grazing. To the extent that this economic activity is replaced with underground coal mining, the current rate of emissions must be subtracted from emissions forecast under the project case.

The Project

According to Hume Coal’s Preliminary Environmental Assessment, the proposal is to develop an underground mine which would extract up to 3.4 Mtpa of unprocessed “run of mine” (ROM) coal which would create up to 3.0 Mtpa of saleable metallurgical and thermal product coal.² Saleable coal will be railed to domestic markets or to Port Kembla Coal Terminal (PKCT) for shipment to domestic and international markets.

Construction of the mine will take approximately 3 years, followed by 19 years of operations and 2 years of rehabilitation.

² EMGA Mitchell McLennan, “Hume Coal Project - Preliminary Environmental Assessment”, (2014)

The project area covers 5,043 hectares, 3,400 of which will comprise the mining area. 115 hectares will be required exclusively for surface infrastructure and operations, and the remaining land will continue under its existing use.

KEY FEATURES

Scope

The Guidelines note that CBA compares costs and benefits at a particular scope, or to a particular community. The required scope under the Guidelines is to assess costs and benefits to the NSW community. This is because the NSW community owns the coal that is to be extracted, so any proposal to exploit this resource should bring a net benefit to the people of NSW.

To arrive at an estimate of net benefit for the NSW community, it is necessary to consider costs and benefits that accrue to other stakeholders. Most clearly in this case, to the owners of Hume Coal, which are domiciled in South Korea. As an earlier version of the Guidelines stated:

In the first instance, it will generally be most practical to assess all major costs and benefits to whoever they accrue and then adjust to estimate the proportion of these attributable to residents of the State.³

This CBA initially adopts a global scope that includes costs and benefits that accrue internationally, most importantly the capital and operating costs of the project and the revenue from coal sales. These costs and benefits are largely borne by and accrue to Hume Coal's Korean owners.

Assessing costs and benefits at both a global level and at a state level gives important insights into the project. In particular we find that the project is very likely to have negative net benefits at an international level, even before environmental and social impacts are considered. This means that the owners are unlikely to proceed with the project as planned, meaning that benefits of production at a state level such as jobs and royalties are unlikely to be realised.

An assessment of a foreign owned project that only estimated costs and benefits to the state would focus largely on royalties. But such an assessment would provide no insight into whether the royalty payments were likely to eventuate. For example, the

³ Department of Planning and Infrastructure (2012) *Guideline for the use of Cost Benefit Analysis in mining and coal seam gas proposals*, page 5.

economic assessment of the Angus Place coal mine estimated net benefits to the NSW community of that mine's expansion at \$770 million, consisting largely of \$418 million of job-related benefits and \$203 million of royalties. This assessment neglected to consider the costs and benefits to the mine's owners, Thai coal company Banpu. The net benefits accruing to Banpu are low or negative, as the mine has been placed in care and maintenance and two years after the economic assessment was written the proponent is yet to respond to submissions on the mine's EIS.⁴

Similarly, a 2014 CBA of the Warkworth Continuation Project assessed the benefits to NSW without considering the costs and benefits to international owners, Rio Tinto, Mitsubishi and POSCO. The estimate of net benefits to NSW came to \$1,488 million, with \$617 million in royalties and \$612 million in job-related benefits. Without considering the benefits and costs to owners, readers have no understanding of whether these benefits to NSW will eventuate. At current coal prices it is unlikely they will, a view given support by Rio Tinto's efforts to sell its NSW coal mines.⁵

The draft Cost Benefit Analysis Workbook prepared as part of the 2015 Guidelines adopts this approach, making it easy for analysts to enter costs and benefits at a global level and make an assessment of benefits and costs to the state. Incautious use of the worksheet, however, could lead to analysts reporting a net benefit to the state, while ignoring a global negative net benefit, as seems to have occurred in the above examples.

In order to understand the likely net benefits of the Hume Coal Project to NSW, it is essential to also consider the costs and benefits at a global level.

Discount rate

As projects such as the Hume Coal Project incur costs and accrue benefits over long periods of time it is important to adjust future costs and benefits into present value terms using a discount rate. The 2015 Guidelines specify a central discount rate of 7 percent, with sensitivity testing at 4 percent and at 10 percent. All present values in

⁴ AIGIS Group (2014) *Angus Place Colliery Extension Project - economic impact assessment*; <http://www.centennialcoal.com.au/News/Latest-News/Angus-Place-Springvale-Restructure-Announcement.aspx>; http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=5602

⁵ BAEconomics (2014) *Economic Impact Assessment for Warkworth Continuation 2014 and Mount Thorley Operations 2014*; Campbell and Denniss (2015) *Submission: Warkworth and Mount Thorley Continuation Projects* available at <http://tai.org.au/content/submission-warkworth-and-mount-thorley-continuation-projects>

this report are based on a 7 percent discount rate, except those in the sensitivity analysis section.

Timeframe

In line with the 2015 Guidelines, this CBA uses as its timeframe the life of the project. We assume that construction would begin in 2018 and the project operate for 19 years before 2 years of rehabilitation.

We assume land acquisition costs are incurred this year, 2016. As these costs were incurred in the past, arguably they should be considered a sunk cost and not included in the CBA. However, as the project has not begun and the properties largely unchanged the proponent could sell these properties if the project is not approved. In including these costs in 2016 we assume that if the project is committed to this year by the proponent, the use of the relevant properties would change and resale would become unfeasible, thus the cost is incurred in this year. Changing this assumption does not lead to a major change in the results of the CBA.

A major concern around the project is damage to groundwater resources. There is a risk of permanent impacts on valuable aquifers. This cost would be likely to accrue over a much longer time period than the project life. This CBA may understate groundwater costs due to the timeframe adopted and the approach to its evaluation.

The draft Cost Benefit Analysis Workbook prepared as part of the 2015 Guidelines does not include a cost line for groundwater impacts, perhaps assuming these costs will be included in operating costs or loss of surplus to other industries. This should be considered in the further development of the worksheets.

Risk and uncertainty

The process of valuing a project involving costs and benefits occurring up to 20 years in the future requires assumptions to be taken on the magnitude and timing all costs and benefits. Estimating future market prices and expenditures is an inherently uncertain pursuit; actual results could be significantly higher or lower. Nonetheless, all project decisions are made with some level of uncertainty, and valuations must still be calculated so that alternative investments can be compared and be traded off.

This report has endeavoured to calculate a 'P50' valuation of the Hume Coal project, meaning there is an equal chance the actual result of each assumption could be higher or lower than the estimate, and by implication, there is an equal chance that the realised value of the project is higher or lower than our estimate.

Furthermore, many environmental and social impacts of the project are uncertain. They are largely considered qualitatively and the risks associated with them should be considered by decision makers alongside quantified costs and benefits.

In line with the 2015 Guidelines, sensitivity testing includes consideration of a range of costs and benefits, notably groundwater impact estimates.

Global CBA

Before assessing the costs and benefits associated with Hume Coal's proposed underground coal mine from the perspective of the state of NSW and the Southern Highlands region, it is necessary to first understand the project at a global level as many of the important financial costs and benefits will accrue to overseas interests.

In May 2013, POSCO Australia Pty Ltd (POSA) acquired Cockatoo Coal Limited's 30% stake in Hume Coal Pty Ltd, making it the sole shareholder of the project⁶. POSA is the Australian subsidiary of South Korean steelmaker POSCO, and is the ultimate and sole shareholder of the Hume Coal project.

Under central valuation assumptions, the Hume Coal project represents a net present value of approximately negative half a billion dollars to POSCO. For Hume Coal to generate a commercial 10% internal rate of return, POSCO would have to believe that coal prices will increase by 58% from current prices, and remain at that level for the life of the project.

GLOBAL BENEFITS – REVENUE

Coal volume

How much and when coal is to be mined and sold is a key driver of total project value, since it dictates both when revenue is received and when expenses are incurred.

At peak production rates, Hume Coal plans to extract 3.4 Mtpa of run-of-mine (ROM) coal, 3.0 million tonnes of which will end up as saleable product (Exhibit 1).

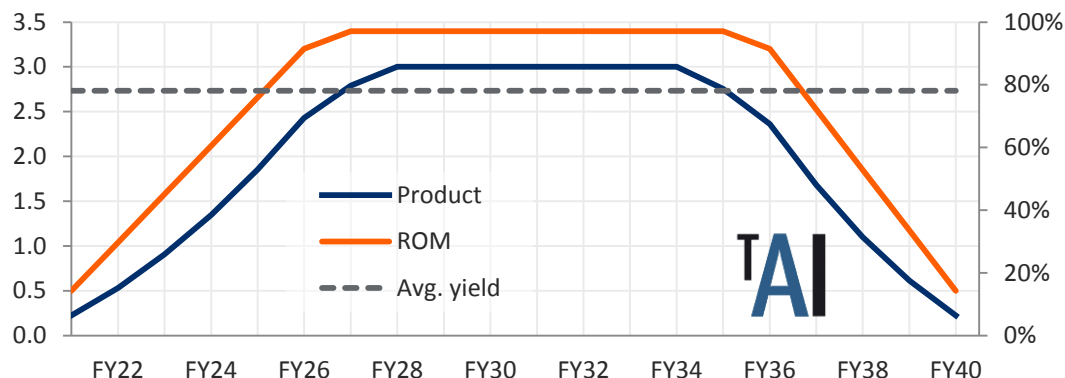
The mining yield is the proportion of ROM coal which is ultimately sold to market, and is particularly important in project valuation, since costs are predominantly driven by ROM volumes, whereas revenue is related to volume sold (product coal). The expected yield was not published in the Hume Coal's 2014 Preliminary Environmental Assessment (PEA), but the proponents included a figure of 78% in their 2013 pre-feasibility study⁷.

⁶ Southern Highland News, "POSCO acquires 100 per cent of Hume Coal", (2015)

⁷ Reported in Pells, P., Pells, S. "Groundwater Study: Background and Synopsis", p.3, (Pells Consulting, 2014)

Exhibit 1 ROM and product coal volume over project life

Mega tonnes per annum (Mtpa)



Source: EMGA Mitchell Mclennan, "Hume Coal Project – Preliminary Environmental Assessment", p. 15, (2014); profile assumed by TAI

Using the information provided in the PEA and pre-feasibility study, the production profile illustrated in Exhibit 1 has been estimated by The Australia Institute (TAI)⁸. The total ROM coal produced in Exhibit 1 is 50 Mt, in line with the PEA. An average yield over the project of 78% gives total product coal of 39.8 Mt. The ROM and Product Coal functions here form part of our estimates of project revenues and operating costs.

Coal volume

How much and when coal is mined and sold is a key driver of total project value, since it dictates both when revenue is received and when expenses are incurred. What share of coal mined is actually sold is also important, since costs are mostly based on run-of-mine (ROM) volumes while revenue depends on volume sold (product coal/saleable product).

At peak production rates, Hume Coal plans to extract 3.4 Mtpa of ROM coal, 3.0 million tonnes of which will end up as saleable product (Exhibit 1). This represents a "mining yield", or proportion of ROM coal that is ultimately sold to market, of about 88%.

The proponents do not provide their expected overall yield in their 2014 Preliminary Environmental Assessment (PEA), but did use the figure 78% in their 2013 pre-feasibility study⁹.

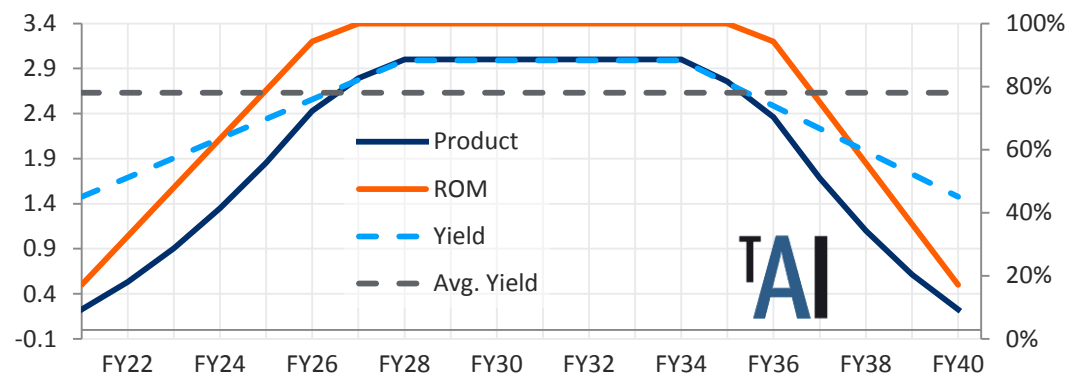
⁸ Total ROM production approximately 50Mt, peak ROM production is 3.4Mtpa, and peak saleable production is 3.0Mtpa as per the EMGA Mitchell Mclennan, "Hume Coal Project - Preliminary Environmental Assessment", (p.50). Average yield is 78%.

⁹ Reported in Pells, P., Pells, S. "Groundwater Study: Background and Synopsis", p.3, (Pells Consulting, 2014)

TAI has used the figures provided in the PEA and pre-feasibility study to assume a profile of ROM and yield, and therefore product coal, over the Hume Coal Project's life¹⁰ (Exhibit 1).

Exhibit 2 ROM and product coal volume over project life

Mega tonnes per annum (Mtpa)



Source: EMGA Mitchell Mclennan, "Hume Coal Project – Preliminary Environmental Assessment", p. 15, (2014); profile assumed by TAI

The total ROM coal produced in Exhibit 1 is 50 Mt, in line with the PEA. An average yield over the project of 78%, in line with the pre-feasibility study, gives total product coal of 39.8 Mt. The ROM and Product Coal functions here form part of our estimates of project revenues and operating costs.

Coal price

Probably the most sensitive assumption towards the valuation of any mining project is the price buyers are willing to pay for the mine's product. Hume Coal plans to produce metallurgical and thermal coal, which will be sold into international and domestic markets¹¹.

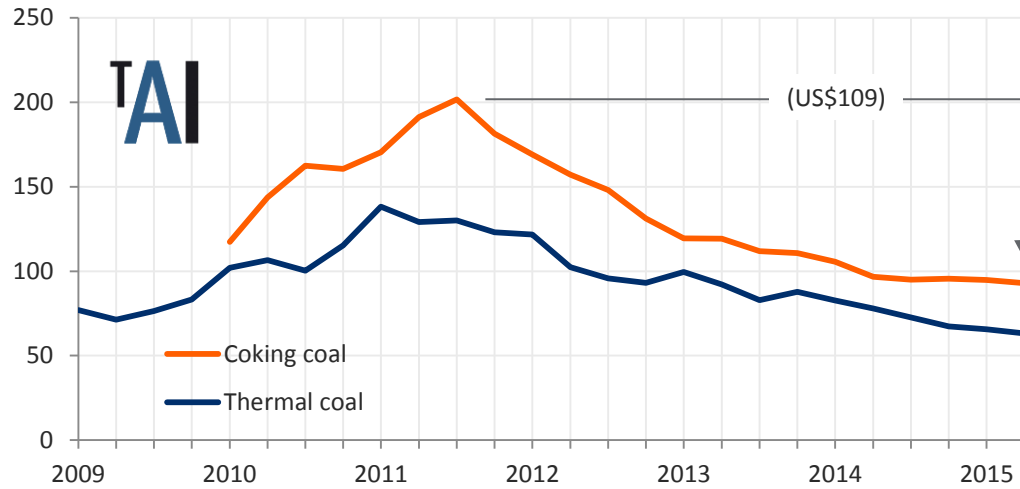
The value of metallurgical coal has fallen by over US\$100 per tonne since 2011, driven by the slow-down in the Chinese construction industry, a corresponding reduction in demand for steel products and major expansions in global coal supply, with prices now closer to long term averages (Exhibit 3).

¹⁰ Total ROM production approximately 50Mt, peak ROM production is 3.4Mtpa, and peak saleable production is 3.0Mtpa as per the EMGA Mitchell Mclennan, "Hume Coal Project - Preliminary Environmental Assessment", (p.50). Average yield is 78%.

¹¹ EMGA Mitchell Mclennan, "Hume Coal Project - Preliminary Environmental Assessment", p. E.3, (2014)

Exhibit 3 Historical coal prices

US\$ per tonne FOB, nominal



Source: Steelonthenet, "Metallurgical Coal Prices", (2016); Indexmundi.com, "Coal, Australian thermal coal Monthly Price – US Dollars per tonne", (2016)

As of April 2016, the price of 'Hard Coking Coal (Premium Low Vol) FOB Australia' was US\$92.75¹², and according to research released by the National Australia Bank (NAB) in March 2016, prices are expected to decline further in the second half of 2016 due to weak steel demand and falling production¹³.

Note that Hume's metallurgical coal will likely trade at a lower price than Australian premium coking coal. The NSW Coal Industry Profile shows that Hume's product coal does not meet Australian hard coking coal benchmarks on several specifications:

Table 1: Coal specifications

Specification	Hume	Platts benchmark Hard Coking Coal FOB Australia
Moisture (% air dried)	2.3	N/A
Moisture (% as received)	8.0	9.5
Ash (% air dried)	11.0	9.0
Volatile Material (% air dried)	34.3	21.5
Sulphur (% air dried)	0.59	0.50
Energy content (kcal/kg)	7,337	7,800 ^a
Crucible Swelling Number	7.0	8.5

^aThis is the Platts Low Vol PCI FOB Australia Benchmark rather than Hard Coking Coal FOB Australia, which does not list energy content.

Sources: Division of Resources and Energy (2013) *NSW Coal Industry Profile*; Platts Global (2016) *Methodology and Specifications Guide Metallurgical Coal*.

¹² CME Group, "Australian Coking Coal (Platts) Low Vol Futures Quotes", (2016)

¹³ National Australia Bank, "NAB Minerals & Energy Commodities Outlook – March 2016", (2016)

Table 1 shows that, while Hume's coal is likely to meet standards for moisture and swelling properties, ash content, volatiles and sulphur is high. Energy content is below the benchmark for pulverised coal injection product (PCI), which itself trades at a discount to hard coking coal.

While Hume's metallurgical coal is likely to trade at a discount to Australian Hard Coking Coal benchmark prices, in our assessment we assume no discount. Hume Coal state that the raw ash content of its product is "... higher than typical Australian export metallurgical coal, but the ROM coal will be washed on-site to meet export coking coal market specifications as required, including ash content specifications". Based on this statement, the central assumptions do not penalise Hume Coal for their lower quality product; it is assumed that the impact of processing more coal to meet quality standards is reflected in the 78% yield. Regardless, our approach seems optimistic and may result in an overstatement of the value of the project.

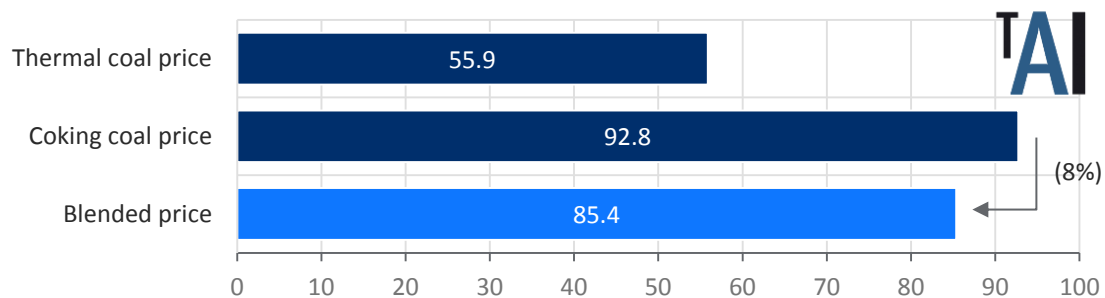
For metallurgical and thermal coal, miners typically enter into contracts with buyers for certain quantities of their annual production. Since POSCO is a vertically integrated steel producer, it will probably be the primary customer of Hume Coal's production. The market price, however, is still very important, as it represents the price POSCO could have purchased coking coal for from another supplier.

Metallurgical coal has historically achieved around a 40% premium to thermal coal, and it is therefore important for any proposed project to understand how much of their output will be sold into each market. The proponents don't share production splits between thermal and coking (metallurgical) coal, but the nearby 'Illawarra Metallurgical Coal' operation, owned by South32, reports that 20% of its saleable production is thermal coal¹⁴. In estimating the value of Hume Coal's production, this report has adopted the same mix for Hume Coal, which results in an average price assumption across Hume Coal's total output being 8% lower than the benchmark coking coal price (Exhibit 4).

¹⁴ South 32 (2015) *Making a Difference from the Ground Up-Roadshow Presentation March 2015*, sd31

Exhibit 4 Market coal prices and Hume Coal average price (April 2016)

US\$ per tonne FOB

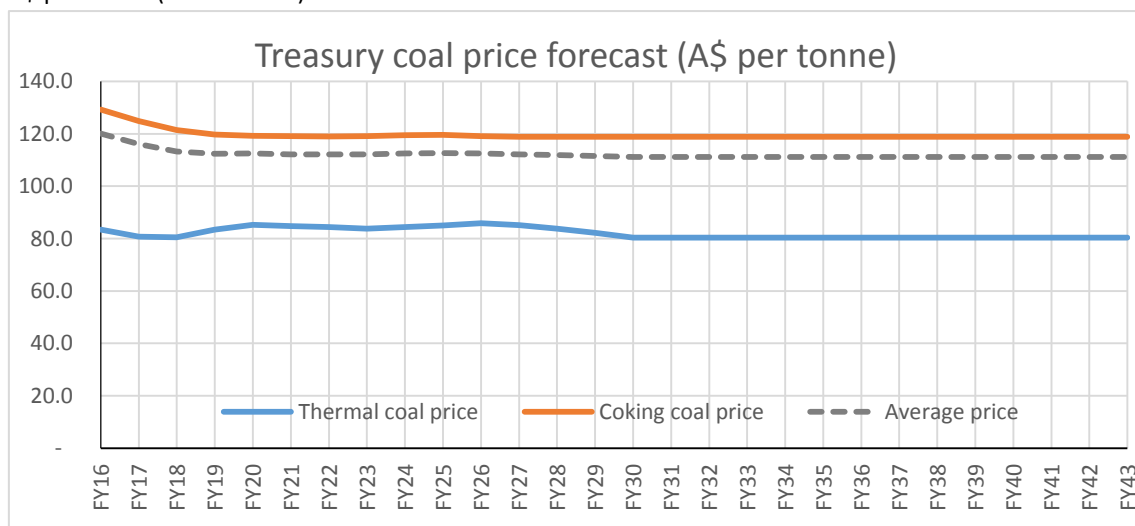


Source: CME Group, “Australian Coking Coal (Platts) Low Vol Futures Quotes”, (2016);
Indexmundi.com, “Coal, Australian thermal coal Monthly Price – US Dollars per tonne”, (2016)

At the current exchange rate of 0.77, this represents A\$110 per tonne for the average price per tonne Hume will receive, based on the above assumptions. This is close to price estimates in the Commonwealth Treasury’s Long-Run Forecasts (Exhibit 5):

Exhibit 5 Commonwealth Treasury long-term coal price forecast

A\$ per tonne (2012 dollars)



Source: The Australian Government Treasury, “Long-Run Forecasts of Australia’s Terms of Trade – Treasury Working Paper”, p.19–21, (201)

Our estimates are based Treasury’s forecast and we assume that the average price Hume Coal will to receive is A\$112 per tonne. **Exhibit 14** (presented further down in this chapter) shows sensitivity analysis of the NPV of the project at a global level for Hume’s average received prices between US\$50 and US\$150.

Gross mining revenue

Under the above assumptions, gross mining revenue over the project life is almost A\$4.5 billion, or A\$1.7 billion in present value terms at a 7 percent discount rate. The relevant sections of the draft worksheet are presented below:

Table 2: Gross mining revenue table from Draft Worksheet (undiscounted)

1. Gross mining revenue (GMR)

		Total
Quantity of coal/mineral output	tonnes ('000)	39,820
Price (forecast) of coal/mineral	\$ per tonne	
Total (quantity x price)		4,440,995

Table 3: Discounted mining revenue from Draft Worksheet

A1. Direct economic benefits – Global

		Total
1 Gross mining revenue (GMR)	AU\$ ('000)	1,709,936
2 Residual value of land	AU\$ ('000)	—
3 Residual value of capital	AU\$ ('000)	—
Total discounted direct economic benefits – Global		1,709,936

GLOBAL FINANCIAL COSTS

Operating costs

The cost required to extract coal from underground, process it, and transport it to port is a key cost of the project. Many factors contribute to the operating cost for a mining project. Open cut mines are generally cheaper than underground mines on a per tonne basis, and mines which recover a high proportion of the in situ resource are generally cheaper than those which leave most in place. Since Hume Coal is an underground

mine, with a proposed recovery rate of only 35%¹⁵, it is likely to be at the costlier end of the coking coal mining spectrum.

Hume Coal provide some detail around expected initial construction and sustaining capital costs, as well as information on mining techniques assisting comparison with other mines. As the project will adopt “environmental and social practices above and beyond the standard measures used at Australian coal mines”, which they demonstrate through five design principles¹⁶:

1. Innovative ‘non-caving’ coal extraction methods
2. Underground reject coal replacement
3. Covered coal transport rail wagons
4. Advanced high performance locomotives; and
5. Apprenticeships, training, and local procurement

While this commitment to responsible practices is commendable, the reason why these particular practices are not generally employed at other Australian coal mines is because they add considerably to costs. To take the second point as an example, replacing reject coal back into the underground void would necessitate significant additional coal transport and handling per ROM tonne, which will increase costs through additional labour, fuel, and equipment maintenance expenses.

In the absence of the project-specific information required to conduct a detailed operating cost study, we have referred to two other underground operations which have published actual or expected operating costs. This approach is not uncommon. Operating cost estimates for mines submitted to the NSW planning process are often based on comparison with other mines rather than proponent estimates¹⁷. In one recent proposal consultants used operating cost estimates based on other mines’ known costs instead of the overly optimistic data provided by the proponent¹⁸.

The Belview Coking Coal Project is a proposal for a 3.5Mtpa ROM underground single longwall coking coal mine in Queensland’s Bowen Basin. In April 2013 the proponents

¹⁵ ABC News, “Hume Coal announces plans to build Southern Highlands mine”, (2015)

¹⁶ EMGA Mitchell McLennan, “Hume Coal Project - Preliminary Environmental Assessment”, p.20, (2014)

¹⁷ Deloitte Access Economics (2013) *Cost benefit analysis and economic impact analysis of the revised Bulga Optimisation Project*; Deloitte Access Economics (2014) *Cost Benefit Analysis and economic impact analysis of the Mount Owen Continued Operations Project*.

¹⁸ Deloitte Access Economics (2015) *Cost Benefit Analysis and Economic Impact Analysis of the Wilpinjong Extension Project*.

released a concept study for the mine, which estimated operating costs at A\$91.4 per saleable tonne FOB Gladstone¹⁹.

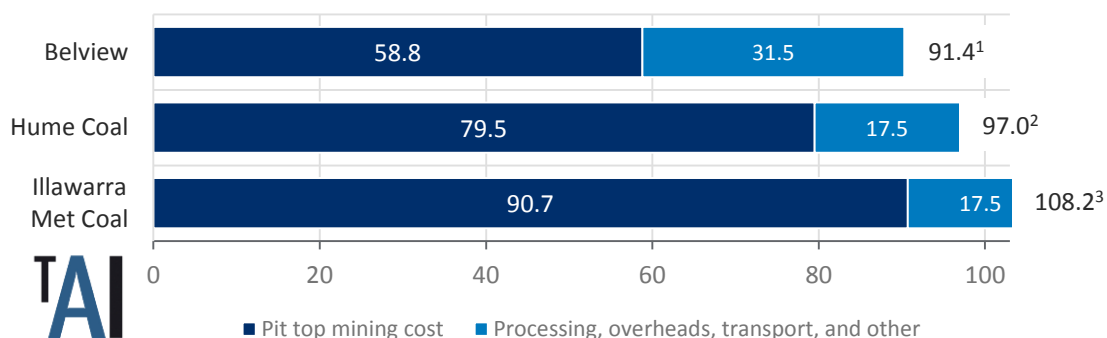
Much closer to the proposed Hume Coal site, Illawarra Metallurgical Coal (IMC) is a three-longwall underground mining operation extracting 12Mtpa of ROM coal. In March 2015, they published operating costs for FY14 of US\$99 per tonne, which translates to A\$108 per saleable tonne using the average FY14 exchange rate of 0.91 (Exhibit 6).

Total operating costs for Belview consist of both 'pit top mining costs', as well as processing, transport, levies and overheads. In comparison to Hume Coal, Belview will extract coal from a deeper seam than Hume (approximately 400m versus 100m), but will recover a much higher proportion of the coal (80% versus 35%). Since the operating costs are considered as a rate per saleable tonne, and given most of the effort required in underground mining is accessing the seam, leaving 65% as opposed to 20% of the coal in place adds significantly to costs. It has therefore been assumed that Hume Coal will incur around 35% more cost per saleable tonne in getting coal to the processing plant door.

On the other hand, Hume Coal is located just 80km by rail from Port Kembla, significantly shorter than the almost 300km by rail between Belview and Gladstone, which is reflected by the lower transport, processing, and overheads assumption in Exhibit 7.

Exhibit 6 Comparison of Hume Coal and other mine operating costs

A\$ per product tonne; C1 cash costs (nominal)



Source: 1) Stanmore Coal, "ASX announcement – New Concept Mining Study for Belview Coking Coal Project", (2013); 2) TAI estimate; 3) South 32, "Making a Difference from the Ground Up – Roadshow Presentation March 2015", slide 30, (2015)

¹⁹ Stanmore Coal, "ASX announcement - New Concept Mining Study for Belview Coking Coal Project", (2013)

Note: 1) Cost in FY13 dollars; 2) Estimate is in FY16 dollars; 3) Cost quoted as US\$99 in FY14 and converted to A\$ using FY14 average A\$/US\$ exchange rate 0.91

While the breakdown of operating costs for IMC was not published, since it is a similar distance to port, it is assumed that transport costs will be comparable to Hume Coal. Similar to the Belview proposal, IMC also employ longwall underground mining, which is likely to be more cost effective than the largely untested 'Pine Feather' technique proposed by Hume Coal. However, since IMC has been mining in the area for a significant amount of time, it is also likely that they are incurring legacy costs not expected to be faced by Hume Coal. This report has therefore conservatively assumed that the central operating cost assumption is lower than IMC, but higher than Belview, at A\$97 per saleable tonne FOB Port Kembla.

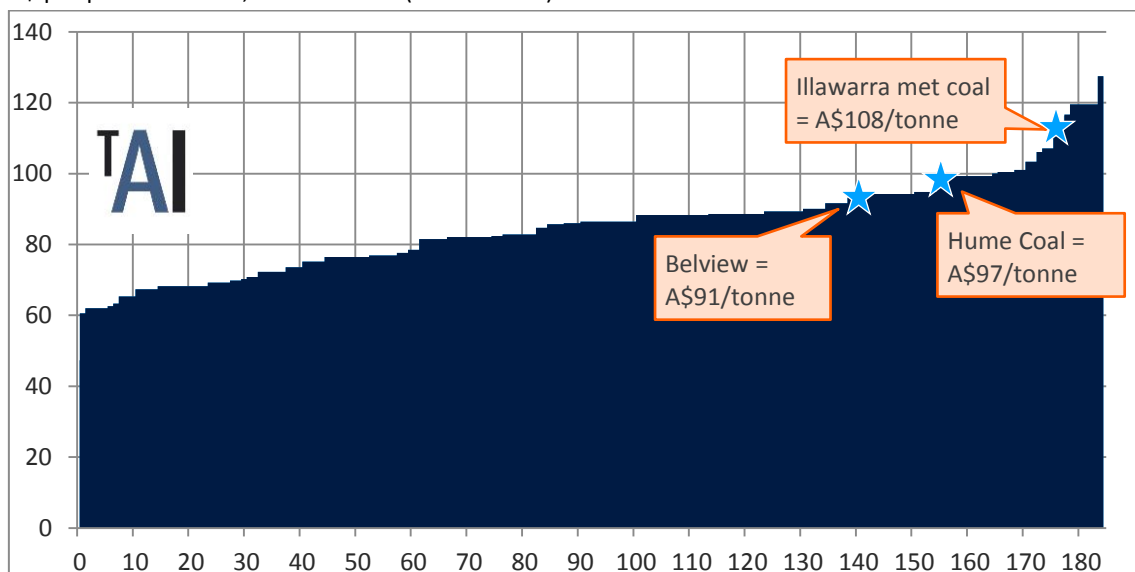
Note that we have not included separate estimates of decommissioning costs, environmental mitigation costs, transport management costs and rehabilitation costs. We assume that these costs are factored into the operating cost estimate. Given the potential environmental impacts of the Hume project, this approach could significantly understate the costs of the mine.

Based on these assumptions of pit-top mining and other costs, averaging \$97/t over the life of the project, we estimate total operating costs of \$3.86 billion. Present value of operating costs at a seven percent discount rate is \$1.50 billion.

Operating costs of A\$97/t would place Hume Coal in the top quartile of Australian coking coal mines (Exhibit 7). As commodity prices have returned to near long term averages, this is not a good starting position for a greenfield mining development.

Exhibit 7 Australian seaborne metallurgical coal cost curve, 2012

A\$ per product tonne; C1 cash costs (2016 dollars)^{1,2,3}



Source: Wood Mackenzie Australian seaborne metallurgical C1 cash cost curve (2012) – sourced from: Whitehaven Coal, “A Leading Independent Australian Coal Producer – Presentation to Bank of America Merrill Lynch 2012 Global Metals, Mining and Steel Conference”, (2012)

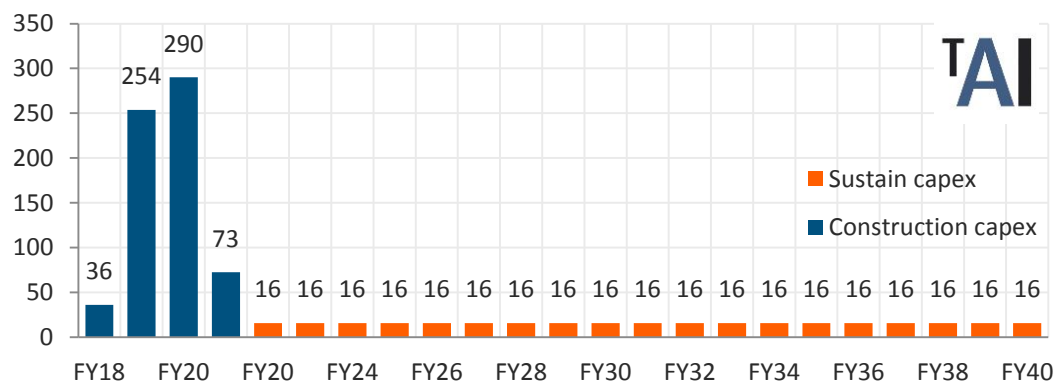
Notes: 1) C1 cash costs include mining, coal preparation, transport, port and overhead costs. It does not include royalties and levies. 2) Converted to A\$ using A\$/US\$ 1.04 exchange rate as cited by Whitehaven Coal. 3) Converted to 2016 dollars using 2.5% p.a. escalation; 4) Hard Coking Coal (Premium Low Vol) FOB Australia April (CME Group, 2016), converted to A\$ at spot A\$/US\$ exchange rate 0.77

Capital costs

Hume Coal estimates that initial construction, including the Mine Infrastructure Area (MIA), the Coal Handling and Processing Plant (CHPP), and initial development of the mine, to cost A\$720 million over a three-year period^{20,21}. Ongoing capital costs for equipment and infrastructure replacements are estimated to cost a further A\$300 million over the life of the project²² (Exhibit 8).

Exhibit 8 Capital costs

A\$ Millions, 2016 dollars



Source: EMGA Mitchell McLennan, “Hume Coal Project – Preliminary Environmental Assessment”, p.17, (2014); Profile assumed by TAI

The present value of capital costs in Exhibit 7 is \$626 million at a 7 percent discount rate.

It is worth noting that construction cost estimates published in the Hume Coal PEA in 2014 were dramatically reduced from that included in the pre-feasibility study

²⁰ The Australian Mining Review, “Australia’s First Low Impact Coal Mine”, (2015)

²¹ The Hume Coal PEA gives a construction capex figure of only A\$682m, but states that the associated rail infrastructure (the ‘Berrima Rail Project’) will be treated in a separate development application - It is assumed that the difference between the A\$720m figure previously quoted by Hume Coal represents the full amount.

²² EMGA Mitchell McLennan, “Hume Coal Project - Preliminary Environmental Assessment”, p.17, (2014)

completed in March 2013. The pre-feasibility study estimated that construction could cost as much as A\$1,357m, with a best estimate of A\$1,044 in 2012 dollars, 45% more than Hume Coal’s latest estimates (and those used in this report). Without access to the pre-feasibility study it is difficult to comment on exactly how much of this decrease is warranted, but it should be noted that the figures used in this report are likely to be a ‘best-case’ scenario, rather than a P50 estimate.

GLOBAL FINANCIAL NET BENEFITS

At this point it is important to consider the implications of the preceding sections. The operating and capital costs of the project are greater than its revenues in both undiscounted and present value terms. Even before consideration of external costs, which are potentially large, the project has negative net financial benefits at a global level, summarised in Table 4 below:

Table 4: Financial net benefits

Item	Undiscounted (A\$,000)	Present value (A\$,000, r=7%)
Revenue	4,440,995	1,709,936
Capital cost	949,900	625,648
Operating cost	3,859,726	1,497,268
Global net financial benefits	-368,631	-412,980

Under the above assumptions the project has negative value of A\$368 million in undiscounted terms and A\$412 million in present value terms. The larger negative present value reflects that many costs are early in the project, while what profit it makes is far in the future.

Readers interested in the development of the Draft Worksheet should note that the worksheet does not have a comparable table or summary figure. The net direct economic cost calculation in the CBA tab (G150 in CBA tab) includes “Local contributions”. This is incorrect from a global CBA perspective as the contribution payments represent a transfer from the proponent to the local community. The cost to the proponent is netted out by the benefit to the community, see Table 5 below:

Table 5: Draft worksheet global direct costs (undiscounted)

A. Direct economic costs – Global

		Total
1	OPEX	AU\$ ('000) 3,859,726
2	CAPEX	AU\$ ('000) 949,900
3	Decommissioning costs	AU\$ ('000) –
4	Environmental mitigation costs	AU\$ ('000) –
5	Transport management costs	AU\$ ('000) –
6	Rehabilitation costs	AU\$ ('000) –
7	Purchase cost of land	AU\$ ('000) 2,377
8	Local contributions	AU\$ ('000) 11,250
Total direct economic costs – Global		AU\$ ('000) 4,823,252

GLOBAL EXTERNAL COSTS

A global CBA includes costs and benefits to whomever they accrue, not just to overseas interests. The following costs are largely borne by the NSW community and are important to include as part of both global and NSW-level CBA.

Groundwater

The most contentious issue of the proposed Hume Coal project is the impact it could have on groundwater. There are two primary economic costs associated with depleting groundwater: firstly, the opportunity cost of water consumed or otherwise diverted by the mine which cannot be used elsewhere, and secondly, the drop in groundwater depth requires existing water users to incur expenses to increase the depths of their bores.

By consuming or diverting limited water supplies, there is less water for other users. The opportunity cost in this case would be the lost agricultural output and the loss of other uses of groundwater, such as by gardens linked to the local tourism industry and by an equestrian facility close to the mine site.

When groundwater depths are lower, existing water users will have to incur expense deepening their bores. The cost in this case is the expenses incurred by drilling deeper bores, as well as any other environmental cost associated with significantly lowering

the groundwater depth. Several groundwater users express the opinion that this may not be possible even at considerable expense.

Opportunity cost of water consumed or diverted

Mining underground creates a void in the earth, which surrounding groundwater will naturally flow into. According to the EMGA Mitchell McLennan, “Hume Coal Project – Preliminary Environmental Assessment”, (PEA), this inflow will be pumped to a 6 mega-litre (ML) underground sump, after which it may be pumped to the surface to for treatment and subsequent re-use, reinjection, supply to others or release into local creeks and estuaries²³.

Groundwater, like surface water, naturally has water flowing into the system, and all other things being equal, if the water being drawn from the system is less than or equal to that flowing into the system, then the system will not deplete.

There are currently 16.3 Giga-litres (GL) of water licences issued to the Nepean district, which the proposed Hume Coal project falls completely within. This region is said to be fully allocated²⁴, meaning that no more water licences are expected to be issued and, if they were, the aquifer would begin to reduce.

To determine how much water will be consumed by the Hume Coal project over its life, a three dimensional engineering model must be developed, which calculates annual inflow rates as the size and shape of the mine progresses.

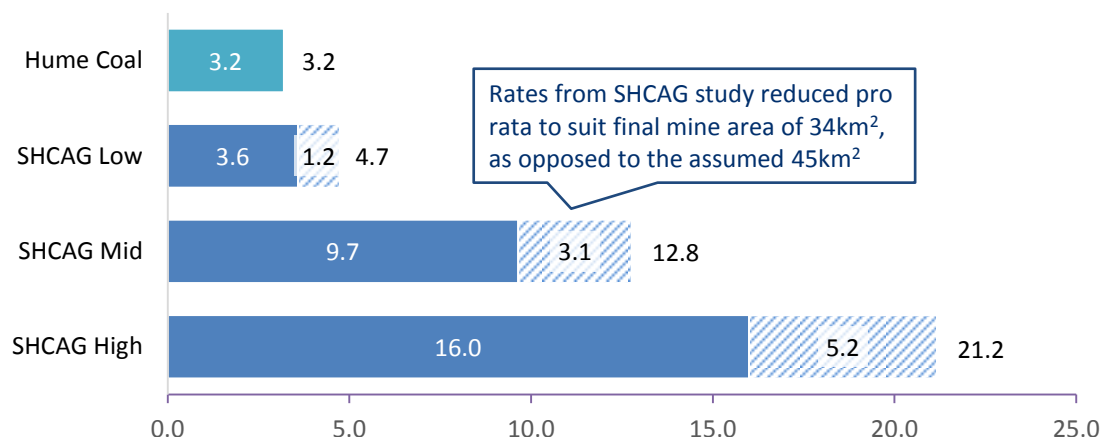
The Southern Highlands Coal Action Group (SHCAG) commissioned a groundwater study by Pells Consulting in 2014. The central inflow estimate was for a peak of 13GL per annum, but high and low scenario modelling revealed a range of between 5 and 21GL per annum²⁴. Hume Coal have developed their own numerical model which estimates a peak of 3.2GL per annum would be drained from local aquifers as a result of the project.

²³ EMGA Mitchell McLennan, “Hume Coal Project - Preliminary Environmental Assessment”, p.34, (2014)

²⁴ Pells, P., Pells, S. “Groundwater Study: Background and Synopsis”, p.13, (Pells Consulting, 2014)

Exhibit 9 Water inflow rates

GL per annum



Source: EMGA Mitchell Mclennan, "Hume Coal Project – Preliminary Environmental Assessment", p.28, (2014); Pells, P., Pells, S. "Groundwater Study: Background and Synopsis", p.9, (Pells Consulting, 2014); TAI analysis

The SHCAG study was commissioned before the Hume Coal PEA was released, and in the absence of any other mine plan information from Hume Coal, it was based on an assumed mining area of 45 square kilometres. The now published Hume Coal PEA states that the mine area will in fact only cover an area of 34km², and so the raw inflow rates in the SHCAG study have been reduced proportionally in Exhibit 8 to reflect the new mine area^{25,26}.

Even after this adjustment, the central estimate from the SHCAG study is three times that of Hume Coal's own assessment. There is certainly a margin of error in conducting these studies, and inputs such as the assumed permeability of the earth can have an order of magnitude impact on the results of the model²⁷. That said, since Hume Coal's own water inflow assessment is very similar to the 'best case' scenario from the SHCAG study, it may be the case that the proponents have run their model on best case assumptions, rather than a true central estimate.

While the merits of the results of varying engineering studies can be debated, the neighbouring Berrima Colliery provides a real world example of what potential impacts may occur. This underground mine is adjacent to, and shares similar geology as Hume Coal, but produced only one fifteenth of the annual coal that Hume Coal is expecting. Even at this comparatively small production rate, the Berrima Colliery drains 3 to 4ML

²⁵ EMGA Mitchell Mclennan, "Hume Coal Project - Preliminary Environmental Assessment", p. 1, (2014)

²⁶ This is an approximation only. A new groundwater study has been commissioned, but the results of which won't be available until after this report is published.

²⁷ Per phone call with Steven and Phillip Pells of Pells Consulting, authors of the groundwater study

per day of groundwater, or about 1.3 GL per year²⁸. Multiplied by 15 as an approximation for what the Hume Coal project might cause, this works out to almost 19GL per annum, 4GL more than even the worst case SHCAG scenario. Simply scaling the inflow rates by production volumes is obviously a gross approximation but, at an order of magnitude level, it supports the SHCAG study rather than the Hume Coal estimate.

Cost of lowering the groundwater depth

In addition to the cost of consuming water, there are also costs associated with lowering the groundwater depth. By effectively creating a drain in the middle of the aquifer, the depth of the surrounding groundwater will decrease until it matches the depth of the drainage point, in much the same way drilling a hole in a bucket would. Hume Coal have stated that the cost associated with deepening the bores of existing water licence holders, or other compensatory arrangements, will be paid for by the company²⁹.

The Hume Coal PEA states that groundwater levels will be restored to within 2m of their pre-mining levels after the conclusion of mining³⁰, but does not provide any estimates of what the impact would be during operations. The SHCAG groundwater study, however, finds that water table draw down of 120m would likely occur in large parts of the 180 square kilometre model area (only 34km² of which are occupied by the mining area)³¹.

In addition to the cost of simply gaining access to the deeper water, there may be serious environmental consequences associated with lowering the groundwater level. One of these is discussed in the 'Biodiversity impact' section, but there are likely other impacts that will not reveal themselves until the damage has been done.

Difficulty in compensating affected properties

Hume Coal is required by the NSW Aquifer Interference Policy to 'make good provisions' where aquifer depths drop by more than 2m, which is defined as ensuring "third parties have access to an equivalent supply of water through enhanced infrastructure or other means, for example deepening an existing bore, funding extra pumping costs or constructing a new pipeline or bore"³².

²⁸ Pells, P., Pells, S. "Groundwater Study: Background and Synopsis", p.12, (Pells Consulting, 2014)

²⁹ EMGA Mitchell McLennan, "Hume Coal Project - Preliminary Environmental Assessment", p.60, (2014)

³⁰ EMGA Mitchell McLennan, "Hume Coal Project - Preliminary Environmental Assessment", p.57, (2014)

³¹ Pells, P., Pells, S. "Groundwater Study: Background and Synopsis", p.10, (Pells Consulting, 2014)

³² NSW Government Department of Primary Industries, "NSW Aquifer Interference Policy – Fact Sheet 4", p.5, (2013)

‘Deepening an existing bore’ is not likely to be a viable option for properties located above the mining area, since a bore cannot be drilled through the mine void. In these cases, building pipelines from the mine area (or other water source) to each of the affected properties is likely to be necessary. There is a large number of separate properties throughout the affected area, and the cost of connecting each of these properties would be extremely high.

Another option for Hume Coal might be truck water to every affected property. Montrose House and Berry Farm is an example of one such property, which has combined water licences for 130 ML per annum from its own bore holes. To supply this volume of water by tanker would require over 11 return semi-trailer trips per day. Cost aside, the impact of this volume of trucking for just one property will create multiple further externalities, such as accelerated road degradation, increased traffic and accident probability, as well as noise and air quality issues.

The cost of these mitigating measures have not been calculated in this report, but it is likely to be significant. There is also considerable doubt as to whether they can actually be achieved; the volume of water that must be compensated is simply too great. To borrow our trucking example again, to move the 13 GL per annum the Hume Coal project is expected to displace from the water table would require 1,179 semi-trailer water truck return trips every day.

Estimation of groundwater impact cost

The cost of groundwater impacts depends on the amount of water lost from other productive use, discussed above, and also on the value of the groundwater.

Groundwater is traded in the Southern Highlands area, however the market is small, there are not large numbers of trades with observable prices. Landholders interviewed for this report had bought licences for around \$2,000 per megalitre. The same value has been used in proponent-commissioned assessments of coal mines throughout NSW³³.

While licences of several megalitres may be purchased at this price, it is unlikely that volumes of at least 3GL could be obtained at this price, if at all. As discussed above, the relevant groundwater resources are fully allocated at 16.3GL. Even at Hume’s estimated inflow rate of 3 GL this represents 20 percent of the total allocation. SHCAG’s upper estimate of inflow is greater than the total sustainable allocation of groundwater.

³³ See for example, Gillespie Economics (2012) *Cobbora Coal Project Economic Assessment*; Gillespie Economics (2012) *Watermark Coal Project Economic Impact Assessment*; Gillespie Economics (2012) *Drayton South Coal Project Economic Impact Assessment*.

With such large portions of the groundwater allocation in question, even if obtaining the licenses were possible, prices are unlikely to represent the marginal change in present value of earnings from a megalitre of water. Many landholders interviewed for this report claim to have invested millions of dollars into infrastructure, land improvement, crops, trees and other forms of property improvement based on their ability to access groundwater at reasonable prices. The value of such a large change in groundwater use would need to reflect these large investments. Given the value of properties and businesses involved, the potential value is likely to be in the hundreds of millions of dollars.

In Table 6 below, we apply the \$2,000 per ML to the above inflow estimates. In addition we apply values of two and three times amount to reflect the likely increase in price of such a large increase in demand. At the higher levels of inflow even this represents a likely underestimate:

Table 6 Groundwater cost estimates at various inflow and water values, present value

	\$2000/ML	\$4000/ML	\$6000/ML
Hume coal (3.2GL)	11	21	32
SHCAG mid (9.7GL)	65	131	196
SHCAG high (16.0GL)	108	216	235

Source: TAI interviews, PEA, Pell Consulting and TAI calculations

Note that the values in Table 6 are present values based on a 7% discount rate and that level of inflow assumed increases linearly through the project life to reach the inflow estimates in Exhibit 8 in the final year of the project. The wide range of estimates in Table 6 reflects the uncertainty around both groundwater impacts and the value of removing or reallocating such large portions of the local groundwater allocation. Given this uncertainty a range of values are used in sensitivity testing.

Surface water

While the impact of the proposed Hume Coal project will be most pronounced on groundwater systems, the project is also located in a particularly sensitive area from a surface water perspective. There are several creeks and tributaries which run directly through the mining area, all of which feed into the Wingecarribee River, located approximately 2km north of the project area. The Wingecarribee River in turn forms part of the Warragamba Dam catchment, which supplies water to Sydney³⁴.

³⁴ EMGA Mitchell McLennan, "Hume Coal Project - Preliminary Environmental Assessment", p.60, (2014)

Hume Coal has already identified a number of areas where it is likely to have an impact on surface water³⁵:

1. Reducing stream baseflows by depleting groundwater, or changing surface and groundwater connectivity
2. Negatively impacting catchment and drainage through the construction of surface infrastructure, particularly for Oldbury Creek and Medway Rivulet
3. Water quality degradation during construction and operations from surface infrastructure
4. Erosion, contamination or other negative impacts on the receiving environment as a result of the discharge of treated water to nearby watercourses, or through the supply of water to others

These points all represent serious risks to the local water environment, but it is the last point which warrants further discussion and analysis. Hume Coal assert that, where possible, mine water recovered from underground workings will be recycled and reused on site for dust suppression, coal washing, belt cleaning, vehicle wash down, amenities, and fire protection systems³⁶.

While mining can be water intensive, the volume of water flowing into Hume Coal's mine will be orders of magnitude greater than it can ever use for the above purposes. By way of illustration, the Tasman Extension Project EIS estimates it will require 90kL/day for underground operations, 30kL/day for dust suppression, 3.5kL per day for wheel wash and 15kL / day for potable water, which is a total of 50 ML per year³⁷. If the Hume Coal project uses 3 times this much (Hume Coal will operate at 3.4 ROM Mtpa versus Tasman's 1.5 Mtpa), then this still only amounts to 150 ML per year. Using Hume Coal's own conservative mine water inflow assessment of 3.2GL per year, this represents only 4.7% of the water Hume Coal must manage, and using the SHCAG central estimate of 9.7GL per year (Exhibit 8), it is only 1.5%.

Hume Coal acknowledge that they will have to manage excess water, stating it will be:

1. Returned to mined-out-voids
2. Returned to the overlying groundwater system
3. Supplied to others; or
4. Released to nearby watercourses under licence

³⁵ EMGA Mitchell McLennan, "Hume Coal Project - Preliminary Environmental Assessment", p.63, (2014)

³⁶ EMGA Mitchell McLennan, "Hume Coal Project - Preliminary Environmental Assessment", p.16, p.34, (2014)

³⁷ Donaldson Coal, "Tasman Extension Project Environmental Impact Statement - Appendix C - Surface Water Assessment", p. 62, (2012)

Returning water to mined-out-voids is not an attractive option from a safety perspective. In 1996, four miners were killed in the Gretley Colliery near Newcastle, when water burst through the mine face from a void left by the long abandoned Young Wallsend Colliery, which over time had filled with water. Mining near water filled voids represents a considerable risk which cannot be fully mitigated (human error was the culprit in the Gretley Colliery case), and it is concerning that this is one of the leading solutions to Hume Coal's water woes.

Returning water to the overlying groundwater system only delays the water management issue, since most of this water will make its way back into the mine void in a relatively short amount of time.

Supplying water to others is challenging for the reasons already outlined, and therefore releasing water into nearby watercourses is, at least from Hume Coal's perspective, the most practical course of action. This would, however, place a significant risk on the local environment, and a potential contamination risk to Sydney's drinking water supplies.

An economic value has not been placed on the cost of Hume Coal's impact on surface water, partly because the engineering studies have not yet been completed, but also because the risk of impact is difficult to assess and there is a risk of double counting groundwater impacts.

If impacts are limited to depleting a number of dams and creeks, costs may be small. However, there is a risk of contamination of drinking water, which would bring large costs. A 2012 study into the Clarence Colliery near Lithgow, which discharges waste water into the Wollangambe River, found that pollution caused by the mine decreased macroinvertebrate family richness by 65% and abundance by 90%³⁸. Valuing the magnitude and probability of this kind of environmental destruction is difficult, so these risks will instead be noted qualitatively.

Opportunity cost of land

The land earmarked for the Hume Coal project area is currently utilised for a mix of agricultural and residential purposes. Although Hume Coal has already spent approximately \$50m acquiring 1,760 hectares of land within and adjacent to the proposed mining area^{39,40}, only 115 hectares of the total 3,400 hectare mining area will

³⁸ Belmer et.al., "Impact of a coal mine waste discharge on water quality and aquatic ecosystems in the Blue Mountains World Heritage area", (Proceedings of the 7th Australian Stream Management Conference, 2014)

³⁹ ABC News, "Plan for Hume Coal mine in NSW Southern Highlands divides local community", (2015),

have its primary use changed from farming to mining⁴¹. Since the mine is an underground operation, the majority of the mining area will continue to be used largely in its present form, with the exception of the disruption caused by drilling and other surface activities, as well the impact caused by changes to underground and surface water conditions (these will be covered in separate sections).

The opportunity cost of land relevant to this CBA is therefore only the 115 hectares, since it cannot continue to be used in its existing economic capacity. The opportunity cost of discontinuing its current use is equal to the present value of the revenues and costs that would have been generated over the life of the project⁴². Assuming property markets are correctly priced, however, land values should already reflect this opportunity cost.

The properties Hume Coal has already acquired provide the most recent indication of land values in the area⁴³. Table 7 lists two of the major acquisitions, and their implied land value per hectare.

Table 7 Property values in Hume Coal mining area

Property	Sale price	Area	Land value
Mereworth retreat	A\$ 11.1 m	500 Ha	A\$ 22,200 / Ha
Evandale property	A\$ 11.6 m	600 Ha	A\$ 19,390 / Ha
Total / average	A\$ 22.7m	1,100 Ha	A\$ 20,667 / Ha

Source: Domain, "Southern Highlands farmers ramp up fight over mine", (2015)

At a value A\$21k per hectare, the opportunity cost of the 115 hectares of land being transferred to exclusive mining use is **\$2.4m**. This is assumed to occur in the first year of the project.

Greenhouse gas emissions

A number of the processes involved with coal mining cause or contribute to the release of greenhouse gases (GHGs) into the atmosphere. The consensus from the global scientific community is that GHG emissions are causing climate change, which if unabated will place a significant cost on the world's citizens.

⁴⁰ EMGA Mitchell McLennan, "Hume Coal Project - Preliminary Environmental Assessment", p.5, (2014)

⁴¹ EMGA Mitchell McLennan, "Hume Coal Project - Preliminary Environmental Assessment", p.17, (2014)

⁴² NSW Government Department of Planning and Environment, "Guidelines for the economic assessment of mining and coal seam gas proposals", p.13, (2015)

⁴³ "Michael Maloney, principal of Richardson & Wrench Bowral, said the sales reflect land-value only", Domain, "Southern Highlands farmers ramp up fight over mine", (2015)

Between July 2012 and June 2014 in Australia, the negative externality caused by the release of greenhouse gases from a range of large businesses and industrial facilities was internalised through the carbon pricing mechanism, at a price beginning at \$23 / t CO₂-e⁴⁴. Although this legislation has since been repealed, and mining companies in Australia are no longer taxed on their emissions, the externality remains and presents a cost to the citizens of NSW and the world.

The largest cause of GHG emissions from coal mining is through fugitive emissions, where carbon dioxide (CO₂) and methane (CH₄) are released into the atmosphere when the seam is mined⁴⁵. In addition, coal mining contributes to GHG emissions through the combustion of diesel in excavation and haulage equipment, the consumption of electricity onsite to power the CHPP and conveyor belts, and through the consumption of diesel by the locomotives used to take the product to port. GHG emissions will also arise from shipping product to foreign markets, and transporting it from port to the end users' facility, but these have not been included here. Ultimately, when the coal is combusted in either a steel smelter or thermal power plant, an enormous amount of GHGs will be emitted but, as is standard practice, these emissions should be counted by the party responsible for combusting the coal, not the entity which extracts it.

Estimating the quantum of GHGs released by the Hume Coal project will be the subject of a detailed engineering study to be released in the project's Environmental Impact Statement (EIS) in late 2016. In the absence of the results of this study, this report has borrowed the findings of the Tasman Extension EIS, which is a 1.5Mtpa underground mine located near the Port of Newcastle.

Emissions from the Tasman EIS have been converted into rates per ROM tonne, or per 100km of rail transport saleable tonnes for rail emissions, and are listed in Table 8 below. These assumptions were then applied to the Hume Coal ROM rates and port distances to give the total GHG emissions listed in the last column.

⁴⁴ Clean Energy Regulator, "About the mechanism", (2015)

⁴⁵ Minerals Council of Australia, "Emissions from Coal Mining", (n.d.)

Table 8 Greenhouse gas emissions assumptions and quantum

Scope	Source	Assumption	Assumption units	Hume total (Mt CO2-e)
Scope 1	Diesel	0.003	t CO2-e / ROM t	0.17
Scope 1	Fugitive Methane	0.014	t CO2-e / ROM t	0.71
Scope 2	Electricity	0.011	t CO2-e / ROM t	0.58
Scope 3	Diesel	0.000	t CO2-e / ROM t	0.01
Scope 3	Electricity	0.002	t CO2-e / ROM t	0.13
Scope 3	Bloomfield CHPP	0.001	t CO2-e / ROM t	0.05
Scope 3	Rail	0.001	t CO2-e / saleable t x 100 km	0.49
	Total			2.14

Source: Donaldson Coal, "Tasman Extension Project Environmental Impact Statement – Appendix J – Air Quality and Greenhouse Gas Assessment", p.56, (2012); TAI analysis

Table 8 shows that 2.14 mega tonnes of CO2 equivalent greenhouse gas emissions will be released if the Hume Coal project goes ahead. Under the base case, however, the 115 hectares of land required for exclusive mining use would continue to be used for cattle grazing. Assuming a stocking rate of 11 head per hectare, the Beef Greenhouse Accounting Framework Northern (B-GAFN) developed by the University of Melbourne⁴⁶ estimates that 1,502 t CO2-e would be emitted annually. Over the 25-year period for which grazing would not occur in this area, this sums to 0.04 Mt CO2-e (Hume State that normal activities will continue for the remainder of the mining area). The net emissions caused by the Hume Coal project is therefore slightly less at 2.10 Mt CO2-e.

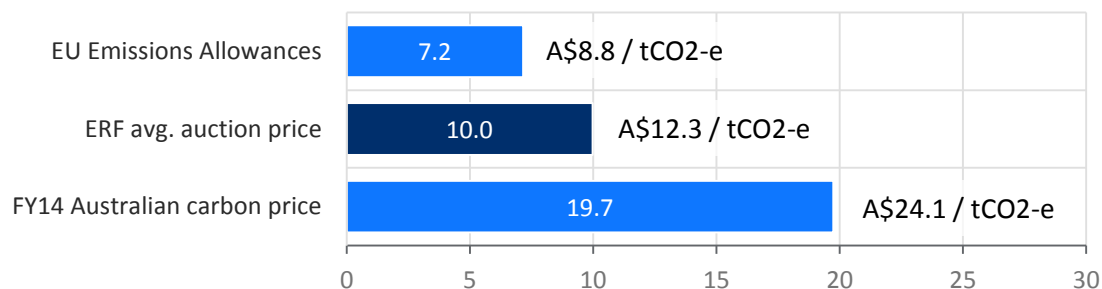
Expressing these 2.10 mega tonnes of GHG emissions as an economic cost to the project requires a price to be placed on the damage done by each tonne of CO2-e. Estimating the exact cost of this externality is the subject of much international debate, and so a pragmatic approach has been taken here to use the A\$12.25 / t CO2-e average price per tonne of abatement achieved in the November 2015 Emissions Reduction Fund auction⁴⁷.

⁴⁶ Eckard, R., Hegarty, R., Thomas, G., "Beef Greenhouse Accounting Framework Northern (B-GAFN)", (The University of Melbourne, 2008)

⁴⁷ Clean Energy Regulator, "Auction – November 2015", (2016)

Exhibit 10 Cost of greenhouse gas emissions under various prices

A\$ millions (Present Value)



Source: Clean Energy Regulator, "Auction – November 2015", (2016); eeX, "European Emission Allowances – Global Environmental Exchange", (2016); TAI analysis

Notes: EU Emissions Allowance price EU5.89 / t CO₂-e; A\$/€ rate 0.67

Exhibit 10 shows the present value of Hume Coal's net GHG emissions to be A\$10m. Sensitivity testing using the former Australian carbon price of A\$24.15 per tonne doubles this cost to A\$20m, whereas using the EU Emissions Allowance price yields a slightly lower result of A\$7.2m.

Air quality and noise impacts

As an underground mine, Hume Coal's impact on local air quality will be less significant than the open cut coal mines typical of the Hunter Valley. That said, two primary dust-generating activities will still occur, namely⁴⁸:

1. Vehicle movements on unpaved above ground surface area during construction
2. Processing, storage, handling and transporting coal and rejects

Hume Coal is commissioning air quality and noise assessments as part of the EIS, and without further detail it is difficult to determine which properties would be affected, and by how much. The primary sources of noise and dust will be from the operation of above ground equipment, such as vehicles, the CHPP, conveyor belts, load out facilities, and locomotives.

The most common method for quantifying the impact of reductions in air quality is by counting the value of any affected properties. Several landowners and businesses interviewed for this report expressed concern that noise and dust could affect them, particularly as the proposal is close to the town of Berrima. A local real estate agent interviewed for this report said that the location of project was "the first question buyers in Sutton Forest/Berrima area are asking when inquiring about property in the

⁴⁸ EMGA Mitchell McLennan, "Hume Coal Project - Preliminary Environmental Assessment", p.71, (2014)

area.” He was particularly concerned as he believed that winds blow south-west in the winter, from mine entrance site towards expensive residential areas.

There is no doubt that the uncertainty around the project is currently affecting property values. However, without detailed assessment of dust and noise impacts and without more certainty around groundwater impacts, these costs are difficult to quantify without double counting. These issues are not quantified in the CBA, but are discussed further in the LEA.

Heritage impact

The region surrounding the Hume Coal project is home to some of Australia’s oldest and most historically important buildings. In many cases, historically important buildings in the towns of Berrima, Sutton Forest and Exeter are being maintained by the businesses that occupy them. If these businesses lost revenue or went out of business, the landlords would not be able to pay the expensive upkeep.

A prime example of this is Eschalot, a hatted restaurant located in central Berrima, a town considered to be the best preserved Georgian town on the Australian mainland⁴⁹. The main setting of the restaurant is in a beautiful house constructed in the mid-1800s, but it also caters functions in a former brothel of the same era located across the street. Despite running on thin margins, Eschalot has funded the meticulous restoration and preservation of the buildings it occupies in partnership with the landlord, as it sees this as critical to its future success.

The proprietor estimates that 50% of its customers are drawn from out of town, mainly Sydney and Wollongong, and is acutely aware of the impact a coal mine in the area would have on tourism numbers. Without out-of-town customers, there is simply no way a business could afford the upkeep required to maintain these historic buildings.

Another example of heritage buildings being maintained by a local business is found at Bendooley Estate. Just over 8 years ago, the historic farmhouse was relatively run down. The owners wanted to restore and maintain the buildings and gardens, but could not afford the hundreds of thousands of dollars required annually without commercialising the property. Bendooley Estate now hosts a restaurant and wedding business, which has paid for the full restoration of the farmhouse, and the restoration and maintenance of heritage gardens.

⁴⁹ Weekendnotes.com, “Ten best country towns for day trips near Sydney”, (2015)

Beendooley Estate's wedding business, however, is heavily dependent on water to keep its gardens at a standard high enough to attract couples from all over the state. Any changes to its ability to access water, or the gardens ability to retain it, would have serious negative impacts on the business, and ultimately on the maintenance of the co-located heritage buildings.

Similarly, the Montrose House and Berry Farm has heritage listed buildings and gardens, essential for attracting weddings and other events. If groundwater resources were affected, the owners say this would impact the viability of their business and their ability to maintain the heritage listed aspects of their property.

While the Hume Coal project deliberately avoids mining directly under any heritage listed properties, the project could still impact many of the historic and heritage listed properties in the area. A value has not been placed on the potential impact, but will be considered qualitatively against the net benefits of the project.

Visual amenity

Most of Hume Coal's activities will be conducted deep underground, so the visual impact is largely minimised. Hume Coal acknowledges that the surface infrastructure area is likely to be visible from several adjacent areas such as Medway Road⁵⁰.

Transport impact

Road impact

The major roads and motorways within and around the Hume Coal mining area currently generally operate well with little congestion⁵¹. The proposed mine will require no changes to existing roads, except for minor modifications to the site access intersection.

Hume Coal is expecting 400 workers to be employed by the mine during construction, with an operational workforce of 300 thereafter. During shift changes, this is likely to add congestion to a number of local roads but, in the absence of a comprehensive road traffic study, it is difficult to value this cost.

Rail impact

Scheduling the trains which transport product coal from the rail load out to Port Kembla and back again represents a significant challenge for Hume Coal. Accessing the

⁵⁰ EMGA Mitchell McLennan, "Hume Coal Project - Preliminary Environmental Assessment", p.82, (2014)

⁵¹ EMGA Mitchell McLennan, "Hume Coal Project - Preliminary Environmental Assessment", p.75, (2014)

Unanderra line from the Moss Vale siding requires locomotives to cross the Main Southern Line in both directions, which often results in extensive delays.

Furthermore, the Illawarra line, which will carry the train the remainder of the way to port, has a three-hour ban on freight movement in the morning and afternoon peak periods in order to prioritise commuter trains⁵². Details of 'The Berrima Rail Project' have not been publically released and so, depending on the scale of works proposed, some of these issues may be avoided, but likely at significant additional cost to either Hume Coal or to different levels of government.

At peak operation, Hume Coal plan to ship 3 million tonnes of coal per year⁵³, which would require two to three 3.3kT capacity trains making return trips to Port Kembla Coal Terminal (PKCT) each day^{54,55}. While Hume Coal claim that spare rail and port capacity exists, it will present a significant scheduling challenge.

In addition to the challenges faced by Hume Coal, the additional rail traffic will pose a risk of delaying other commuter and freight movements, cause increased noise and disturbance to residents living near the rail line, and cause further road delays at every private and public level crossing on the 80km route to PKCT. These impacts will once again not be quantitatively valued in this report, but noted along with other unquantified costs to be weighed against the net benefit of the project.

Biodiversity impact

A significant portion of the proposed Hume Coal project area will mine beneath native forests and other ecosystems, including the Belanglo State Forrest on the western side of the lease.

The primary impact the project will have on biodiversity is through the effective draining of the groundwater system, and any impact that causes on surface water. In a number of sites throughout the project area, the groundwater depth is less than 10m, which is shallow enough to intersect with and potentially be relied upon by the overlying vegetation.

Hume Coal has already identified six native vegetation types which exist in areas where groundwater depths are less than 10m, and in one of these areas exists the endangered Paddy's River Box population. In addition to potential damage to

⁵² Independent research by Alan Lindsay

⁵³ EMGA Mitchell McLennan, "Hume Coal Project - Preliminary Environmental Assessment", p.15, (2014)

⁵⁴ Assuming train capacity is 3,300 tonnes

⁵⁵ Port Kembla Coal Terminal, "About", (n.d.)

endangered flora, there are a number of threatened fauna species which inhabit or utilise the vegetation as a resource where the groundwater depth is less than 10m. Species include the Glossy Black Cockatoo, Koala, Large-eared Pied Bat and Southern Myotis⁵⁶.

Hume Coal state that "...vegetation within and directly surrounding the project area is considered to be mainly dependent on rainfall", although it is uncertain where this assessment comes from. Given the evidence presented in the Groundwater section, it is almost certain that groundwater will be drained in these areas, which therefore poses a considerable risk to the overlying flora and fauna.

As with heritage impacts noted above, the Hume Coal Project could influence the financial viability of some properties and in turn the owners' ability to maintain ecological values. Several landholders contribute to the restoration and protection of native vegetation communities on their properties, particularly areas of Southern Highlands shale woodlands. These woodlands are listed as endangered ecological communities with the NSW Office of Environment and Heritage.⁵⁷ Landholders emphasise that if the financial viability of their properties were affected through groundwater impacts, their ability to continue with these conservation efforts would be reduced.

The risk placed on aquatic ecology from the release of waste water into local waterways, mentioned in the 'Surface water' section, should also be noted here. The cost of these biodiversity risks will be weighed qualitatively against the net benefits of the project.

Loss of surplus to other industries

There are many industries and businesses within and around the Hume Coal mining area which are already being negatively impacted by just the prospect of a mine operating in the area.

The cause of the losses to these industries come from several negative externalities the Hume Coal proposal will generate, the most prominent of which are:

1. Changes to groundwater and surface water conditions
2. Soil compacting, noise, and disturbance caused by drilling

⁵⁶ EMGA Mitchell McLennan, "Hume Coal Project - Preliminary Environmental Assessment", p.68, (2014)

⁵⁷

<http://www.environment.nsw.gov.au/determinations/SouthernHighlandsShaleWoodlandsSydneyEndComListing.htm>

3. Damage to Southern Highlands' brand as a tourism destination
4. Damage to Southern Highlands' brand as a residential destination

These externalities manifest as losses to existing industries and businesses in different ways, as shown in **Table 9**.

Table 9 Impact of Hume Coal project on existing industries

Externality	Affected industries	Method of impact
1. Changes to ground and surface water	Agriculture, agri-tourism, wedding industry	<ul style="list-style-type: none"> - Gardens at wedding destinations cannot be maintained to the standard required to attract couples without considerable water - Reduction in output of traditional farms and agri-tourism businesses
2. Soil compacting, noise, and disturbance caused by drilling	Equestrian centres, stud farms	<ul style="list-style-type: none"> - Compacting of soil on show jumping and cross country courses by drilling trucks make it impossible to continue to provide world-class facilities - Disturbance caused to studs by drilling trucks would disrupt breeding
3. Damage to S.H. brand as a tourism destination	Hospitality and tourism, wedding industry, construction industry	<ul style="list-style-type: none"> - Reduced tourist numbers and wedding demand as perception of the region changes from 'quaint historic getaway' to 'polluted coal mining town' - Reduced investment in business expansion and associated construction as a result of lower volumes
4. Damage to S.H. brand as a residential destination	Construction industry	<ul style="list-style-type: none"> - Delayed and abandoned residential construction and renovation plans as a result of future uncertainty

Source: TAI interviews

Cost–benefit analysis can sometimes lead to double counting of benefits or costs. In this case, the cost of removing water from the local area has already been valued in the Groundwater section, so counting it again here as a loss to existing industry is not appropriate. It is however, useful to see how the impact of these externalities is felt by local industry, and that, considering the likely loss of surplus to these industries, the value estimated previously is probably conservative.

The other three externalities listed in **Table 9** have not been included elsewhere, so including them here is appropriate. At this stage, not enough is known about the effects of items 2 and 3 to make an accurate assessment of their impact, but anecdotal evidence can help us estimate the cost of item 4.

In interviews with various landowners, it became apparent that there could be up to 10 local properties which are delaying residential construction as a result of future uncertainty caused by Hume Coal. These construction projects would only go ahead in the absence of a mining operation, and therefore Hume Coal is causing a loss to the residential construction industry. This will be further discussed in the LEA, but has not been quantified in the CBA.

Aboriginal heritage

There are a number Aboriginal heritage sites in the project site identified in the PES, including grinding grooves, rock shelters and open artefact sites. It is unlikely these will be directly affected by the project, unless as subsidence problems arise⁵⁸.

Indirectly, the project may have more significant impacts. A number of landholders interviewed for this report say that their land also contains sites important to Aboriginal heritage. They say that they incur expense in assisting with the conservation of these sites. If the Hume Coal Project went ahead and impacted groundwater resources, the viability of their operations and these conservation efforts would be affected.

The cost of the impact the Hume Coal project will have on Aboriginal heritage has not been quantified, but is mentioned qualitatively as a potential impact of the project.

Net public infrastructure cost

As discussed above, the project would have some impact on road and rail transport.

Without more information on the proposed 'Berrima Rail Project', it is difficult to assess what infrastructure may be necessary and which party would pay for them. Upgrades to signalling equipment, level crossings, and pedestrian overpasses may be required. There is currently a proposal with council to build an overpass over a section of rail line that would benefit Hume Coal.

This report has not included any public infrastructure costs, but if new infrastructure is required it would add to the cost of the project.

⁵⁸ EMGA Mitchell McLennan, "Hume Coal Project - Preliminary Environmental Assessment", p.78, (2014)

GLOBAL NET BENEFITS

Quantified benefits and costs

The main output of any CBA is net present value (NPV), the calculation of the present value of all benefits less the present value of all costs. The costs and benefits identified at a global level are summarised in the table below based on the Department's draft worksheet:

Table 10: Global CBA results summary

Net benefit – Global CBA

Net benefit of project

Benefit		NPV total
Net direct economic benefit	AU\$ ('000)	1,709,936
Net indirect economic benefit	AU\$ ('000)	–
Total net economic benefit	AU\$ ('000)	1,709,936
Cost		
Net direct economic cost	AU\$ ('000)	2,125,293
Net indirect economic cost	AU\$ ('000)	140,524
Total net economic cost	AU\$ ('000)	2,265,817
NPV of project		AU\$ ('000) -555,881.67
BCR (benefit cost ratio)		0.75

Table 8 shows that the costs of the Hume Coal Project far outweigh its benefits. The NPV of the project at a global level is negative \$556 million. Table 9 below is also based on the draft Worksheet, showing some disaggregation of these costs and benefits. As discussed above, the project's direct financial costs outweigh its benefits. Indirect costs relating to environmental impacts further reduce NPV:

Table 11: Global CBA Breakdown of discounted benefits and costs

Direct Benefits		NPV total
1. Gross mining revenue	AU\$ ('000)	1,709,936
2. Residual value of land	AU\$ ('000)	–
3. Residual value of capital	AU\$ ('000)	–
Total direct benefits	AU\$ ('000)	1,709,936

Indirect Benefits		NPV total
1. Net economic benefit to existing landholders	AU\$ ('000)	–
2. Net economic benefit to all workers		–
3. Net economic benefit to all suppliers		–
Total indirect benefits	AU\$ ('000)	–

Direct costs		NPV total
1. OPEX & CAPEX	AU\$ ('000)	2,122,916
2. Decommissioning costs	AU\$ ('000)	–
3. Environmental mitigation costs	AU\$ ('000)	–
4. Transport management costs	AU\$ ('000)	–
5. Rehabilitation costs	AU\$ ('000)	–
6. Opportunity cost of land	AU\$ ('000)	2,377
7. Local contributions	AU\$ ('000)	–
Total direct costs	AU\$ ('000)	2,125,293

Indirect costs		NPV total
1. Air quality	AU\$ ('000)	–
2. Greenhouse gas emissions	AU\$ ('000)	9,971
3. Visual amenity	AU\$ ('000)	–
4. Transport impact	AU\$ ('000)	–
5. Net public infrastructure cost	AU\$ ('000)	–
6. Groundwater impact	AU\$ ('000)	130,553
7. Biodiversity impact	AU\$ ('000)	–
8. Noise impact	AU\$ ('000)	–
9. Loss of surplus to other industries	AU\$ ('000)	–
Total indirect costs	AU\$ ('000)	140,524

Readers interested in the development of the draft worksheet should note that all indirect economic benefit cells are blank, with a value of zero. There is considerable debate around whether these benefits exist at all, further discussed below. Where there is a case for their inclusion, it must be at a state level and the distributional effects closely described. At a global level, these benefits are merely a transfer between the proponent and these other stakeholders.

For example, where workers are paid a wage premium this represents an added cost to the producer equal to the benefit enjoyed by the worker. As a transfer they may be important for distributional effects, but at a global level they net out. The Draft worksheet should be amended to reflect this.

Transfers between parties in the cost benefit analysis are important to consider when adjusting the scope of the analysis from global to the NSW community. Transfers are also important to consider when calculating producer surplus.

Unquantified benefits and costs

The quantified benefits and costs above outlined above need to be considered alongside all the other costs the project causes, but which have not or could not be ascribed an economic value. Table 12 below provides a summary of the non-valued costs this report has identified.

Table 12 Impacts of the Hume Coal project not included quantitatively in the CBA

Cost	Implication and link to Hume Coal project
Degradation of heritage listed and historically important buildings and properties	<ul style="list-style-type: none"> The project will cause negative impacts on the profitability of a number of existing business, many of which use their revenue to pay for the restoration and upkeep of the heritage or historical buildings they occupy.
Impacts on surface water flows	<ul style="list-style-type: none"> The aquifer beneath the project area will be drained as a result of the mining activities, which may cause further reductions to creek and tributary surface flows where groundwater and surface water interact. The project will receive enormous volumes of groundwater inflows to the mining void, well in excess of the water it could reasonably use on site. Hume Coal will need to discharge a considerable portion of this water into local creeks and streams, and this may have serious impacts on the receiving environment and aquatic biodiversity.

Biodiversity impact	<ul style="list-style-type: none"> • A number of locations within the project area exist where groundwater is less than 10m below the surface, a depth which intersects with the overlying flora. • With the effective draining of the local aquifer by the project, this may have serious impacts on both the overlying vegetation, as well as the fauna which relies upon that vegetation. • Of particular concern is the endangered Paddy's River Box population, which grows within these shallow groundwater areas.
Loss of surplus to existing industries	<ul style="list-style-type: none"> • A variety of existing industries and local businesses could be negatively impacted by either physical or perceived effects of the Hume Coal project • Some losses to existing industries are already captured through other costed externalities, such as groundwater, but many other businesses or industries will experience sizable losses as a result of externalities not included elsewhere. • These industries include equestrian centres, stud farms, the hospitality and tourism industry, the wedding industry, and the construction industry.
Rail transport impacts	<ul style="list-style-type: none"> • Hume Coal will require 2–3 return train trips per day to transport its product to port at peak production. • This may cause delays to other rail commuters, cause delays for road users at level crossings, and create noise and air quality issues for residents living close to the railway.
Impacts to Aboriginal historical sites	<ul style="list-style-type: none"> • Possible effects from future subsidence. • Possible indirect effect of existing landholders directing fewer resources to conservation.

These impacts may be significant and our reluctance to quantify them should not be considered to reduce their importance for decision making.

PRODUCER SURPLUS

To estimate producer surplus from the global CBA results, several transfers need to be considered between the proponent and other stakeholders.

Royalties

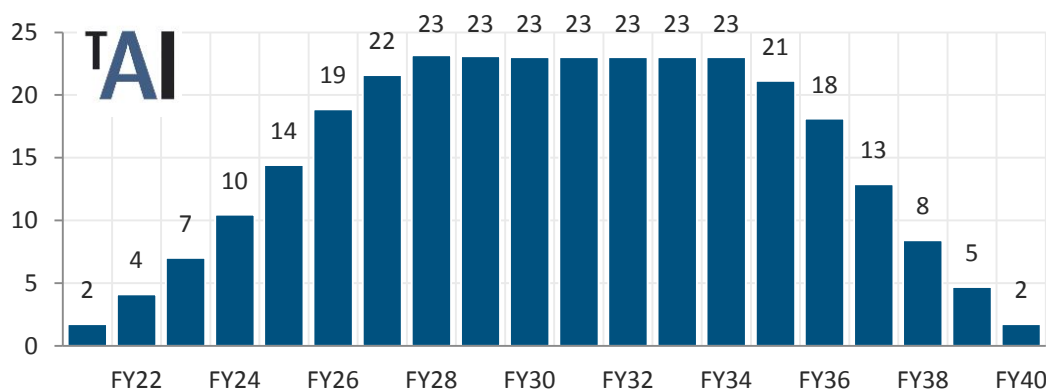
Royalties are the price charge by the state for the transfer of the right to extract and deplete a mineral resource⁵⁹. In NSW, royalties are charged as a percentage of the value of production (*ad valorem*) at a rate of 6.2%, 7.2% and 8.2% for deep underground, underground, and open cut mining respectively. The Hume Coal project will mine coal using underground methods from depths ranging between 70m and 180m⁶⁰, which qualifies it as underground mining (as opposed to deep underground mining) under the NSW legislation.

The royalty of 7.2% is payable on the total value of net disposals, which is the net volume of coal sold (sales less purchases) multiplied by the average sales price, less any allowable deductions⁶¹. The main deduction considered in our analysis is for beneficiation – costs associated with the processing of the coal.

We calculate royalty payments at the same Commonwealth Treasury long-term price discussed above, reduced by a cost of \$4.60 per tonne for beneficiation. No coal levy deductions have been assumed. The resulting royalty payments from Hume Coal to the NSW government and show in in **Exhibit 11** in real 2016 dollars.

Exhibit 11 Royalties paid by Hume Coal to the NSW government

A\$ Millions (2016 dollars)



Source: TAI analysis

This represents of \$118m in present value terms, calculated at a 7 percent discount rate. Undiscounted the total value is \$307 million.

It is important to note that royalty payments will only eventuate if the project goes ahead. The current proposal is unlikely to go ahead in current and forecast economic conditions as its direct economic costs far outweigh direct economic benefits. While

⁵⁹ NSW Department of Resources & Energy, "Paying mining royalties", (2016)

⁶⁰ EMGA Mitchell McLennan, "Hume Coal Project - Preliminary Environmental Assessment", p. 13, (2014)

⁶¹ NSW Department of Resources & Energy, "Monthly-Ad-Valorem-Coal-31122008-.xls", (2009)

this may seem obvious, unviable mines have been approved in NSW with the benefits of royalties cited as part of their benefit to the community. Obvious examples are the Cobbora Coal Project and the Angus Place Extension project.

We include these calculations here for completeness, but they are really a hypothetical exercise – if the proponent is prepared to operate a loss-making project for decades, how much royalty would they pay? It is more likely that if approved the project would not produce, at least not at the scale and timeframe of the current proposal. If the project is to produce saleable coal this would likely occur far into the future, reducing present value royalties below our calculated levels.

Readers interested in the development of the draft worksheets should note that the worksheet does not include consideration of benefaction expense, or other potential deductions from royalty calculations. A line has been added to the Benefits tab by TAI to enable the calculations above.

Company tax

In Australia large companies currently pay 30 percent company tax on taxable income. If the Hume Coal Project produced taxable income and was liable to pay company tax, this would be deducted from net revenues after royalties to estimate the surplus the project would deliver to proponents. This payment would accrue to the Australian federal government and some portion would accrue to the NSW community and be relevant for a NSW level CBA.

However, under the assumptions above the project will not have a positive cash flow until 2024 and would have accumulated losses sufficient to never have to pay company tax.

Readers interested in the development of the draft worksheet should note that the calculations in the CBA tab of Earnings before interest and tax and is flawed for several reasons. Economists can work out operating surplus estimates, but taxable income requires different data and skills. Taxable income is usually much lower, as companies are able to deduct items like depreciation and interest payments as well as losses incurred in other parts of their business.

Furthermore, tax minimisation schemes involving related party transactions are common in the Australian mining industry, particularly with vertically integrated companies such as POSCO, Hume Coal's owner. Companies set up trading hubs in low-tax countries such as Singapore. Sales are made to the Singapore entity at a low price, then the Singapore entity sells to end buyers at a higher price. This ensures minimal profit is made in Australia, so less tax is paid here. The profit is transferred to

Singapore, where it is taxed at a lower rate. The recent Senate inquiry into multinational tax avoidance included evidence of similar practices from mining companies operating in NSW such as BHP and Rio Tinto⁶².

Applying the company tax rate of 30% to operating surplus less royalties is not correct from an economic or accounting perspective and will overstate the value of company tax paid and accruing to NSW. Even if estimates of company tax paid were accurate, this information may be commercially sensitive and companies may object to its disclosure.

The correct approach would be to apply a rate of tax to operating surplus. The amount of company tax paid by the mining industry is available through Australian Tax Office statistics. Estimates of the gross operating surplus of the mining industry are published by the ABS. The rate of company tax paid to operating surplus can be calculated this way and applied to the operating surplus of the project being assessed. The rate of company tax paid on gross operating surplus in the mining industry in 2008–09 was 13.9 per cent⁶³. Applying this rate, or an updated estimate, would result in a more accurate estimate of tax payments accruing to NSW and also protect companies' commercially-sensitive information.

Local contributions

Money donated from the proponent to the local community is another transfer, rather than a net cost or benefit at a global level. Our modelling includes a present value expense of \$11.2 million for Local Contributions, in line with the PEA claim that:

The company is actively supporting local businesses, education facilities and other community initiatives. It currently makes substantial local investment each year, including \$450,000 through its Charitable Foundation to a range of initiatives including education, indigenous programs and not-for-profit preschool providers, as well as its local apprenticeship/traineeship program.⁶⁴

We assume Hume Coal donates \$450,000 each year to the NSW community throughout the life of the project. This donation is relevant to global producer surplus as it is an expense incurred by the proponent. Within CBA however, it is a transfer from the proponent to the NSW community, which nets out at a global level with no net benefit. It is relevant again for CBA for the NSW community.

⁶² <http://www.abc.net.au/news/2015-05-25/tax-man-targets-the-singapore-sling/6495592>

⁶³ Richardson D. and Denniss R. (2011) *Mining the truth: the rhetoric and reality of the mining boom*, Institute paper number 7, The Australia Institute, Canberra

⁶⁴ Preliminary Environmental Assessment, page 84

Readers interested in the development of the draft CBA Worksheet should note that Contributions made to local community (See Costs tab, rows 74 to 78) are incorrectly treated within the worksheet. While they are correctly treated as a cost to the proponent, they are not then counted as a benefit to the NSW community. This leads the global CBA summary to overstate the costs of the project at a global level and to understate direct economic benefits to NSW.

Producer surplus estimate

Based on the production, coal price, operating and capital costs outlined above, the Hume Coal project represents a negative present value of A\$539 million. The Table below is taken from the draft CBA Worksheet:

Table 13: Global producer surplus

Net producer surplus and company income tax

Net producer surplus

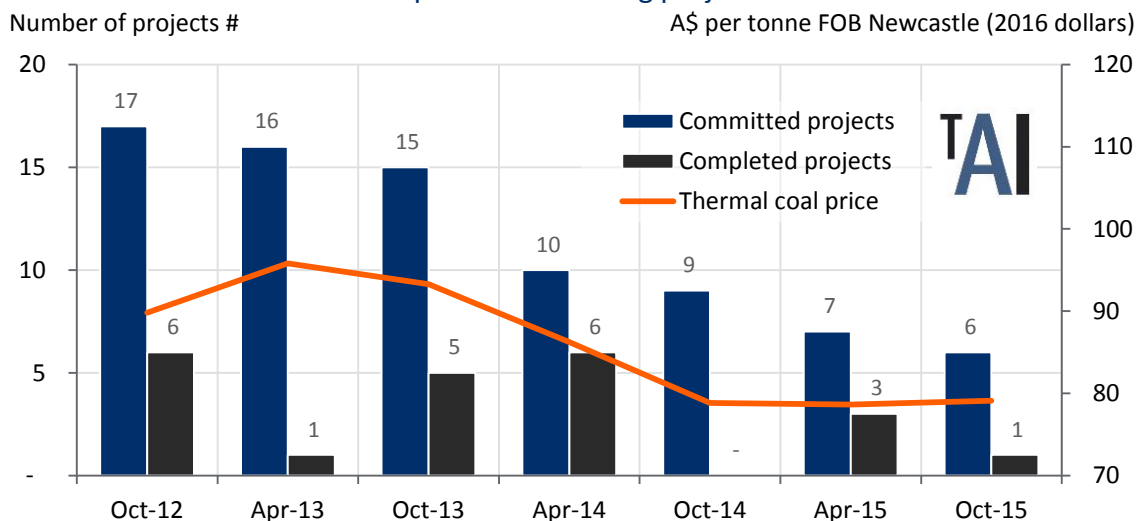
		NPV total
Earnings before interest and tax – Global	AU\$ ('000)	- 538,562
Income tax expense (Australia)	AU\$ ('000)	—
Net profit after tax (net producer surplus) - Global	AU\$ ('000)	- 538,562
Australian share of project ownership	% of total	0%
Net profit after tax (net producer surplus) – Australia	AU\$ ('000)	—
NSW population share of Australian total population	% of total	32%
Total Net producer surplus attributable to NSW	AU\$ ('000)	—

Company income tax

		NPV total
Income tax expense (Australia)	AU\$ ('000)	—
NSW population share of Australian total population	% of total	32%
Company income tax apportioned to NSW	AU\$ ('000)	—

Hume Coal is far from alone in owning an uneconomic coal proposal. Many new coal mining projects are sub-economic, indicated by the declining number of committed projects shown in **Exhibit 12**.

Exhibit 12 Committed and completed coal mining projects in Australia



Source: Australian Government Department of Industry, Innovation and Science, "Resources and Energy Major Projects lists" (2012–2015)

Note: 'Completed' is since last period

While the number of committed projects is falling, the number of projects which are either 'Publically Announced' or at 'Feasibility' stage is relatively steady. In October 2012, committed coal projects represented 22% of total projects, but as of October 2015 they represented just 12%. Mining companies are keeping their options open to develop coal mines in the future if prices recover by progressing through the approval process, but are not in any hurry to actually develop the resource.

Implications of negative producer surplus

The analysis so far demonstrated that, under current economic conditions, there is little likelihood that the operation described in the Hume Coal PEA can create value for its shareholders. While from an economic perspective there is little logic in pursuing the project, there are several reasons why a mine owner would pursue regulatory approval of an extension project which is not profitable under current market conditions. Four reasons stand out:

- The proponent may be willing wait for an increase in coal prices to make the project profitable. Gaining approval does not force the proponent to undertake the project, so once the approval is secured the proponent can wait for better conditions without having to undertake costly investment.

- The approval provides an option to undertake the project. Having the option of immediate commencement makes the mine more valuable and means it could be sold to another company for a higher amount than would otherwise be the case. The option to develop may also be important from a corporate strategic perspective. A vertically integrated steel maker may see advantage in security of supply from a number of different sources, even if the current proposal is uneconomic.
- Not pursuing approval and abandoning the project means all prior expenditure must be written off as a loss. This would have accounting implications as what is currently considered an asset would lose all value.
- There is a perception that once project approval has been given, modifications to project conditions are easier to pursue. Hume may attempt to change the more expensive aspects of the project's planned operations, such as "pine-feather" mining and covered coal wagons, to cheaper methods such as longwall or more traditional bord and pillar mining and uncovered coal wagons.

Importantly, while there may be corporate strategic regions for Hume to pursue this project, none of these bring benefits to NSW. In fact, Hume Coal pays only a fraction of the option's real cost, with the remainder of the burden falling on the residents and existing business owners of the Southern Highlands.

The cost of having the 'black cloud' of a proposed and unknown coal mine hanging over residents and business owners in the Southern Highlands will be discussed in detail in the LEA, but in short, they constitute delayed business investment, delayed residential construction, depressed land values and reduced heritage restoration, as well as significant mental health effects on some landholders opposed to the proposal.

CBA of Hume Coal Project to NSW

Under the 2015 NSW *Guidelines for the economic assessment of mining and coal seam gas proposals*, the main scope of CBA is the NSW community. The global scope discussed in the previous sections raises significant issues for decision makers, but the key focus is the costs and benefits to residents of NSW. Through the elected government and its relevant departments, NSW residents are the ultimate decision makers of how the state's resources should be consumed or protected. Assessment of their economic welfare is therefore most important for decision making.

The implications of the global CBA in the last section are clear – the Hume Coal Project is highly unlikely to go ahead as currently proposed under current and forecast economic conditions. The company appears to be pursuing approval for corporate strategic reasons rather than intending to commence a project that will affect the economic welfare of NSW in the near future.

As a result, calculating the NPV of the project to NSW is a hypothetical exercise. These costs and benefits will only occur if the proponent is prepared to incur sustained financial losses over decades to implement the project. Because this is unlikely, the following estimates of potential costs and benefits to NSW should be considered highly uncertain.

A more likely scenario is that if the project is approved it would remain undeveloped. This would continue to have impacts on the local community and economy. This is further discussed in the LEA.

POTENTIAL BENEFITS TO NSW

Royalties

The NSW *Guidelines for the economic assessment of mining and coal seam gas proposals* lists "Task 1" of CBA for NSW as "estimate royalties payable". As discussed in the Global CBA section above, the project is unlikely to go ahead in its proposed form under current economic conditions. Hypothetically if the proposal did go ahead, we estimate royalties payable at \$118 million in present value terms. More detail on this calculation is in the Producer Surplus section above.

Company tax to NSW

Task 2 in the Guidelines CBA is to estimate the company tax payments that would accrue to NSW. As discussed above, this is usually difficult for economists who lack the skills and information to make a realistic estimate of company tax payments. The draft CBA Workbook is not suitable for this calculations.

In the case of the Hume Coal Project, however, these difficulties are easily overcome. Because the project is highly unlikely to produce any taxable income as currently proposed, this figure can be estimated at zero.

Producer surplus to NSW

The Guidelines list tasks 3–5 of NSW CBA as relating to quantifying producer surplus. For future editions of the Guidelines this should be amended. As discussed in the global CBA section above, it is important to first estimate producer surplus to understand the likelihood and size of any tax, royalties and transfer payments.

Ordinarily for a proposed development the value of the project would at least be positive to the shareholders (even if it was not a positive to the state), however in this case, the producer surplus (loss) represents a cost to the CBA.

Since this project is 100% foreign owned, however, the cost is fully borne by the citizens of South Korea (and foreign shareholders in POSCO), and not the citizens of NSW. The producer surplus (loss) included in this part of the CBA is therefore zero.

Economic benefit to existing landholders

According to the Guidelines:

A mining or coal seam gas proponent may need to purchase land or pay an access fee to an existing landholder(s) to undertake the project's activities. Often these payments to existing landholders exceed the opportunity cost of land. The surplus is an economic benefit to existing landholders.⁶⁵

Affected residents have blockaded a privately owned road and taken legal action to prevent Hume Coal from accessing their land. Clearly, there is no economic surplus to the landholders under the existing arrangements with Hume Coal. On the contrary,

⁶⁵ NSW Government Department of Planning and Environment, "Guidelines for the economic assessment of mining and coal seam gas proposals", p.12–13, (2015).

access arrangements have cost landholders large amounts of time, money and energy⁶⁶. This is further discussed in the LEA.

Several local people including a real estate agent interviewed for this report said that Hume Coal had acquired property for the project at well above market prices. This does represent a benefit for the landholders who secured this deal. However, this is now a sunk cost and no further benefit seems likely. On the contrary, as discussed in the LEA, the project is contributing to lower prices and difficulties selling properties in the area.

Economic benefit to workers

The Hume Coal project is expected to employ a peak workforce 400 full-time-equivalent (FTE) workers during construction, followed by an operational contingent of approximately 300 FTEs for the remainder of the mine life⁶⁷.

The standard approach in most cost benefit analysis is to assume that markets for labour, supplies, etc, are operating efficiently and to assume that project proponents would not pay above the market value for labour, supplies or land. This general assumption is supported by consultants to the coal industry:

BCA involves the comparison of the 'with and without' project circumstances. The use of resources with and without the mine must therefore be considered. Without the mine, the resources to be allocated to the mining operation would be engaged in other uses in the economy. These are the opportunity costs of the proposed mine. Given that markets for these resources (land, machinery, labour etc.) in the Australian economy are relatively competitive and not highly distorted by subsidies and regulations, market prices reflect these resources opportunity costs.⁶⁸

This assumption of prices being equal to opportunity cost is also recommended in other NSW Guidelines to Economic Assessment:

The use of resources (manpower, finance or land) in one particular area will preclude their use in any other. Hence the basis for valuing the resources used is the "opportunity cost" of committing resources; ie the value those resources would have in the most attractive alternative use ...

⁶⁶ <http://www.abc.net.au/news/2016-05-10/southern-highlands-families-win-appeal-against-hume-coal/7402054>

⁶⁷ EMGA Mitchell McLennan, "Hume Coal Project - Preliminary Environmental Assessment", p. 2, (2014)

⁶⁸ Bennett, J. (2011) Maules Creek Coal Project Economic Impact Assessment: A review.

In certain cases, where a resource has a market price, that price may not reflect the marginal social cost of using the resource. Such cases are reasonably rare.⁶⁹

The standard assumption for CBA is that labour is priced at its opportunity cost. In other words, we assume that workers could get another job at similar wages in the absence of this project.

The 2015 *Guidelines for the economic assessment of mining and coal seam gas proposals* take this standard approach as a 'starting assumption':

An appropriate starting assumption should be that workers do not receive a wage premium, even if they will earn more working in the mining sector.⁷⁰

Even though a mine may offer a wage premium to attract workers from other industries, this is often to compensate for greater risk, or worse working conditions, and therefore it doesn't represent a net benefit to workers.

It is debateable how many workers will be new to the mining industry, or receive any premium. During construction Hume Coal has relaxed the geographical restriction and will draw workers from a wider catchment area, suggesting that many will come from other mining projects. The DPE Guidelines correctly state that higher wages in this case are generally compensation for relocating to the Southern Highlands. Recently, the company has also advertised in Goulburn, over 45 minutes away. Realistically, the company is likely to have access to existing mining industry workers who live in the Illawarra and in South West Sydney. The base case assumption in this assessment will therefore be that no incremental benefits accrue to workers as a result of the Hume Coal project.

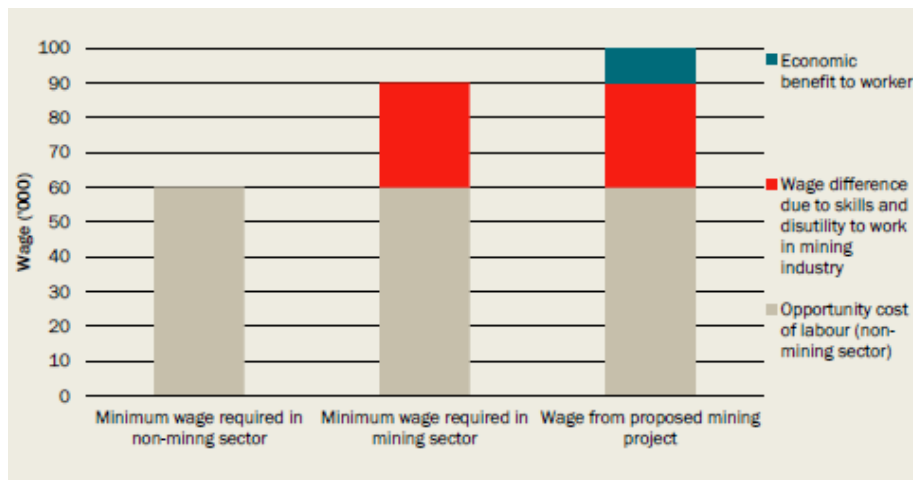
If the project does proceed, it is unlikely that no workers experience any wage premium. Some workers are likely to experience an increase in wages, beyond what is strictly required to compensate them for working in a mine. Unemployment in the Southern Highlands and Shoalhaven region is high at 8.2% of the workforce⁷¹, so some benefit would be likely to occur. The economic benefit to these workers is explained in the chart below, taken from the 2015 Guidelines:

⁶⁹ NSW Treasury (2007) *NSW Government Guidelines for Economic Appraisal*

⁷⁰ NSW Government Department of Planning and Environment, "Guidelines for the economic assessment of mining and coal seam gas proposals", p.13, (2015)

⁷¹ The Australian Government Department of Employment, "New South Wales – Unemployment Rate by Labour Force Region", (2016)

Exhibit 13 Identifying the economic benefit to workers



Source: NSW Government Department of Planning and Environment, “Guidelines for the economic assessment of mining and coal seam gas proposals”, p.14, (2015)

However, against this benefit – shown in blue in Exhibit 12 above, would need to be considered the cost to workers in other Southern Highlands industries. As discussed in the LEA, there are substantial numbers of businesses that are currently delaying investments and employment due to uncertainty around the Hume Coal project.

Treatment of employment benefits in other CBAs

The treatment of worker or employment benefits in recent coal mine CBAs has been inconsistent. To provide some context, and to justify the analysis presented here, a brief commentary of some of these CBAs is given here.

Beginning with the Mount Owen Continuation and the Bulga Optimisation Project, they have both been consistent with the DPE’s current advice by including no employment benefits. They assumed that the labour market was already priced at its opportunity cost, and that their projects would not hire otherwise unemployed workers, or pay above market rates once factoring in risk and relocation costs.

For the Boggabri, Maules Creek, and Watermark coal projects, the economic value of employment was not included, but rather the value society places on avoiding unemployment. This pushes the boundaries of what can be considered a hard economic benefit, and in the words of Dr Jerome Fahrer, “while it is likely that there is some social value added to mining employment, per se, given alternative opportunities and given the history of mining in the region ... it is best excluded in the quantitative calculation of the CBA”⁷²

⁷² Fahrer, J. “Ashton South East Open Cut Project Economic Assessment - Expert Report of Dr Jerome Fahrer”, (ACIL Allen Consulting, 2013)

The merit of that technique aside, there is another internal inconsistency associated with this approach. The authors acknowledge “that labour resources used in a project would otherwise be employed elsewhere”⁷³, but then go onto argue that social value is created for the project through reducing unemployment. The project either does or does not reduce unemployment, it can’t do both.

The Warkworth Mine Extension economic assessment also contains an oversight, in that it assumes that if people weren’t working in the mining industry, they would be either unemployed or working for the average wage received in their locality. While it might true that their project pays above market wages for the skill set required, it is highly unlikely that these highly skilled workers would go back to earning the average wage if made redundant by the mining industry.

Finally, and most flawed of all, is the Airly mine extension, which attributes the full value of employment to the project case, effectively assuming that every employee was sitting around unemployed beforehand.

Table 14 Comparison of recent Cost–Benefit Analyses

Proposal	Year	Prepared by	Supplier benefit included?	Worker benefit included?	Benefit calculation method
Mount Owen continuation	2014	Deloitte Access Economics	No	No	GMR less costs
Bulga optimisation project	2012	Economics Consulting Services	No	No	GMR less costs
Boggabri coal mine	2010	Gillespie Economics	No	Yes (social value)	GMR less costs
Maules creek project	2011	Gillespie Economics	No	Yes (social value)	GMR less costs
Watermark coal project	2012	Gillespie Economics	No	Yes (social value)	GMR less costs
Warkworth mine extension	2014	BAE Economics	No	Yes (proportion)	Itemised
Airly mine extension	2014	Aigis Group	No	Yes (full value)	Itemised
Ashton SEOC project	2013	ACIL Allen	No	No	

Source: Environmental Impact Statements from respective proposals

⁷³ Gillespie Economics, “Continuation of Boggabri Coal Mine Economic Assessment”, (2010)

Net benefit to NSW suppliers

Consistent with the other mining CBAs presented in Table 14, no supplier benefits have been included in this CBA. As discussed in the LEA, few local businesses expected to benefit from the project. The main business that could benefit from the project is Joy Mining, an international manufacturer of mining equipment with facilities in Moss Vale. Joy were contacted repeatedly for comment. Significantly, Joy is part of a global business. Any actual surplus due to Hume Coal buying equipment there is likely to be moved offshore.

POTENTIAL COSTS TO NSW

Most of the potential environmental costs discussed in the Global CBA above are relevant to CBA for NSW, relating to groundwater impacts. Groundwater is the largest, and most uncertain, with a central cost estimate of \$131 million in present value terms. Other relevant costs to NSW from the global CBA section are:

- Surface water impacts
- Opportunity cost of land
- Air quality and noise impacts
- Heritage impacts
- Transport impacts
- Biodiversity impacts
- Loss of surplus to other industries
- Aboriginal heritage impact
- Potential cost of infrastructure investment

While greenhouse gas emissions should be of concern to decision makers, including the implications of expanding supply of thermal coal, from a strictly NSW CBA perspective, much of these costs are borne by the rest of the world and are generally not considered as a major cost in state-level CBA. Readers interested in the development of the draft CBA Workbook should note that the workbook currently considers all costs of greenhouse gas emissions as being incurred by the NSW community.

POTENTIAL NET BENEFITS TO NSW

As discussed above, the Hume Coal Project is unlikely to go ahead as currently proposed as it represents a large economic loss at a global level and to the proponent's South Korean owners. Hypothetically if the project was to proceed in the

current form, the quantified net present value to the NSW community would be negative \$12.5 million, as summarised in the draft CBA Workbook table below:

Table 15: Quantified net benefits to NSW

Net benefit of project – Approach 2

Benefit		
Direct benefit: royalties payable	AU\$ ('000)	118,044
Direct benefit: company income tax apportioned to NSW	AU\$ ('000)	–
Net indirect economic benefit	AU\$ ('000)	–
Total net economic benefit	AU\$ ('000)	118,044
Cost		
Net indirect economic cost	AU\$ ('000)	130,553
Total net economic cost	AU\$ ('000)	130,553
<hr/> <hr/>		
NPV of project	AU\$ ('000)	-12,509.28
<hr/> <hr/>		
BCR (benefit cost ratio)		0.90
<hr/> <hr/>		

The key costs in Table 13 are the impact on groundwater. Our central estimate of this value is greater than the royalties payable at the Commonwealth Treasury's forecast coal price. Depending on the level and value of groundwater impacts, the project is likely to represent a net loss in economic welfare to the NSW community, even if approved and pursued by the proponent. Furthermore, consideration needs to be given to the many unquantified impacts listed above.

SENSITIVITY ANALYSIS

The project as currently proposed has a large negative NPV, based on our central assumptions. In this section we change some of these key assumptions to:

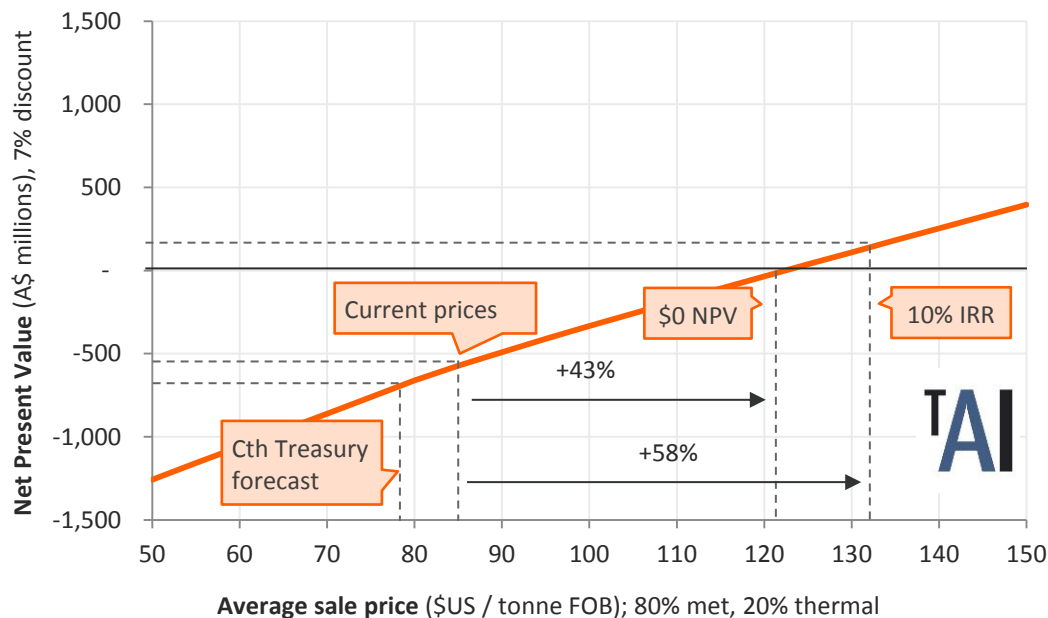
provides decision makers with the potential range in the level of net benefits that could arise from the project.⁷⁴

Coal price

For the project to generate positive NPV, in other words for the project to ‘break even’ economically, higher coal prices are needed. Based on current metallurgical and thermal coal prices, Hume’s average received price is US\$85.4 per tonne, or at current exchange rates, A\$110/t. Under our cost assumptions average price received by Hume needs to be 43% higher than current prices to break even in NPV terms, US\$122/t (A\$159/t). To achieve a more commercial 10% rate of return, prices would have to be 58% higher at US\$135 per tonne (Exhibit 13).

Exhibit 14 Net Present Value versus average sale price

A\$ Millions, \$US / tonne FOB



Source: TAI analysis; Commonwealth Treasury

The likelihood of such an increase in coal prices is low. Even if coal prices rose to levels where the Hume Coal Project was viable in the coming years, this price rise would need to be sustained for the life of the project. This is unlikely in the context of historical coal prices.

To put this in historical context, Hume’s average received price for 80% metallurgical and 20% thermal coal needs to be A\$158/t to break even. Given the average premium

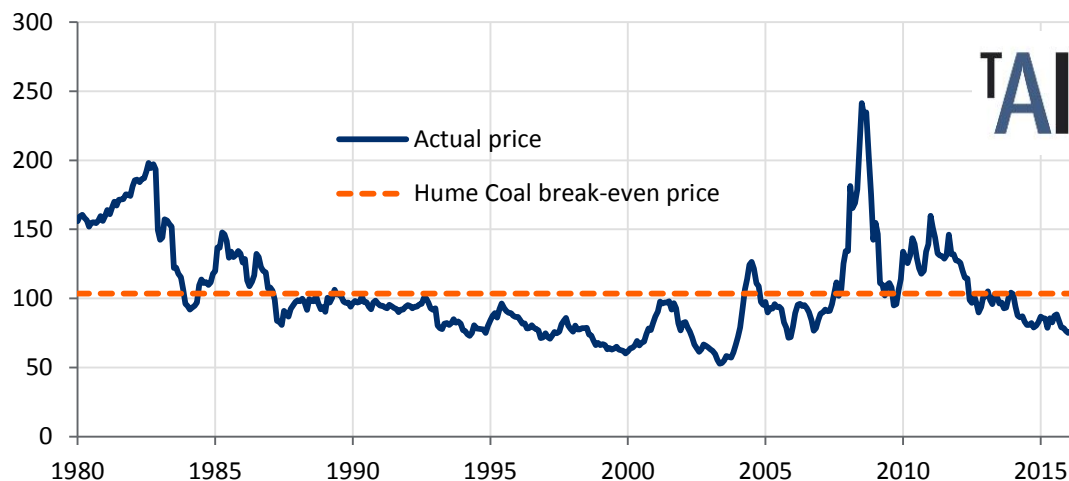
⁷⁴ NSW Government Department of Planning and Environment, “Guidelines for the economic assessment of mining and coal seam gas proposals”, p.18, (2015)

paid for metallurgical coal, this translates to a thermal coal price of A\$103/t and a metallurgical coal price of A\$172/t.

Longer historical data is available for thermal coal. Exhibit 14 compares Hume's required break even thermal coal price, A\$103/t, with historical coal prices. It shows that such prices are historically infrequent:

Exhibit 15 Australia thermal coal price FOB, 1980–2016

A\$ per tonne FOB Newcastle (real 2016 dollars)



Source: <https://www.quandl.com/collections/markets/coal>;

Exhibit 14 shows that shows that coal prices have only traded at more than a 43% premium to their current level (in real terms) for the equivalent of 12 out of the last 36 years, or 33% of the time. Aside from the 2008 and 2011 coal price peaks, sufficiently high coal prices for the Hume Project to break even have rarely occurred since the mid 1980s. The project would not have broken even in any from 1989 to 2004. The probability of sufficiently high prices being maintained for the twenty years of the project's proposed life is extremely low.

Operating costs

Operating costs are a major driver of coal mine NPV and Hume is no exception. As discussed above, our estimates are based on comparison with other coal mines of similar size and location. Hume's proposal is unusual, using relatively uncommon techniques and low rates of extraction to reduce environmental impacts. While we believe our cost assumptions are optimistic, for the reasons discussed above, Hume may be able to reduce costs to improve project viability.

At Commonwealth Treasury's forecast coal prices, used in our central estimates, Hume would need to reduce operating costs by 38 percent in each year over the life of the

project for it to return a positive NPV. While there could be potential to substantially reduce the mine's operating costs, these changes, such as to longwall mining or other techniques, would be almost certain to increase the impacts of the project on groundwater resources.

Groundwater and royalties

From the perspective of the NSW community, the NPV of the project depends on the impacts on groundwater, unquantified environmental impacts and the payment of royalties. As mentioned above, there is huge uncertainty around the potential value of groundwater impacts and what flow on effects might be experienced elsewhere in the local environment and economy with even Hume Coal's forecast depletion of groundwater. Reproducing the table above:

Table 16 Ground water cost estimates at various inflow and water values, present value

	\$2000/ML	\$4000/ML	\$6000/ML
Hume coal (3.2ML)	11	21	32
SHCAG mid (9.7ML)	65	131	196
SHCAG high (16.0ML)	108	216	235

Source: TAI interviews, PEA, Pell Consulting and TAI calculations

In our hypothetical estimate above, where the proponents operate the project despite large financial losses, we estimated royalties payable at \$118 million in present value terms. While this would seem sufficient to offset quantified groundwater impacts at Hume Coal's estimates of inflow, this decision comes with risks around both groundwater impacts and timing.

Timing is important as the project is likely to be financially marginal at best. Any delay or period in care and maintenance reduces the present value of royalties. In the table below we present the likely value of royalties at different coal prices and with periods in care and maintenance after three years of production.

Table 17 Royalty payments, and years of delay, present value at 7%

	Price – Treasury forecast	Price –break even (+43%)	Price – IRR=10% (+ 58%)
Years in C&M – zero	\$118	\$154	\$187
Years in C&M – two	\$104	\$135	\$166
Years in C&M – five	\$87	\$113	\$138
Years in C&M – ten	\$64	\$83	\$102

Table 17 shows that if the project goes ahead, but experiences delays, the present value of royalties rapidly decreases. Even if coal prices rise by 58 percent, to a level that would provide a reasonable rate of economic return, any delay makes it difficult for royalty payments to offset our central estimate of cost of groundwater impacts. Even then the project is unlikely to bring economic benefit at a state level, as several of the unquantified externalities are likely to be significant.

Discount rates

The results of the analysis are not particularly sensitive to changes of the discount rate. The global CBA figures are shown at different discount rates in Table X below:

Discount rate	NPV (A\$m)
4%	-635
7%	-556
10%	-497

As the project produces an economic net loss in every year under our central assumptions, the loss is minimised with a higher discount rate, and is higher under a lower discount rate.

Conclusion

The Hume Coal Project is likely to represent a loss of economic welfare at both a global and NSW level. From an economic perspective, the project should be rejected as it represents a loss in economic welfare relative to the base case scenario of no mining.

As proposed it is almost certainly unviable for the proponents. If approved it is likely to be deferred indefinitely, in the hope of higher coal prices, or kept as a potential alternative supply for corporate strategic reasons. It is unlikely to be built without modifications that would likely increase costs to the community.

Even as a proposal, the project imposes costs on the local economy due to the uncertainty created. These impacts are further explored in the local effects analysis that accompanies this cost benefit analysis.

If the project is approved and proceeds, it will cause economic loss. If the project is approved but does not proceed, the indefinite uncertainty will harm the region and community.

The strong conclusion of the cost benefit analysis is that the project should be rejected by planning authorities.

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Hume Coal Project

Submission on Environmental Impact Statement

The Hume Coal proposal is not economically viable as proposed and is already having a negative impact on the Southern Highlands economy. This is ignored in the EIS economic assessment, which is not transparent, does not comply with the relevant guidelines and suffers from flaws commonly identified in literature on major project assessment.

Rod Campbell
Tony Shields
June 2017

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Summary

The Hume Coal project should be rejected on economic grounds. It is a relatively small, high-cost, greenfields mine far from major markets. It is unlikely that it can be financially or economically viable as currently proposed. It is already imposing economic costs on the Southern Highlands community. Proceeding with the project, particularly with possible modifications to reduce operating costs, brings the risk of major impacts on groundwater, on which many local industries depend.

This submission should be read in conjunction with other Australia Institute research on coal and the Southern Highlands Economy:

- *Economic assessment of the Hume Coal project* (June 2016)
- *For Hume the bell tolls: Local economic impacts of the Hume Coal project* (May 2017)

The economic assessment in the EIS contains obvious errors and is non-transparent, with minimal information provided on the project's costs and benefits. It suffers from many of the problems with optimism bias and insider views identified in academic literature on major project assessment. The project should be quickly rejected to remove the uncertainty it is creating for Southern Highlands businesses.

Introduction

The Australia Institute objects to the Hume Coal proposal. We have conducted extensive research on the proposal and its potential impact on the economy of the Southern Highlands based on several field visits, interviews with businesses and local government. This submission should be read in conjunction with our two most recent reports on coal and the Southern Highlands:

- *Economic assessment of the Hume Coal project* (June 2016)
- *For Hume the bell tolls: Local economic impacts of the Hume Coal project* (May 2017)

These reports are attached to this submission. The Australia Institute received financial and logistical support from Coal Free Southern Highlands in producing these two reports.

Our research shows that the uncertainty around the Hume Coal proposal is currently imposing economic costs on the Southern Highlands economy. *For Hume the Bell Tolls* gives several examples of businesses that are deferring investment due to the project's potential impacts on water resources and amenity, particularly in Berrima. One example includes an olive growing business:

with a shopfront, sheds, housing, machinery and the olive trees. They were planning to build a showroom and work shed, plant more trees, and employ more staff in higher-skill roles, but will not do so while the coal mine remains a possibility. Instead, they built a much smaller shed and sales area and would expand "straight away" if the mine were cancelled. (p19)

The Hume proposal is reducing land values. According to a local real estate agent:

Buyers in the Sutton Forest/Berrima area always ask where the mine is in relation to the property on sale. Unfortunately, the region's most valuable properties are also nearest the proposed mine head, and typically downwind from the proposed mine during the south-westerly winter winds. (p18)

The Hume proposal is not consistent with the economic planning that has been undertaken in the region. The Southern Highlands Development Framework is an

initiative by Wingecarribee Shire Council, the Southern Highlands Chamber of Commerce and Industry and the Moss Vale Rural Chamber of Commerce.¹

Based on the experience and opinions of local business and community leaders, there would be significant economic benefit if the project is rejected. Rejection would provide certainty for the many and diverse businesses that depend on groundwater and the amenity of the region, facilitating investment, increased activity and employment.

If approved, however, this uncertainty is likely to continue, as the project *as currently proposed* is unlikely to be financially or economically viable. We estimate the net present value of the project at negative \$360 million. If approved the proponents would likely need to wait for higher coal prices or apply for a modification to mine using a different extraction method, one that would almost certainly bring greater risk to groundwater resources. These topics are covered extensively in our 2016 report *Economic assessment of the Hume Coal project*. Headline figures from that report have been updated in this submission.

The Environmental Impact Statement (EIS) for the Hume Project ignores these economic realities. The EIS's Appendix Q: Economic Impact Assessment Report by BAEconomics is flawed. It misrepresents the Southern Highlands economy, including obvious errors relating to the tourism industry. It ignores the central issue: the potential for groundwater impacts to affect agriculture and related industries, as covered in *For Hume the Bell Tolls*. It fails to consider the economic viability of the project and does not meet NSW economic assessment guidelines for mining projects.

The economic assessment and much of the EIS reflects the biases and flawed reasoning so common in assessment of major projects. There is now a substantial literature around how often major project assessment suffers from optimism bias and strategic misrepresentation, as well as the reasons why this occurs. Some of this literature is discussed in this submission in the context of the Hume project.

¹ Southern Highlands Development Framework (n.d.) <http://www.southernhighlandsdevelopment.com/>.

Misrepresentation of Southern Highlands economy

The EIS Economic Assessment does not provide an accurate description of the Southern Highlands economy. The main section describing the economy in the assessment completely omits any mention of the agri-tourism industry which is central to economic activity in Berrima and parts of the wider region. It does not mention the major employing service industries of health care and social assistance, retail trade, education or accommodation and food services:

The project area is in a semi-rural setting, with the wider region characterised by grazing properties, small-scale farm businesses, natural areas, forestry, scattered rural residences, villages and towns, industrial activities such as the Berrima Cement work [sic] and Berrima Feed Mill, and some extractive industry and major transport infrastructure such as the Hume Highway. (page 13)

While grazing is clearly visible around the Southern Highlands, it is wrong to suggest the economy of the region is “characterised” by grazing and other nondescript “small-scale farm businesses”. The region has a strong network service providers and high-value agricultural producers closely integrated with the local tourism industry. This is described in the report appended to this submission, *For Hume the bell tolls: Local economic impacts of the Hume Coal project*.²

The economic assessment makes no mention of the substantial amount of economic planning that has been undertaken by local government, industry and community stakeholders. The Southern Highlands Development Framework is an initiative by Wingecarribee Shire Council, the Southern Highlands Chamber of Commerce and Industry and the Moss Vale Rural Chamber of Commerce. It was established in 2015 through a process involving 250 community members. Tourism groups have also undertaken economic planning work in collaboration with state government agency Destination NSW. These topics are also covered in the report appended to this submission, *For Hume the bell tolls: Local economic impacts of the Hume Coal project*.

The economic assessment’s misleading description of the local economy is compounded in the Local Effects Analysis (LEA) section where the descriptions and data relating to tourism and agriculture industries are clearly wrong.

² Also available at <http://www.tai.org.au/content/hume-bell-tolls-impacts-hume-coal-project-southern-highlands-businesses>

LEA ‘LOCAL TOURISM’ SECTION

There are numerous errors in the ‘Local tourism’ section of the LEA. Table 4-1 suggests that there are only four tourism establishments in the Berrima–Moss Vale SA2 region. Anyone who has been to either town in the last decade would realise that this is wrong. BAEconomics’ first error is in confusing the Australian Bureau of Statistics count of ‘accommodation establishments’ with ‘tourism establishments’. Tourism-based businesses include a range of non-accommodation businesses such as historic sites, souvenir shops, restaurants, winery cellar doors, etc. BAEconomics ignore these completely. They also ignore that much Southern Highlands tourism is day trips from Sydney or Canberra, which do not require accommodation.

Furthermore, a simple internet search reveals that there are far more than 4 accommodation establishments in Berrima and Moss Vale. A Google search on 28/6/2017 shows seven accommodation businesses in Berrima village proper, 12 within Moss Vale town and dozens in the surrounding areas. AirBnB lists at least 15 options in Berrima and over 20 in Moss Vale.

The economic assessment claims that ABS data:

Suggests that the Southern Highlands SA2 region where the mine would be located accounts for a relatively small share of tourism establishments, and, in particular a very small share of revenues from tourism accommodation in the Wingecarribee LGA.

This statement shows either ignorance of the local geography or an intention to mislead readers. The ABS ‘Southern Highlands SA2 region’ is different to what is generally referred to as the Southern Highlands, which is more accurately reflected by the Southern Highlands SA3 region. The SA2 region excludes Berrima and all the major towns and is relatively undeveloped.

BAEconomics use the SA2 region here to give the impression that there is little tourism activity in the locality of the mine. This is misleading as the mine entrance would be located very close to Berrima and its many tourism businesses. Berrima is omitted from Figure 2.4 of the economic assessment, which gives the impression that the project area is a considerable distance from population centres.

This is not the case. As discussed in the report appended to this submission, *For Hume the bell tolls: Local economic impacts of the Hume Coal project*, dust from the mine is a major concern for nearby businesses and the Wingecarribee Shire Council.

AGRICULTURE

The economic assessment considers impacts on agriculture only on the properties owned by Hume, where the surface mine infrastructure would be located. No consideration is made of any potential impact on agriculture through the mine's impacts on groundwater resources that would affect a much wider area. This is the key issue that has sparked the intense community opposition to the Hume Project. Despite the centrality of this issue to the community, BAEconomics make no attempt to quantify a range of potential impacts, stating only:

The cost of estimated make-good measures has been accounted for in the costings for the project. (p33)

This cost estimate is not disclosed in the economic assessment. In the report attached to this submission, *Economic assessment of the Hume Coal project*, a range of values are estimated with a central estimate of \$131 million, greater than the \$114 million estimate of present value royalties of the mine.

Expert reports commissioned by Coal Free Southern Highlands show that it is highly likely that groundwater resources will be affected. Most recently a report by Pells and Pann (2017)³ states that the water take from the mine could be ten times what is predicted in the EIS. Water drawdown could extend for kilometres beyond the mine workings.

BAEconomics failure to consider the potential economic effects of groundwater impacts means decision makers are not able to weigh these costs against potential economic benefits.

³ Included in Coal Free Southern Highland's submission to the Hume Coal EIS process.

Economic and financial viability of current proposal

The Hume Project as currently proposed is not economically or financially viable. This is the strong conclusion of our appended paper *Economic assessment of the Hume Coal project*, as well as two reports from the Institute of Energy Economics and Finance.⁴

Updating the 2016 report *Economic assessment of the Hume Coal project* to current coal prices and revised information from Hume, our cost benefit analysis estimates that at a global level the project has a net present value of negative A\$360 million. Key assumptions in this estimate are an average price for Hume's production of A\$118 per tonne, operating costs of A\$97 per tonne, a 7% discount rate and groundwater inflow of 9.7 gigalitres per year.

As before, the project as proposed is almost certain to represent a large financial loss to the proponent. Under our central assumptions, producer surplus – a basic estimate of profit – is estimated at negative A\$351 million. This means that, if approved, the project is unlikely to proceed as proposed unless there is a major increase in coal price.

If it did proceed despite the financial loss to the proponent, we estimate the project would be liable for royalties worth A\$132 million in present value terms (formerly A\$118 million). While this represents a substantial benefit to the NSW community, our central estimate of the cost of groundwater impacts is A\$131 million. Beyond this likely cost there are many, potentially large, unquantified impacts that make it extremely unlikely that the project represents an improvement in economic welfare for the Southern Highlands or the NSW community as a whole.

The 2016 report is appended to this submission. We would be pleased to provide worksheets and discuss the update in more detail with the Department.

The EIS economic assessment does not provide any detail on the viability of the project. It does not provide any estimate of the costs and benefits of the project at a global level, or any detail on producer surplus and whether the project as proposed would make money for the proponent. The economic assessment provides no

⁴ Buckley and Nicholas (2016) *The Hume Coal Mine: A Stranded Asset in the Southern Highlands*, http://ieefa.org/wp-content/uploads/2016/08/The-Hume-Coal-Mine-A-Stranded-Asset-in-the-Southern-Highlands_Aug-2016.pdf A 2017 update of that report has also been prepared as part of submissions to the Hume Coal EIS process.

information on capital or operating costs of the project, despite noting on p25 various operating practices that are uncommon in Australia and would certainly add substantially to operating costs.

There is minimal transparency around key inputs to the economic assessment. This is compounded by the methodology used, which differs from assessments of every other coal mine in NSW other than those done by BAEconomics. BAEconomics explain:

From an economic perspective, the extent to which a project contributes to the welfare of a country or state differs from a private benefit calculation, which focuses on the consumer and producer surplus. The public benefit of a project is measured with reference to 'value added'. Value added is the additional value of goods and services that are newly created in an economy, and that are available for domestic consumption or for export.

This is incorrect. Public benefit of a project is not measured with reference to value added, which as BAEconomics later explain is based on returns to capital, labour and mixed income. The foundations of cost benefit analysis are in welfare economics, and focus on changes to consumer and producer surplus which are suitable for private and public benefit calculations. This is clear from the NSW 2015 *Guidelines for the economic assessment of mining and coal seam gas proposals* with their emphasis on producer surplus. The Guidelines do not consider BAEconomics' approach, which works to minimise transparency. No working is provided for most values in their assessment, particularly those in Table 3-6. The BAEconomics assessment does not meet the letter of the 2015 Guidelines and is certainly not in the spirit that they were worked on with many stakeholder groups through 2015. The Guidelines must continue to develop and should incorporate the lessons of the substantial literature on systemic flaws in major project assessment, discussed below.

Systemic flaws in project assessment

The BAEconomics assessment suffers from flaws that are often seen in megaproject assessment. These systemic biases have become well documented and well known, particularly due to the work of Bent Flyvbjerg, but also due to the work of Nobel Prize Winner for Economics Daniel Kahneman, together with Amos Tversky. These biases include:

- optimism bias;
- the planning fallacy;
- strategic misrepresentation; and
- principal agent theory.

Kahneman and Tversky are credited with demonstrating the over-optimistic bias of humans. People underestimate the costs, completion times and risk of planned actions, whereas they overestimate the benefits of the same actions.⁵ Kahneman and Tversky also highlighted the planning fallacy: the tendency for people involved in a project to underestimate the costs and risks of a project simply because they do not foresee what can go wrong. They base their forecasts of the future on the best case rather than the likely case. Kahneman and Tversky say those involved with a project take *the inside view*. People who take the inside view:

- make forecasts by focusing tightly on the project at hand, considering its objective, the resources they brought to it, and the obstacles to its completion; and
- imagine scenarios of progress and extrapolate these into the future.

This results in overly optimistic forecasts.⁶

⁵ Kahneman & Tversky (1979) *Prospect theory: An analysis of decisions under risk*, *Econometrica*, 47, p 313–327; Kahneman & Tversky (1979) *Intuitive prediction: Biases and corrective procedures*, in Makridakis & Wheelwright (eds) *Studies in the Management Sciences: Forecasting*, vol 12

⁶ Flyvbjerg (2008) *Curbing Optimism Bias and Strategic Misrepresentation in Planning: Reference Class Forecasting in Practice*, *European Planning Studies* 16:3–21, p9
https://www.researchgate.net/publication/233258056_Curbing_Optimism_Bias_and_Strategic_Misrepresentation_in_Planning_Reference_Class_Forecasting_in_Practice

Kahneman and Tversky contrast the inside view with the much more accurate *outside view*. The outside view examines the experiences of a class of similar projects, lays out a rough distribution of outcomes for this reference class, and then positions the current project in that distribution.⁷

Flyvbjerg highlights strategic misrepresentation and the principal agent theory.⁸ These theories suggest that there are strong incentives for project proponents to deliberately overstate the benefits and underestimate the costs and risks of projects. For example, politicians may want to have projects built to meet political objectives. Managers may want to have projects built because there are tangible and intangible rewards for getting them underway and for running a bigger company than a smaller company. If senior managers are keen on a project, company employees know the benefits of working positively on the project rather than being a negative, though more realistic, critic. Employees' ownership of a company (for example, company shares) is often small compared to their salary and potential bonus, consequently their losses if a project fails are small but their rewards for success are much greater. Managers and employees may also rightly reason that they will have another job elsewhere by the time a project fails and that the blame for the failure will be diffuse.

In addition to the incentives mentioned above there are three particular incentives acting to make it likely that the benefits of the Hume Coal project are over-estimated and the cost underestimated:

Firstly, this project is strongly opposed by many people. Therefore the project proponents have stronger reasons to misrepresent the benefits and costs (ie overestimate the benefits and underestimate the costs) compared to if the Project had little opposition.

Secondly, to reduce the risk to groundwater from mining, the pine feather mining system is to be used. This is the first time such a method has been used in Australia. This is a high cost mining method.⁹ Once the project is approved and operations are underway, the project proponents could then "find" that the pine feather mining system is uneconomic. The mine could then seek a modification of its licence to carry out the lower cost and more commonplace longwall mining technique. With a mine already constructed, employees earning regular income and businesses benefiting from supply contracts, there will be much stronger political pressures to grant this modification compared to today where there is no mine, no supply contracts and no employees.

⁷ Paraphrasing Flyvbjerg (2008) *Curbing Optimism Bias and Strategic Misrepresentation in Planning*, p9

⁸ Flyvbjerg (2008) *Curbing Optimism Bias and Strategic Misrepresentation in Planning*

⁹ Buckley and Nicholas (2017) *Hume Coal Update 2017*, June 2017

Thirdly, approval to mine would add dramatically to the value of the Hume Coal project. It not only allows the proponents to start mining but also makes it more valuable and easier to sell. The return on investment from gaining mining approval is in the order of hundreds and thousands of per cent, making it potentially one of the best investments available in business. It costs a few million dollars to compose and lodge an Environmental Impact Statement; project approval can add tens or hundreds of millions of dollars of value to an asset. Once again, the incentives for misrepresentation to gain approval are clearly present.

Bengt Flyvbjerg is the world's most cited scholar on megaprojects. He has advised the UK Government on its "Green Book" used to evaluate projects, the US Government and several corporations.¹⁰ Flyvbjerg has collected statistics on megaprojects from around the world. He summarises:

Success in megaproject management is typically defined as projects being delivered on budget, on time, and with the promised benefits. If, as the evidence indicates, approximately one out of ten megaprojects is on budget, one out of ten is on schedule, and one out of ten delivers the promised benefits, then approximately **one in one thousand projects is a success**, defined as "on target" for all three. Even if the numbers were wrong by a factor of two—so that two, instead of one out of ten projects were on target for cost, schedule, and benefits, respectively— the success rate would still be dismal, now eight in one thousand. This serves to illustrate what may be called the "iron law of megaprojects": **Over budget, over time, over and over again. Best practice is an outlier, average practice a disaster** in this interesting and very costly area of management.¹¹

In reference to benefit cost analyses, Flyvbjerg further writes that:

When cost and demand forecasts are combined, for instance in the cost-benefit analyses that are typically used to justify large infrastructure investments, the consequence is inaccuracy to the second degree. **Benefit-cost ratios are often wrong, not only by a few percent but by several factors.** As a consequence, estimates of viability are often misleading, as are socio-economic and environmental appraisals, the accuracy of which are heavily dependent on demand and cost forecasts. These results point to a significant problem in policy and planning: **More often than not the information that promoters and**

¹⁰ Said Business School (2017) *Bent Flyvbjerg* <http://www.sbs.ox.ac.uk/community/people/bent-flyvbjerg>

¹¹ Flyvbjerg (2014) *What you should know about megaprojects and why....*, p11, emphasis added.

*planners use to decide whether to invest in new projects is highly inaccurate and biased making plans and projects very risky.*¹²

With a capital cost variously estimated at \$982 million and \$860 million,¹³ the Hume project just falls short of the US\$1 billion number that Flyvbjerg uses to define a megaproject. However, the dangers of the optimism bias and planning fallacy are just as likely to be present (as anyone who has renovated a kitchen or built a house will attest) as are the problems caused by misrepresentation and principal–agent conflict.

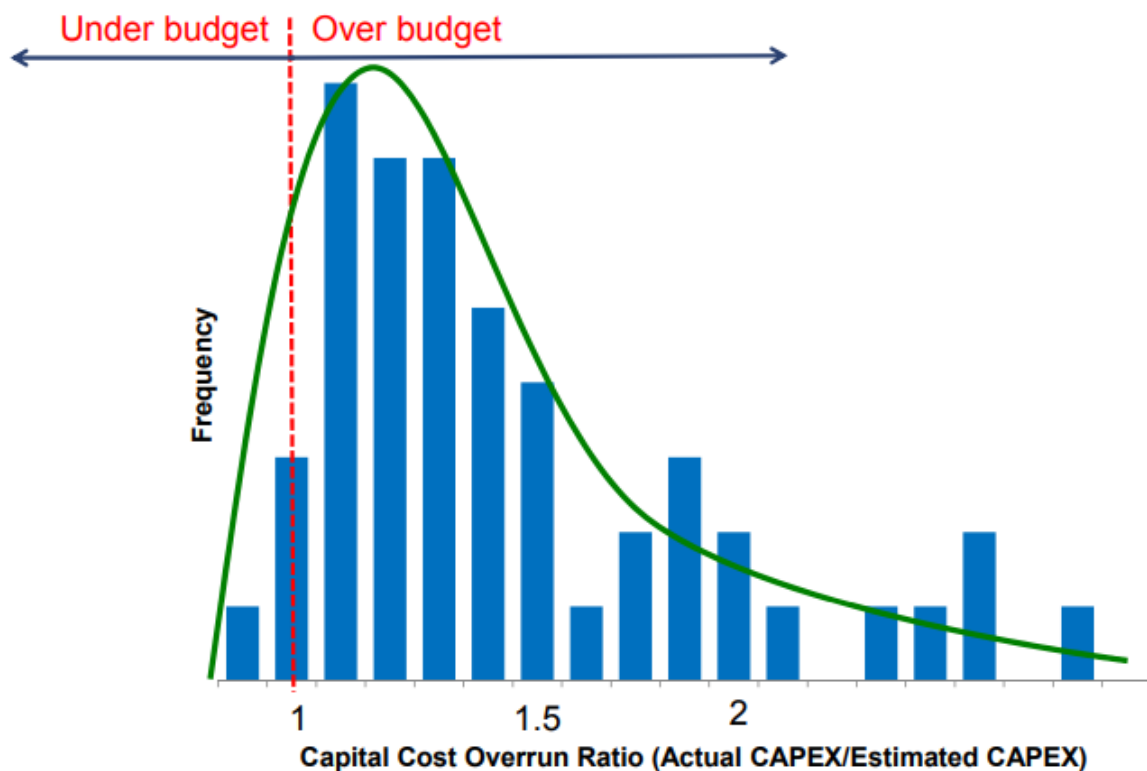
Research has found that the resources industry suffers from the same over-optimism that affects other industries. In 2014, Christopher Haubrich, a mining analyst, gave a paper titled “Why Building a Mine on Budget is Rare: A Statistical Analysis”.¹⁴ Haubrich constructed a database of 50 mining projects and found that capital cost overruns are significant and persistent with average cost overruns of 20%–60% recorded since 1965. Many projects run over cost by much greater percentages – see Figure 1 below. Haubrich stated that the mining industry has a worse record than other industries.

¹² Flyvbjerg (2008) *Curbing Optimism Bias and Strategic Misrepresentation in Planning...*, p5, emphasis added.

¹³ Buckley and Nicholas (2017) *Hume Coal Update 2017*, June 2017,

¹⁴ Haubrich (2014) *Why Building a Mine on Budget is Rare: A Statistical Analysis*, 16 October 2014, http://www.canadian-german-mining.com/files/events/2014-10-16_CIM_MES_Rocks_Stocks/3_Chris_Haubrich_Why_Building_A_Mine_on_Budget_is_Rare_-_A_Statistical_Analysis.pdf

Figure 1: Distribution of Capital Cost Overruns¹⁵



Haubrich also found that that marginal projects are likely to have larger cost overruns. Haubrich stated that this was because when projects are marginal, the incentive is to “sharpen your pencils” and reduce cost estimates in order to make the project numbers viable. Haubrich found no relationship between the cost of the project and cost overruns.

Global consulting firm EY found that mining projects run over-budget by an average of 62%, and that 50% of projects were reporting delays. Only 31% of projects came in on budget. EY quoted media coverage of some projects with cost overruns:

A major copper and gold operation in Central Asia: The National Finance Minister had been quoted as saying: “No one understands why the project has gone US\$2b over budget.”

A major iron ore project in Brazil: To date, the project has experienced an overrun from the initial estimate of approximately 690%. The chief executive officer of the company has gone on record to say that “they are working very hard” to ensure no more delays or cost overruns on the project.

¹⁵ Haubrich (2014), p22.

A Brazilian megaproject: This project saw capital costs escalate from US\$3.6b in 2007 to US\$8.8b in 2013. Media sources have described this investment as one of this organization's "most significant failures of recent years."¹⁶

The Australia Institute has also collected information on optimism bias in the oil and gas industry.

COST OVER-RUNS AND REVENUE SHORTFALLS IN THE MINING, OIL AND GAS INDUSTRY

Westney is a Houston-based engineering and risk consultant to the oil and gas industry. They estimate that the probability of oil and gas projects running on time and on cost is only between 5% and 25%.¹⁷ Westney also quote Independent Project Analysis who found only 22% of large oil and gas projects were on time and on budget.¹⁸ Both these estimations leave aside the question of whether the projects also achieved their stated benefits (i.e. revenue). To help answer this question Westney quote a PricewaterhouseCoopers study that found only 2.5% of megaprojects met their objectives of scope, cost, schedule *and* benefits.¹⁹

EY analysed 365 oil and gas megaprojects and found 65% were over-budget and 73% over schedule. The budget overruns were not small – current project estimated costs were, on average, 59% above the initial estimate. EY noted these estimates were likely to understate poor performance as a substantial amount of the projects were still underway. Once again, EY only looked at cost performance and did not cover revenue performance.²⁰

¹⁶ EY (2015) *Opportunities to enhance capital productivity: Mining and metals megaprojects*, [http://www.ey.com/Publication/vwLUAssets/EY-opportunities-to-enhance-capital-productivity/\\$FILE/EY-opportunities-to-enhance-capital-productivity.pdf](http://www.ey.com/Publication/vwLUAssets/EY-opportunities-to-enhance-capital-productivity/$FILE/EY-opportunities-to-enhance-capital-productivity.pdf)

¹⁷ Briel, Luan and Westney (2014) *Built-in Bias Jeopardises Project Success*, p2, <http://www.westney.com/wp-content/uploads/2014/04/Built-in-Bias-article-SPE-as-published.pdf>

¹⁸ Boschee (2012) *Panel Session Looks at Lessons Learned from Megaprojects*. SPE Today, 10 October 2012. Quoted in Briel, Luan and Westney (2012).

¹⁹ PricewaterhouseCoopers (PwC) (2009) *Need to know: Delivering capital project value in the downturn*. Quoted in Briel, Luan and Westney (2012). Note this study refers to all megaprojects, not just oil and gas megaprojects.

²⁰ EY (n.d.) *Spotlight on oil and gas projects*, p4-5, [http://www.ey.com/Publication/vwLUAssets/EY-spotlight-on-oil-and-gas-megaprojects/\\$FILE/EY-spotlight-on-oil-and-gas-megaprojects.pdf](http://www.ey.com/Publication/vwLUAssets/EY-spotlight-on-oil-and-gas-megaprojects/$FILE/EY-spotlight-on-oil-and-gas-megaprojects.pdf)

Revenue forecasts are subject to the same biases that make cost forecasts so optimistic. Flyvbjerg estimates 84% of rail projects overestimate demand by more than 20%, and 72% of projects overestimate demand by more than 40%. For roads, 50% of projects overestimate demand by more than 20%, and 25% by more than 40%.²¹ For mining projects, revenue projection is made doubly difficult because of the difficulty of forecasting both reserves under the ground *and* also forecasting commodity prices which can fluctuate wildly from year to year.

As Flyvbjerg writes, when optimistic forecasts of cost are combined with optimistic forecasts of demand, it is very risky to place much weight on the resulting estimation of net benefit. Take a generous estimate of the likelihood of mining projects running on cost: say 1/3 of projects run on budget or better as opposed to the 1 in 10 figure quoted by Flyvbjerg, the 31% quoted by EY, the 5–25% of oil and gas projects quoted by Westney and the 22% of oil and gas projects quoted by Independent Economic Analysis (see above). Combine it with a generous estimate of the probability of revenue running as forecast: say 1/3 of projects deliver their estimated revenue. The result is still only a 1 in 9 chance that a project will meet both its cost and revenue projections. Moreover as Flyvbjerg, Haubrich and EY indicate, there is also a good likelihood that if a project fails to meet its projections, it will not be off by just 10 or 20 per cent, but much more, possibly hundreds of per cent.

While BAEconomics estimates that this project will provide a net benefit to NSW of \$295 billion in net present value terms, analysis shows that similar projects overstate their NPV in 90% of cases - often by a considerable amount.

NSW legislation and guidelines largely ignore the systemic biases that cause projections for mining projects to overestimate their benefits and underestimate their costs. These systemic biases have caused Flyvbjerg to propose the *iron law of megaprojects: over cost, over time, over and over again*. However, as Haubrich indicates, the systemic biases apply to all projects regardless of size.

²¹ Flyvbjerg (2008) *Curbing Optimism Bias and Strategic Misrepresentation in Planning...*, p5.

Conclusion

The Hume Coal project should be rejected on economic grounds. It is a relatively small, high-cost, greenfields mine far from major markets. It is unlikely that it can be financially or economically viable as it is currently proposed. It is already imposing economic costs on the Southern Highlands community. Proceeding with the project, particularly with possible modifications to reduce operating costs, brings the risk of major impacts on groundwater, on which many local industries depend.

The economic assessment in the EIS contains obvious errors and is non-transparent, with minimal information provided on the projects costs and benefits. It suffers from many of the problems with optimism bias and insider views identified in academic literature on major project assessment. The project should be quickly rejected to remove the uncertainty it is creating for Southern Highlands businesses.