Regional Mining and Infrastructure Planning project - Eyre and Western Region

Interim report for public consultation

Prepared for the South Australian Department of Planning, Transport and Infrastructure and the Commonwealth Department of Infrastructure and Transport
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This interim report is one of three prepared for the Regional Mining and Infrastructure Planning project. As each interim report is intended to be a ‘stand-alone’ document there is some duplication between the three reports, particularly in chapters 1, 2, 9 and 10. If you are planning to read each of the reports, please note that feedback provided on these chapters in one document will be taken to apply to all three.
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARTC</td>
<td>Australian Rail Track Corporation</td>
</tr>
<tr>
<td>Axle load</td>
<td>Weight felt by road or rail surface for all wheels connected to a given axle</td>
</tr>
<tr>
<td>Beneficiation</td>
<td>Processing of raw ore to increase mineral concentration prior to export</td>
</tr>
<tr>
<td>Bulk commodities</td>
<td>Commodities shipped unpackaged in large volumes</td>
</tr>
<tr>
<td>Concentrate</td>
<td>Processed ore with increased mineral concentration</td>
</tr>
<tr>
<td>DIRN</td>
<td>Defined Interstate Rail Network</td>
</tr>
<tr>
<td>DSO</td>
<td>Direct Shipping Ore</td>
</tr>
<tr>
<td>Easement</td>
<td>Right to use land for a specified purpose</td>
</tr>
<tr>
<td>GL</td>
<td>Gigalitre</td>
</tr>
<tr>
<td>GWh</td>
<td>Gigawatt Hours</td>
</tr>
<tr>
<td>IDS</td>
<td>Infrastructure Demand Study</td>
</tr>
<tr>
<td>JORC</td>
<td>Joint Ore Reserves Committee</td>
</tr>
<tr>
<td>kV</td>
<td>Kilovolt</td>
</tr>
<tr>
<td>MAPS</td>
<td>Moomba to Adelaide pipeline system</td>
</tr>
<tr>
<td>MCA</td>
<td>Multi-Criteria Analysis</td>
</tr>
<tr>
<td>Mtpa</td>
<td>Million Tonnes per annum</td>
</tr>
<tr>
<td>MW</td>
<td>Megawatt</td>
</tr>
<tr>
<td>Ore</td>
<td>A metal bearing mineral or rock</td>
</tr>
<tr>
<td>PACE</td>
<td>Plan for accelerating exploration</td>
</tr>
<tr>
<td>Potable</td>
<td>Water of quality to be safe for human consumption</td>
</tr>
<tr>
<td>Remnant vegetation</td>
<td>Areas of native trees, shrubs and grasses which have not been altered</td>
</tr>
<tr>
<td>RESIC</td>
<td>Resources and Energy Sector Infrastructure Council</td>
</tr>
<tr>
<td>RMIP</td>
<td>Regional Mining and Infrastructure Planning</td>
</tr>
<tr>
<td>TJ</td>
<td>Terajoules</td>
</tr>
<tr>
<td>Transmission network</td>
<td>Network of high voltage electricity lines and transformer assets</td>
</tr>
</tbody>
</table>
The South Australian Government has invested heavily to promote mining exploration and development over the past ten years. This investment is paying dividends in the form of an increase in minerals exploration and the number of mines in production.

The expansion in the mining industry presents a tremendous opportunity to further economic and social objectives in South Australia particularly in regional centres.

The South Australian Government, miners and regional communities are becoming increasingly concerned about the ability of existing infrastructure to service the future needs of the mining industry.

The South Australian Government commissioned the Regional Mining and Infrastructure Planning (RMIP) project to consider the infrastructure which is best able to facilitate the development of the mining sector and articulate the means of delivering this infrastructure. Three plans will be developed, one for each of the regions in which existing and potential mining operations are concentrated – Eyre & Western, Far North and Mid North and Yorke/Braemar. Each of the plans are intended be standalone documents, but will recognise the interdependencies between the regions.

Funding for the RMIP project has been provided by the Commonwealth Government through the Regional Infrastructure Fund.

This interim report presents the findings of the RMIP project to date and invites feedback from interested stakeholders. Feedback from stakeholders on this document will inform a detailed assessment process will be undertaken to develop a list of priority infrastructure projects. This process will prioritise projects based on:

- Efficiency of delivery (strategic importance to multiple mines)
- Ability to facilitate growth in the mining and minerals processing industries
- Contribution to economic prosperity
- Regional and community impact (positive and negative)
- Environmental benefits/costs

All those with an interest in the RMIP project are invited to review the findings of this interim report and provide feedback to inform the development of the three final plans. In particular, feedback from communities and groups with interests in the regions on the ‘grass roots’ environmental and social implications of growth in the mining sector and the infrastructure proposals identified in this report is critical and will provide an important input to the prioritisation of solutions in the final plan.
1. Purpose and intent

Purpose and intent of the Regional Mining and Infrastructure Planning project

The Regional Mining and Infrastructure Planning (RMIP) project has been tasked with articulating a plan for the delivery of infrastructure to support the development of mining in South Australia.

The objective of the RMIP project is to identify infrastructure solutions that maximise the net benefits to South Australia by improving connectivity from existing mines and reducing infrastructure related risks for new mines.

The RMIP project will deliver a roadmap, including the respective role of governments and the private sector in facilitating the delivery of long-term infrastructure solutions which are sensitive to the diverse economic, social and environmental requirements of all stakeholders in each of the regions.

This interim report identifies the infrastructure requirements to support further development of existing mines and new mines located within the Eyre and Western Region. This infrastructure is generally located in the Eyre and Western Region or it may be located in one of the adjacent regions, where there is better connectivity to support mine development. For this reason, RMIP plans are being developed concurrently for the Far North and Yorke and Mid-North/Braemar regions which provide an integrated approach to planning of mining developments across the State.

Previous work undertaken

The Resources and Energy Sector Infrastructure Council (RESIC) commissioned the 2011 Infrastructure Demand Study (IDS) which surveyed resource and energy project proponents in South Australia to develop a dataset of mining proponents’ expectations for future infrastructure requirements for their projects.

The RESIC commissioned study collated proponents’ infrastructure requirements in the event projects proceeded. The study assigned weights based on the likelihood projects would proceed, however this was not based on forecast economic conditions. The RESIC study identified a project weighted outbound resource task of 120 million tonnes per annum from 2017 and beyond.

Building upon the findings of the RESIC study, further information gathering from prospective miners and infrastructure proponents, industry experts and economic forecasts, the RMIP project has assessed the future infrastructure requirements of mining in South Australia. The assessment in this project considers the drivers and impediments to mining project development to develop realistic mining infrastructure demand scenarios, underpinned by key macroeconomic drivers.

The South Australian Government’s response to the RESIC IDS noted two actions which are to be included in the RMIP project:

- Consider the infrastructure requirements of the sector, including progressing the corridor and utility hub concepts. This will help planners and the private sector to determine their location, purpose and function
- Investigate the need for and location of capesize port capability.
Purpose and intent of this interim report

The purpose and intent of this interim report is to seek broad stakeholder feedback on the identified market need and analysis, along with the identified possible solutions ahead of detailed prioritisation.

Meaningful consultation is critically important to the ability to deliver plans which are sensitive to the broadest possible range of stakeholders' concerns. In developing the interim report as presented in this paper, detailed discussions have been held with:

- Regional Development Australia
- All tiers of government
- Mining interests
- Infrastructure and utilities owners, operators and proponents
- Regulators
- Implicated industries
- Interest groups
- Community.

However, for the final plans to meet the intent of the RMIP project they must meet community and industry needs; this can only be achieved by consulting with regional communities to gain their feedback. This is particularly important in identifying the practical social and environmental implications of the solutions identified. This paper will therefore form the foundation on which this next stage of the consultation process will take place. Feedback from the affected communities will inform the prioritisation of solutions when detailed in the final RMIP plans.

This interim report presents the findings of our work to date with respect to:

- The current state of mining and resultant infrastructure demand
- The forecast future state of mining and resultant infrastructure demand
- The state of current and committed infrastructure
- The gap between forecast infrastructure demand and provision, and
- The solutions which have been proposed to meet the forecast infrastructure gap.

Feedback is now sought in relation to four specific questions:

- Are the future infrastructure gaps and/or issues adequately identified?
- Have all feasible potential infrastructure solutions been identified?
- When assessing potential solutions, what are the key issues which should be considered (e.g. economic, environmental and social implications)?
- Are barriers to the development of priority infrastructure solutions government may seek to address adequately identified?
- Are there any other issues in relation to the RMIP project you wish to raise?

Further details of our approach to consultation are provided in section 10 – “How you can provide feedback”.
2. Approach

Introduction
The approach adopted in the development of the RMIP project has been designed to ensure the comprehensive assessment of current and future infrastructure needs of mining and related industries across South Australia.

The RMIP project considers the requirements of three interrelated regions and therefore the plans must be prepared with consideration to each other to avoid duplication of infrastructure solutions. The approach adopted assessed the various infrastructure solutions and considered the feasibility, cost and delivery requirements of the infrastructure required.

Mining considered in this plan
There is a significant range of mining activity in South Australia including iron ore, copper, uranium, heavy mineral sands, silver, gold and zinc.

For the purposes of this project the mining industry is taken to include the exploration and extraction of minerals with a significant or potentially significant demand for freight, water, power and/or gas infrastructure.

It is recognised that iron ore is the most infrastructure-intensive commodity, in terms of power, water, freight and other infrastructure and is therefore the primary focus of this project.

Energy projects, including coal, coal to liquids, geothermal, conventional and gas projects, have not been addressed in this study, however may be referenced from time to time where opportunities or impacts in relation to mineral projects are identified.

Infrastructure considered in this plan
Infrastructure is a broad term, which refers to the basic physical and organisational structures required for business and community functions to operate. This includes the network of roads, highways, railways and ports that underpins the transportation into, out of and within a region, the water and sewage systems that ensure an adequate supply of clean water as well as the disposal of waste, the power and gas grids that fuel enterprise, the networks that support communication and commercial exchange between parties and the structures and institutions that underpin the delivery of social services such as health, education and justice.
The infrastructure requirements of miners are considered from two dimensions; the extraction of the resources and the transportation of the resources. Subsequently, the infrastructure considered in this plan includes:

- Transport and logistics infrastructure, comprising:
  - Port facilities for import of goods required by the mine and export of product produced by the mine. This includes landside port facilities as well as marine facilities
  - Freight route infrastructure between the mine site and the port. This comprises road, rail, conveyor systems and slurry pipelines or a combination of these
- Water infrastructure to collect, treat as necessary and transport water to mine sites
- Energy infrastructure to produce and/or supply gas and/or electricity to support mine sites processes as well as processes for transport and water infrastructure above.

Project governance

A Steering Committee comprising government agencies has been established due to the relevance of the RMIP project to a range of government functions. The Steering Committee is led by the Department of Planning, Transport and Infrastructure and includes representatives from:

- Department of Manufacturing, Innovation, Trade, Resources and Energy
- Department of Primary Industries and Regions South Australia
- Department of the Premier and Cabinet
- Department of Treasury and Finance
- Regional Development Australia
- Commonwealth Department of Infrastructure and Transport.

The primary role of the Steering Committee is to ensure that the Government’s objectives on behalf of the South Australian community are considered in the development of the RMIP plans.

Those who have contributed to the development of the interim report

The South Australian Government has established a team of deeply experienced contractors to support the RMIP project. This team brings a broad range of skills and expertise including:

- Minerals extraction and processing
- Freight and logistics
- Integrated infrastructure planning
- Public policy analysis
- Regional development
- Electricity generation and transmission
- Gas transmission
- Land transport
- Water supply and transmission
- Ports and shipping
- Cost estimation
- Community planning
- Economic impact assessment
- Environmental assessment.

The contractor team, government, industry and peak bodies have all been involved in planning workshops, one-on-one consultations and have reviewed detailed analysis of the market forecasts and possible solutions, all of which inform this interim report.

**Methodology**

The methodology which will be applied in the development of the RMIP plan for the Eyre and Western Region is summarised in the figure and discussed below and discussed in detail in Appendix A.

**Figure 2.1: Methodology applied for the development of the RMIP plan**
3. Regional background

Mining has the ability to generate benefits for regional centres through its ability to create employment opportunities and support towns which underpin vibrant communities. The ability of regional communities to benefit from mining activity will in part be driven by the socio-demographic profile of the people in the region and in part the ability of the region to attract and support skilled labour.

For context, this chapter provides an overview of the economic activity and demographic characteristics of the Eyre and Western region. The data contained in this chapter will underpin social and economic modelling undertaken as part of the prioritisation process.

The Eyre and Western region

The Eyre and Western Region covers an area of 230,000 square kilometres from Whyalla on the north east of the Eyre Peninsula west to the state’s border with Western Australia.

Figure 3.1: Map of South Australian regions

The region has a population of over 56,000 comprised of several major towns including Whyalla (22,000 residents) and Port Lincoln (15,000). The Eyre and Western Region also contains the Maralinga Tjaruta Lands, an aboriginal local government area south of the APY Lands. The regional economy is heavily invested in the industries of agriculture, tourism and mining.
### Table 3.1: Regional summary

<table>
<thead>
<tr>
<th></th>
<th>Units</th>
<th>South Australia</th>
<th>Eyre and Western</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>no.</td>
<td>1,596,572</td>
<td>56,651</td>
</tr>
<tr>
<td>Population (0-15 years)</td>
<td>% of pop.</td>
<td>18</td>
<td>20</td>
</tr>
<tr>
<td>Population (15-64 years)</td>
<td>% of pop.</td>
<td>66</td>
<td>64</td>
</tr>
<tr>
<td>Population (65 years+)</td>
<td>% of pop.</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>Population growth (2001-2011)</td>
<td>%</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>Average wage/salary income*</td>
<td>$</td>
<td>41,896</td>
<td>40,628</td>
</tr>
<tr>
<td>Indigenous population</td>
<td>% of pop.</td>
<td>2</td>
<td>6</td>
</tr>
</tbody>
</table>

#### Education and employment

<table>
<thead>
<tr>
<th></th>
<th>Units</th>
<th>South Australia</th>
<th>Eyre and Western</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of schools</td>
<td>no.</td>
<td>785</td>
<td>73</td>
</tr>
<tr>
<td>School enrolment</td>
<td>no.</td>
<td>258,991</td>
<td>10,138</td>
</tr>
<tr>
<td>Tertiary education</td>
<td>% of pop.</td>
<td>42</td>
<td>32.5</td>
</tr>
<tr>
<td>Unemployment rate</td>
<td>%</td>
<td>5.7</td>
<td>5.9</td>
</tr>
<tr>
<td>Labour force participation rate</td>
<td>%</td>
<td>59.9</td>
<td>59.8</td>
</tr>
</tbody>
</table>

Major industries

<table>
<thead>
<tr>
<th></th>
<th>Manufacturing (15%), construction (12%), retail trade (9%)</th>
<th>Agriculture, forestry and fishing (18%), manufacturing (12%), retail trade (12%)</th>
</tr>
</thead>
</table>

Regional Demographics

The Eyre and Western region has a relatively large proportion of children (aged 0-14 years) in its population compared to the state average – 21% in the Eyre and Western Region, and 12% state-wide. Overall, the population distribution is similar to that of the state and Australia more broadly.

Figure 3.2: Eyre and Western population profile, 2011

![Population profile chart]

Source: ABS Census 2011

Population projections

The table below presents forecasts of the population for the RDA Whyalla and Eyre region, compared to South Australia. These forecasts refer to the RDA region, which, as described earlier, is equivalent to the Eyre and Western region considered in this study. It can be seen that population growth in the region over the coming decade is expected to be significantly lower than in the state more broadly, experiencing only 4.5% growth in the coming decade.

Table 3.2: RDA population projections

<table>
<thead>
<tr>
<th>RDA region*</th>
<th>2016</th>
<th>2021</th>
<th>2026</th>
<th>% change 2011-2026</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whyalla and Eyre Peninsula</td>
<td>59,842</td>
<td>60,685</td>
<td>6,362</td>
<td>4.5%</td>
</tr>
<tr>
<td>South Australia</td>
<td>1,770,644</td>
<td>1,856,435</td>
<td>1,935,161</td>
<td>16.1%</td>
</tr>
</tbody>
</table>

*NB these regions approximately correspond to the study regions as discussed earlier in this report.
Source: Department of Planning and Local Government, cited in SA Centre for Economic Studies 2012

Economy

Agriculture, forestry and fishing (13%) and health care and social assistance (13%) are the two largest industries of employment for people in the Eyre and Western region. Other key industries of employment are manufacturing (12%) and retail trade (12%). Together, these four industries account for half of the employment in the region. In comparison, these four industries account for 34% of employment on a state level.

The Eyre and Western region has a labour force profile that is similar to SA. The proportion of the labour force in full-time employment in the region (57%) is the same as the proportion in South Australia (57%). The
proportion of part-time employment is also broadly similar in the Eyre and Western Region (30%) and in SA (32%).

49% of people in the Eyre and Western region have an income between $200 and $799 per week. The Eyre and Western region also has a lower proportion of the population in the following income brackets: $800-999, $1000-1249, $1250-1499, $1500-$1999 and $2000 or more. This strongly suggests that incomes are lower on average in Eyre and Western region. The median income ($400-$599) and modal income bracket ($400-$599) in the region are the same as in SA.

Income support for residents in the region included 6.6% of the population recipients of unemployment benefits, and a total of 29.6% of the region being Centrelink card holders.

Figure 3.3: Total personal weekly income, Eyre and Western, 2011

Source: ABS Census 2011

Education

Like the other regions profiled, Eyre and Western has a significantly lower proportion of its working age population with any non-school qualification\(^1\) (32.5%) when compared to the State average (42.0%) or to Australia as a whole (44.9%). This gap is seen across the board in all types of non-school qualifications excluding a Certificate level qualification which is found in 22% of the working population in Eyre and Western, but only 18.8% of SA. The biggest gap in non-school qualifications is at the Bachelor Degree level with 7% of the working age population in Eyre and Western holding that level of qualification, compared to 11.6% of the working age population in SA and 13.5% nationally.

In the Eyre and Western region, 29% of the population identified that they were engaged in study toward a non-school qualification. While some of the people in the ‘inadequately described/not stated/not applicable’ category may have held a non-school qualification, this can be assumed not to be the case for the majority.

This is in contrast to South Australia more broadly, where 83% of the population reported a field of study in non-school qualifications. Similar to the state average, and the other regions profiled in this analysis, engineering and related technologies was the most popular area of qualification (8% of the Eyre and Western region), followed by management and commerce (4%).

\(^1\) This variable describes the level of education of the highest completed non-school qualification (e.g. bachelor degree, diploma).
Regional background

The proportion of adults not attending any type of education in Eyre and Western (89.3%) is significantly higher than in South Australia (71.3%). This is driven by the low proportion of adults in Eyre and Western undertaking full-time studies (0.5%) and part-time studies (3.3%).

Table 3.3: Percentage of population aged 18 and above studying in the Eyre and Western region

<table>
<thead>
<tr>
<th>Education type</th>
<th>Eyre and Western</th>
<th>South Australia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not attending</td>
<td>89.3%</td>
<td>71.3%</td>
</tr>
<tr>
<td>Full-time student</td>
<td>0.5%</td>
<td>19.3%</td>
</tr>
<tr>
<td>Part-time student</td>
<td>3.3%</td>
<td>4.2%</td>
</tr>
<tr>
<td>Institution stated, full-time/part-time status not stated</td>
<td>0.1%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Both institution and full-time/part-time status not stated</td>
<td>6.8%</td>
<td>5.0%</td>
</tr>
</tbody>
</table>

Source: ABS Census 2011

Social infrastructure

Eyre and Western has 6 local health services each run by a local Health Advisory council. Within the region, there are 11 hospitals. Major upgrades have already been planned or undertaken at Ceduna Hospital (completed), Whyalla Hospital (scheduled to finish in May 2013) upgrade of Port Lincoln Hospital (currently in planning).

Critical Rural Health Services that operate in the Eyre and Western region are

- Rural Primary Health Services
- Medical Specialist Outreach Assistance Program
- Royal Flying Doctor Service of Australia
- Rural Women’s GP Service
• Visiting Optometrist Scheme

Of particular note is the fact that significant portions of the region are in areas considered “remote” or “very remote”. This makes access to healthcare critically dependent on transport services. Future development and use of tele-health services including remote conferencing and consultation is set to grow as the rollout of the National Broadband Network (NBN) continues.

There are 27 preschools/kindergartens in the region including 5 school-based preschools reflecting the high proportion of young children in the region. As for school based education, there are 39 government schools in the region with a total enrolment of 7734 students, as well as 5 non-governmental schools, all of which are Christian schools, with a total enrolment of 2404 students.

School age students also have access to 2 specialist schools that teach Farming and Aquaculture as well as the Eyre and Western Trade Training Centre Consortium, which includes 11 secondary and area schools and provide opportunities in primary industry and trades.

The University of South Australia has a campus at Whyalla. The Lincoln Marine Science Centre (LSMC) also operates in the area allowing students to complete marine science related courses through TAFESA and Flinders University.

TAFE SA Regional has 3 major campuses in the region at Whyalla, Port Lincoln and Ceduna as well as sites at Wudinna, Cleve and Kimba.

There are 17 police stations within Eyre and Western which are predominantly located along more populated areas, and thus hew closely to the major road network within the region.

Sports and recreation facilities in the region are commonly co-located, for example at the Streaky Bay Oval Precinct and the Cummins Recreation Centre, which all have multi-purpose sporting facilities. The region also has a significant number of theatres and museums, including the Middle Back Theatre, Civic Hall Complex in Port Lincoln, D’Faces of Youth Arts hall as well as the Axel Stenross Maritime Museum, Whyalla Visitor Centre and Maritime Museum, Koppio Museum, Excell Blacksmith and Engineering Museum, Ceduna Historical Museum and Darling Terrace Gallery.

Land use and the environment

The Eyre and Western region is dominated by agricultural and pastoral land use. Other land uses in the region include conservation, Defence (the Cultana Training Facility) and Indigenous Lands (including the Maralinga Tjarutja lands). The known extent of remnant vegetation in the Far West of the State is significant, whilst on the Eyre Peninsula itself, remnant vegetation is more patchy and is predominantly found in dedicated conservation areas and along roadside and rail reserves. This region also includes a significant number of national parks, including coastal, island and marine reserves which provide significant habitat, breeding and feeding resources for a variety of fauna and flora species.

A list of key environmental assets in the Eyre and Western is in Appendix B and the figure overleaf shows the location of key environmental assets across South Australia.
Figure 3.5: Key South Australian environmental assets
Implications of mining growth

Mining sector expansion is expected to have a significant impact on development and community dynamics of the Eyre and Western Region. Along with the increased investment and commercial activity that would be expected, the increased mining activity will also result in some influx of temporary and permanent residents to the region.

Some clusters on the Eyre Peninsula (South Gawler, Central Eyre and Southern Eyre) are close to existing townships which are likely to be able to provide workers to support mining activity. Local towns will play a central role in providing workers access to key social services such as health and education, social infrastructure such as housing, water and sewerage and broader community and recreational services such as pools, gymnasiums, cafes and retail facilities.

By contrast, Western Sands and Mount Christie operations are not in close proximity to existing townships and are likely to rely heavily on labour sourced from outside the area. In this case it is likely the remoteness of the new operations will promote the development of company built and operated towns to house the growing workforces and provide basic social services. The requirement to accommodate workers from outside the region may necessitate the investigation of new or expanded airports to service these clusters.

Identification of specific social infrastructure and community service needs (including airports) will be undertaken during the prioritisation assessment process in Stage 5.
4. Regional mining profile

Mining in South Australia

Mining has played a key part in the development of South Australia from its foundation, providing not only an economic mainstay but encouraging waves of immigration and exploration. Australia’s first metal mine was established at Glen Osmond in 1841, and before 1850, virtually all of Australia’s metal mines were located in South Australia which, for a period, produced about 10% of global copper supply. Many South Australian firms supplied mining machinery to other Australian colonies, and the economic benefits derived from mining made finance available for further mining developments around Australia.

The copper and gold rushes of the 1850s and 1860s, and the subsequent development of South Australia’s mining industry through the early 20th century fostered the development of infrastructure across the state, facilitating the exploration and settlement of the more remote areas of the state. Numerous towns were founded along or near the infrastructure corridors established to service the state’s burgeoning minerals exports. Through the 20th century, the impact of mining on the state economy was overtaken by agricultural exports but, with the development of the Olympic Dam mine in the 1980s and a steady increase in minerals exploration through the 1990s, the importance of the minerals sector in South Australia began to rise once more.

The PACE (Plan for Accelerating Exploration) funding initiative was established by the South Australian Government in 2004 to promote minerals exploration in the state. The PACE (Plan for Accelerating Exploration) funding initiative was established by the South Australian Government in 2004 to promote minerals exploration in the state. PACE seeks to provide a robust, transparent and timely process to streamline the mining assessment and approval processes that are critical in determining the overall economic, environmental and social impact of a project.2

Initially a 5 year program, PACE is now funded through to 2014 with total funds in excess of $40 million. Due to the increased exploration over the last decade facilitated by the PACE program and encouraged by increasing commodity prices, hundreds of new deposits have been identified and several new mines are now operating. From four operating mines in 2000, South Australia currently has 20 approved mines, and over 130 developing projects and prospects. In the 2012 Financial Year, South Australia’s minerals exports exceeded $4 billion per year, more than one third of total State exports.

With this existing and the potential evident from the number of significant mining projects currently in advanced development, the expansion of South Australia’s mining sector over the coming decades will place additional demand on existing infrastructure networks, support services and systems. Therefore, the expansion of South Australia’s power, water and transport infrastructure is a necessity in order to capitalise on the state’s mineral prospectivity and supports the expansion of mineral production and exports.

Mining in the Eyre and Western region

The Eyre Peninsula has a strong relationship with the mining sector dating back to the 1860s. Beginning with Iron Knob, iron has been mined in the Middleback Ranges since the 1890s, and there have been numerous copper discoveries on the Peninsula, including the Burrawing mine at Lipson near Tumby Bay. BHP and Arrium (formerly OneSteel) have expanded extractive operations in the Middleback Ranges. The associated steelworks and shipyards at Whyalla were a long term economic mainstay in this region. Other commodities mined on the Eyre Peninsula include gypsum, talc, kaolin, jade and graphite.

Current mining operations on the Eyre Peninsula include Arrium’s ongoing Middleback Ranges mines such as Iron Chieftain and Iron Duke, and Iluka’s Jacinth and Ambrosia heavy mineral sands deposits. It should be noted these deposits are not in the Eyre and Western region but are discussed in this context due to the interaction with infrastructure in the region, this is discussed further at the end of this chapter.

The exploration focus on the Eyre Peninsula is centred on a number of large iron deposits spread throughout the eastern and central parts of the Peninsula. Several advanced magnetite projects have marked the Eyre Peninsula as a potential major new iron province in Australia. In addition, the identification of promising uranium, graphite and kaolin deposits and further heavy mineral sands discoveries have added to the diversity of commodities under investigation in the region.

Of the 20 major mines operating in South Australia, just three are located in the region. While Wilgerup is classified as a major mine due to its approval status the mine is still to be constructed. A summary of the mining pipeline for the region is presented below.

It should be noted the economic contribution of mining is a function of production volumes and price paid for the commodity (i.e. uranium is produced in relatively high volumes, but has a relatively high price per tonne).
In total there are 15 mining sites recognised by the Department for Manufacturing, Innovation, Trade, Resources and Energy across the Eyre and Western region that have been assessed as part of the RMIP project. Mining activity in the Eyre and Western region has a focus on iron ore and heavy minerals (HM) projects, but also includes gold, uranium, graphite and kaolin prospects.
Table 4.1: Summary of Eyre and Western region mining activity by resource type (as at April 2013)

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Iron</th>
<th>Cu</th>
<th>U (and associated)</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Operating mines</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1 (HM)</td>
</tr>
<tr>
<td>Number of Developing Projects</td>
<td>8</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4 (HM, Kaolin, Graphite)</td>
</tr>
<tr>
<td>Number of Prospects</td>
<td>5</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Total mining projects</td>
<td>15</td>
<td>9</td>
<td>0</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 4.2: Indicative annual production values for the major mines in the region (2012-13)

<table>
<thead>
<tr>
<th>Mine</th>
<th>Proponent</th>
<th>Mineral</th>
<th>Annual Production volume</th>
<th>Mine/ resource life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jacinth/ Ambrosia</td>
<td>Ilkua</td>
<td>Heavy Minerals (eg zircon)</td>
<td>815,000 tonnes</td>
<td>8</td>
</tr>
<tr>
<td>Middleback Ranges (includes Iron Chieftain)</td>
<td>Arrium</td>
<td>Iron DSO</td>
<td>9.2 mtpa</td>
<td>10</td>
</tr>
</tbody>
</table>

**Iron Projects**

The defining characteristic of iron ore mining is whether the target ore body is haematite or magnetite; these two types of iron oxide deposits have vastly different mineral characteristics which, in turn have considerable impacts on the commercial considerations of mining.

**Haematite**

Haematite comprises the majority of Australia’s iron ore projects, including those in the Pilbara region of Western Australia. Haematite deposits are usually found with other iron minerals such as goethite and limonite, and contain high levels of iron (usually around 60%).

The higher proportion of iron in haematite deposits means mine production can be shipped to steelworks with little or no processing at the mine site. This practice of shipping ore in the state in which it is extracted is referred to as a direct shipping ore (DSO) operation.

The lack of processing required for DSO haematite operations means there is a significantly lower need for capital equipment at the mine site than for magnetite mines. Less capital equipment results in a lower capital cost of developing mines and lower operating cost as there is not as large a draw on power.

The relatively low capital and operating cost of haematite mines means they can be commercially viable at significantly lower production levels (as low as 1-2 mtpa) than magnetite mines.

**Magnetite**

Magnetite is a magnetic iron oxide, and is often found in association with haematite deposits. Magnetite deposits have a lower iron content when mined (usually 25% to 40%) when compared to haematite, which means these deposits have lower overall yields.

The lower iron content found in magnetite deposits means the extracted ore needs to undergo more complex processing at the mine site to produce a magnetite concentrate. This beneficiation requires capital equipment such as grinding mills, crushing plants and magnetic separators, which significantly increase the capital and
operating cost of magnetite mines. The greater fixed and operating cost of magnetite means they must ship ore in larger volumes (around 5 mtpa) to be commercially viable.

However, magnetite mines typically ship concentrate at 68% to 70% iron content. This higher quality product attracts a premium price from steel making customers, which can potentially offset the greater costs associated with processing.

**Iron deposits in the Eyre and Western region**

The geographic distribution of iron ore deposits in the Eyre and Western region is presented in the figure below.

**Figure 4.2: Map of the iron ore mining activity in the Eyre and Western region**

There are no currently operating iron ore mines in the Eyre and Western region, although the Wilgerup mine is in an advanced stage of development. The Eyre Peninsula is regarded as highly prospective region for magnetite, with a number of advanced projects in development. The table below details the iron prospects assessed as part of the RMIP project.
Table 4.3: Iron ore activity in the Eyre and Western region

<table>
<thead>
<tr>
<th>Mine</th>
<th>Operator</th>
<th>DMITRE status</th>
<th>Mine Stage</th>
<th>Target Commodity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middleback Ranges [includes Iron Chieftain]</td>
<td>Arrium</td>
<td>Major Mine</td>
<td>Operating</td>
<td>Iron</td>
</tr>
<tr>
<td>Wilgerup</td>
<td>Centrex Metals</td>
<td>Major Mine</td>
<td>Approved Mine - PEPR\textsuperscript{A} finalisation</td>
<td>Iron</td>
</tr>
<tr>
<td>Fusion</td>
<td>Centrex Metals</td>
<td>Developing Project</td>
<td>DFS commenced 2012</td>
<td>Iron</td>
</tr>
<tr>
<td>Central Eyre Iron Project [Warramboo, Kopi]</td>
<td>Iron Road</td>
<td>Developing Project</td>
<td>Bankable FS 2012, MLA 2013, DFS by Dec 2013</td>
<td>Iron</td>
</tr>
<tr>
<td>Gum Flat</td>
<td>Lincoln Minerals</td>
<td>Developing Project</td>
<td>Pre FS 2012</td>
<td>Iron</td>
</tr>
<tr>
<td>Bungalow + Minbrie</td>
<td>Centrex Metals</td>
<td>Prospect</td>
<td>Pre FS 2012</td>
<td>Iron</td>
</tr>
<tr>
<td>Eyre Iron Magnetite project (Carrow)</td>
<td>Centrex Metals</td>
<td>Prospect</td>
<td>Pre FS 2012</td>
<td>Iron</td>
</tr>
<tr>
<td>Greenpatch</td>
<td>Centrex Metals</td>
<td>Prospect</td>
<td>Pre FS 2012</td>
<td>Iron</td>
</tr>
<tr>
<td>Bald Hill + Charlton Gully</td>
<td>Centrex Metals</td>
<td>Prospect</td>
<td>Exploration</td>
<td>Iron</td>
</tr>
</tbody>
</table>

\textsuperscript{A} PEPR – Program for environment protection and rehabilitation

Copper Projects

Many of the known South Australian copper deposits occur near the margins of the Gawler Craton, including several significant copper prospects within the Eyre and Western region.

The copper produced in South Australia is shipped either as a concentrate or as refined copper metal. The processing of copper has a significant power and water requirement per tonne, particularly the production of refined copper.

Copper deposits are often found in association with commercial reserves of iron ore, gold and uranium. Often the more valuable metals are obtained as by-products of iron ore processing.

Copper deposits in the Eyre and Western region

The Eyre and Western region is not highly prospective for copper. Although uranium is the primary target of the Pundinya prospect, the deposit includes some copper resources, as shown in the table below. The geographic distribution of copper deposits in the Eyre and Western region is presented in the following figure.
Uranium Projects

Uranium mines typically undertake a significant amount of beneficiation at the mine site to produce uranium oxide concentrate suitable for shipping. Although the volumes of concentrate produced are generally not large in comparison to bulk minerals such as iron ore, the processing requirements means uranium mines have a relatively high power and water requirement per tonne of final product shipped.

Uranium deposits in South Australia are generally either hosted in breccia or sandstone geology.

Breccia hosted uranium

Breccia hosted uranium mines require the breccia in which the uranium is contained to be extracted by either open cut or underground mining for processing. The hardness of breccia means it is technically challenging to extract the material as well as costly to crush sufficiently to enable further processing. Breccia hosted uranium deposits must normally be close to the surface if they are to be commercially viable.

Breccia hosted uranium is processed to derive uranium oxide above ground, with significant water and power requirements. In addition, considerable safety measures are required due to its radioactivity.
Sandstone hosted uranium

Due to the porous nature of the surrounding rock, sandstone hosted uranium can be extracted the using in-situ recovery (IRS) process. This process involves circulating local groundwater and chemical solutions through a network of wells through the host rock, which dissolves the uranium. The solution is then pumped to the surface and processed to produce uranium oxide concentrate suitable for shipping.

Because the ISR process is largely undertaken underground, this removing the need for much of the capital expenditure associated with traditional open cut or underground mining operations, such as crushing plants and smelters. Therefore, sandstone hosted uranium deposits require less power and water for extraction and processing than breccia hosted uranium, and produce fewer tailings.

Uranium deposits in the Eyre and Western region

The geographic distribution of uranium deposits in the Eyre and Western region is presented in the figure below.

Figure 4.4: Map of uranium related mining activity in the Eyre and Western region

The Pundinya project is the only uranium project in the Eyre and Western region assessed as part of the RMIP project.

Table 4.5: Uranium activity in the Eyre and Western region

<table>
<thead>
<tr>
<th>Mine</th>
<th>Operator</th>
<th>DMITRE status</th>
<th>Target Commodity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pundinya</td>
<td>Marmota Energy</td>
<td>Prospect</td>
<td>U, Cu, Ni</td>
</tr>
</tbody>
</table>
**Other Projects (Heavy Minerals, Nickel, Graphite, Kaolin)**

In addition to the minerals discussed above, the Eyre and Western region includes several prospects that target other commodities, including gold, silver and other metals.

**Heavy minerals**

Heavy Minerals, such as zircon, rutile and ilmenite, are generally found in sand deposits. The Jacinth/Ambrosia mine currently produces over 800,000 tonnes of heavy mineral concentrate annually, which is exported through the port of Thevenard. The heavy minerals deposits in the Eyre/Western region assessed as part of the RMIP project are detailed below.

**Figure 4.5: Map of mining activity in the Eyre and Western region**

![Map of mining activity in the Eyre and Western region](image)

**Table 4.6: Other mineral activity in the Eyre and Western region**

<table>
<thead>
<tr>
<th>Mine</th>
<th>Operator</th>
<th>DMITRE status</th>
<th>Mine Stage</th>
<th>Target Commodity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jacinth/Ambrosia</td>
<td>Iluka</td>
<td>Major Mine</td>
<td>Operating Mine</td>
<td>HM</td>
</tr>
<tr>
<td>Tripitaka</td>
<td>Iluka</td>
<td>Developing Project</td>
<td>Exploration</td>
<td>HM</td>
</tr>
<tr>
<td>Atacama/ Typhoon/ Sonoran</td>
<td>Iluka</td>
<td>Prospect</td>
<td>Advanced Exploration</td>
<td>HM</td>
</tr>
</tbody>
</table>

**Graphite**

Graphite is a crystalline form of carbon, and numerous deposits of high quality graphite have been identified on the Eyre Peninsula. Whilst some of these are associated with historical graphite mining operations, the region has been the focus of considerable graphite exploration in recent years.
The RMIP project has only assessed the Uley project, which is associated with a historical mine that produced graphite up to 1993.

**Kaolin**

Kaolin is a clay mineral formed from the weathering of silica rich rock such as granite and gneiss, and is used in paints, ceramics, polymers and other industrial applications. The Carey's Well project near Poochera has been included in the RMIP project assessment.

**Mining clusters**

To aid in the identification of concentrations of mining activity in South Australia and the associated requirement for supporting infrastructure mineral deposits have been grouped into clusters of mines.

The intention of the development of clusters is to identify those operating and prospective mines which are likely to have similar infrastructure needs. Therefore, three factors determined whether or not mines would be clustered together:

- Common mineral being extracted (likely to reflect common freight need)
- Common extraction technique (likely to reflect common water and power needs)
- Geographic proximity (to reflect the location in which the infrastructure must be provided).

A key advantage of the development of clusters is the ability it provides to analyse infrastructure demand and facilitate solutions on an aggregated basis, as opposed to mine-by-mine solutions. Further, the consideration of clusters rather than individual mines means identified infrastructure demand, and thus the viability of solutions, is not reliant on circumstances impacting individual operations.

The mining clusters referred to for the remainder of this interim report are presented in the figure overleaf.
Figure 4.6: Mining clusters in the Eyre and Western region
5. Existing infrastructure profile

Mining activity in the Eyre and Western region has increased significantly over the last decade. To date mining operators have fashioned composite bulk freight solutions utilising pre-existing infrastructure networks. This chapter reviews the nature and extent of infrastructure currently in place to support mining activity in the Eyre and Western region; its condition, capacity and capability to meet current infrastructure needs and any current infrastructure deficiencies that need to be addressed.

This chapter is divided into three sections:

- The first is a summary of the infrastructure solutions utilised by existing mines
- The second is an examination of the technical characteristics of infrastructure in the Eyre and Western Region across the categories necessary to support current and future mining activity
- The third summarises the extent to which current infrastructure is supporting mining activity in the Eyre and Western Region.

The information in this chapter is presented to give context and a point of comparison to the discussion of the expected future infrastructure needs of mining in the Eyre and Western Region presented in chapter 6.

Current infrastructure approach of major miners in the region

A summary of the major mines current output and infrastructure tasks is provided in the table below.

Table 5.1: Major mine infrastructure needs

<table>
<thead>
<tr>
<th>Mine</th>
<th>Annual Production volume (mtpa)</th>
<th>Transport to market</th>
<th>Utilities</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jacinth/Ambrosia</td>
<td>0.82</td>
<td>Road to Thevenard</td>
<td>Onsite diesel power station, desalinated groundwater</td>
<td>n/a</td>
</tr>
<tr>
<td>Middleback Ranges (includes Iron Chieftain), Arrium</td>
<td>9.2</td>
<td>Rail to Whyalla</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: SMEC

Existing infrastructure profile

Ports

Currently there are four ports within the Eyre and Western Region:

- Thevenard
- Port Bonython
- Port Lincoln
• Whyalla

Further details for these ports are provided below.

**Figure 5.1: Overview of existing port facilities in the Eyre and Western region**

1. Thevenard

The Port of Thevenard experienced an export volume of approximately 3 million tonnes in 2011. The largest export commodity is Gypsum (1.7mtpa), followed by mineral sands (in excess of 0.4mtpa) and then grain (up to 0.4mtpa).

The Port of Thevenard is operated by Flinders Ports, has a single cargo jetty of approximately 200m in length and Port water depth of 9.8 metres, although operations are constrained by the depth of the Yatala Channel at 8.2m.

The Port precinct covers an area of approximately 95 hectares and cargo storage at the site is limited. There is limited opportunity to expand the port precinct as it abuts residential areas to the north and recreation areas to the east.

The 2008 Eyre Peninsula Ports Master Plan proposed dredging the Yatala Channel to a depth of 10.7m as a key proposal to maintain or grow export volumes from the Port of Thevenard. The 2011/12 Annual report from Regional Development Australia, Whyalla and Eyre Peninsula, identifies the need for upgraded capacity for loading operations as key to any expansion of the Port. At this point however there is no commitment to funding or timing for these proposals.
There is a proposal to establish a marine offloading facility at Thevenard for the fishing fleet in the Western Eyre region. This project is aimed at separating fishing industry Port activities from other commodities and has been identified as a high priority project by Regional Development Australia, Whyalla and Eyre Peninsula (RDAWEP). The District Council of Ceduna has submitted a Development Application for the project as Crown Development under Section 49 of the Development Act 1993. The State Government Department of Planning, Transport and Infrastructure has endorsed the Development Application and the necessary funding is currently being sought through the Regional Development Australia fund.

2. Port Bonython

Port Bonython is owned by the State Government and currently solely operated by Santos as an export only facility exporting approximately 250,000 tonnes per annum (approximately 30 ships per year) of product including Naptha, Crude Oil, Propane and Butane. Port Bonython is subject to an indentured act of Parliament – The Stony Point (liquid projects) Ratification Act 1981.

The Port uses a 2.4km jetty to deep water (approximately 20m) to load ships up to Cape Size. Opportunities to use this Port for other commodities are limited by the safety and practical implications of integrating with the existing uses.

Government approval exists for the construction of a diesel receival, storage and distribution facility at the Port enabling the delivery of up to 1 billion litres of diesel annually to the region although commitment to funding and timing for this development are not confirmed.

3. Port Lincoln

Port Lincoln is managed by Flinders Ports and typically exports 1-3 million tonnes of product, depending on the grain harvest.

Port Lincoln has natural deep water at the berths of up to 15.2m which will cater for small CapeSize and Post Panamax vessels. Viterra own and operate two travelling bulk grain loaders at Berths 4 and 5.

While the naturally deep water and Port location itself are well suited to attracting increasing throughput, the need to move product through the town is a significant constraint.

Centrex Metals received Development Approval in October 2009 to export 1.6 million tonnes of iron ore / annum through Port Lincoln for a maximum of 10 years, however a number of community concerns were raised with this proposal. As a result this approval has now been in place for over 3 years and has not been enacted by Centrex; who are progressing their Port Spencer proposal.

There are proposals for a new unloading facility for Port Lincoln’s fishing fleet at Proper Bay, which may provide the dual benefits of separating the fishing industry from other uses and freeing up additional port capacity. The timeframes for this development are not committed.

4. Whyalla

Whyalla is South Australia’s largest export facility currently exporting more than 6 million tonnes per annum of primarily Iron Ore.

Whyalla Port is owned by the State Government and is operated by Arrium (formerly OneSteel) under an indenture Act of Parliament (The Whyalla Steel Act 1958).

The Port operates using barges to two transhipment points (one for Panamax Vessels and one for Capesize vessels) up to 12km from the Port.
Arrium are currently undertaking an expansion of the facilities at the Port of Whyalla to approximately double the capacity of the Port (from 6Mtpa to 12 Mtpa).

There is opportunity to increase landside storage in alignment with the Whyalla structure planning process.

5. Other – Lucky Bay

In addition to the above defined ports, the Lucky Bay Harbour is used as the Eyre Peninsula terminal for the Wallaroo – Lucky Bay Ferry service operated by Sea Transport.

Rail

The rail network in this region is comprised of four distinct parts:

1. Narrow gauge lines between Kevin and Port Lincoln and between Buckleboo and Port Lincoln
2. Narrow gauge lines between Iron Knob and Iron Baron and Whyalla
3. Standard gauge rail line between Port Augusta and Whyalla
4. Standard gauge rail line between Tarcoola and Western Australia (Adelaide – Perth corridor)

Further details for these lines are provided below.

Figure 5.2: Overview of existing rail lines in the Eyre and Western region
1. A narrow gauge network between Kevin and Port Lincoln and between Buckleboo and Port Lincoln.

This is an isolated network that is owned, operated and maintained (contracted to Transfield) by Genesee Wyoming Australia (GWA) and principally carries grain to Port Lincoln and Gypsum to Thevenard.

This network typically carries 16 tonne axle loads at low operating speeds. The track is in ‘fit for purpose’ condition with a number of speed restrictions. The section between Cummins and Port Lincoln was upgraded in 2007.

There is some capacity to carry additional freight on these lines, however the 16 tonne axle limit and low operating speeds would need to apply along with an increased maintenance input, unless substantial track upgrade works were undertaken.

Without the track upgrade works, volumes in the order of 1.0mtpa may be able to be carried over and above existing use, subject to train scheduling being able to coordinate train crossings at existing loop locations.

2. Narrow gauge links between Iron Knob and Iron Baron and Whyalla.

These lines are owned by Arrium and operated and maintained by GWA.

There are no identified deficiencies with the condition of these lines, which currently operate at a 23tonne axle load (to be increased to 25 tonne as a part of current upgrade works). The lines currently carry approximately 6mtpa, although works are being undertaken to increase capacity to approximately 9.4mtpa in 2013. Arrium are currently building a balloon loop at Whyalla enabling standard and narrow gauge rail.

GWA advise that there is no available capacity for additional freight movements on these lines. Third party access to this track would have to be negotiated with Arrium.

3. Standard gauge rail link between Port Augusta and Whyalla.

This section of track links to the defined interstate rail network (DIRN) and is owned and operated by the Australian Rail Track Corporation (ARTC). This track is able to carry 1800m trains with 25 tonne axle loads and an 80km/h speed limit. Train control is via a verbal train order system although ARTC are proposing to roll-out a new ‘in-cab’ train control system in the next decade which will improve safety and operational efficiency on the line.

ARTC advise there is currently no spare capacity on this line.

4. Standard gauge rail between Tarcoola and Western Australia (part of the Adelaide – Perth corridor).

This is a part of the main ARTC interstate freight network. This line operates at 23 tonne axle load at 80km/h.

There are no identified deficiencies in the condition of the track. As for the Port Augusta to Whyalla section, train control is via a verbal train order system although ARTC are proposing to roll-out a new ‘in-cab’ train control system in the next decade.

There is currently some capacity for additional freight on this section which is broadly estimated at 3 train paths per week or 1.2mtpa, based on a number of assumptions.

Road

Roads through this region are a combination of National Highway (Eyre Highway), State Arterial Roads and local roads. Typical existing traffic volumes and percentage of freight vehicles are shown on the diagram below.
Existing infrastructure profile

The Eyre Highway is in fair condition although is recognised as having an aged pavement and shoulders that will require upgrade over time, particularly west of Penong.

The Lincoln Highway is generally in good condition, particularly the section between Port Augusta and Whyalla which was upgraded approximately 4 years ago. Other arterial roads are generally fit-for-purpose however most roads will require shoulder upgrade and sealing if significant additional loads are to be accommodated. Additionally many arterial roads will have insufficient pavement strength to carry significant additional loads and pavement upgrade works are likely to be required.

The Department of Planning, Transport and Infrastructure also manages roads in the unincorporated areas in the far west of this region as a part of a total of 10,000 of their unsealed road network through the north and west of the state. Almost all of these roads would require pavement upgrade and sealing if significant additional loads were to be allocated.

The local network is a mixture of sealed and unsealed roads managed by 11 regional councils. The roads are generally fit for purpose however almost all local roads would also require pavement upgrade, shoulder widening and sealing if significant further loads were to be added.
Many roads, as detailed in the DPTI online RAVNet system, are currently gazetted for a range of Restricted Access Vehicles including:

- 32 and 36.5m road trains
- B-doubles
- HML vehicles.

In addition, a number of roads are also used for over-dimension and over-mass freight movements.

In broad terms, there is spare capacity on most roads however the following would need to be considered as a part of a risk assessment process prior to any material change in volumes or type/s of vehicles used in individual roads or sections of road;

- Pavement capability,
- Road geometry (including intersection layouts),
- Safety, including interfaces with other users (eg rail) and crash history,
- Impact on structures (culverts, bridges)
- Community impact (eg; if a road passes through a town)
- Service level impacts (eg; opportunities to overtake)
- Road upgrade costs and responsibility
- Road maintenance costs and responsibility.

It should be noted ownership and responsibility for maintenance of national highways is with the Commonwealth Government, state roads with the South Australian Government and local roads with local councils.

**Electricity**

Electricity for the Eyre and Western Region is provided from the South Australian Electricity Grid via the ElectraNet transmission network and the South Australian Power Networks (SAPN) Distribution network.

The South Australian Electricity Grid receives power generated from coal fired power stations at Port Augusta (approximately 16%), nine gas fired power stations (approx. 65%) and a number of wind (17%) and diesel (2%) generation sites. In addition, the South Australian grid is connected to the National Electricity Market via two interconnector systems.

The peak demand for South Australia is at approximately 3,400MW, which occurs for about 80 to 100 hrs per year. For over 90% of the year, South Australia uses between 1,000 and 2,000 MW; a level which is well below the states peak demand.

The generation capability for South Australia, without reliance on the interconnectors, is approximately consistent with the current peak demand requirements.

For the Eyre and Western region of the state, Transmission of electricity is via a 275kV network to Cultana and then via 132kV radial supplies to Yadnarie, Wudinna and Port Lincoln. In addition to that shown there are some local sections of transmission line connecting Wind Farms to the network and connecting the Iron Baron mine in the Middleback Ranges.

A summary of the electricity network in the region is presented in the diagram overleaf.
This system is currently able to supply capacity of approximately 100MW to the Eyre and Western region. This is used to near capacity at present, although demand has reduced slightly in recent years.

Accordingly, there is limited capacity for significant additional demand on this section of the network.

ElectraNet have advised that much of this system was originally built in 1967 and will need replacement / upgrade in the foreseeable future. ElectraNet have undertaken a Regulatory Investment Test to establish whether or not a capacity upgrade of this network should also be undertaken as a Regulatory project. At this stage, such an upgrade is not supported by the Regulator.

It is also recognised that Eyre Peninsula does have significant opportunity for further renewable energy generation (particularly wind and wave) but this will require an upgrade of the transmission network capacity in order to allow this generation to feed back into the South Australian grid.

**Water**

South Australia uses just over 200GL of water per annum. This water comes from:

- Surface Water 46.6%
- River Murray 45.6%
- Ground water 6.0%
- Sea water 1.8%

For the Eyre and Western Region, the current demand is approximately 27.7GL per annum, of which approximately 22% is for residential use, 29% is for non-residential use, 27% is used for stock, 14% for Mining and 8% for other.
The sources of water for this region are as follows,

- River Murray 39%, of which the vast majority is used in Whyalla
- Ground water 37%
- Tod Reservoir 7%
- Recycled water 11%
- Farm dams 6%

The total water supply sources are estimated at 28.6GL/a in the SA Water Demand and Supply statement for the region.

This is only marginally above the current demand estimates showing there is limited available capacity for any further significant demand. Similar to Electricity however, it should be noted that demand has reduced slightly in recent years.

In 2008, SA Water did identify that an additional water source will be required in the next 25 years and identified a desalination plant in the south of the Eyre Peninsula as the preferred approach. Timing for this will be dependent on ongoing demand monitoring.

**Gas**

South Australia’s gas is supplied from two sources;

- The Moomba to Adelaide pipeline system (MAPS), which links to the South West Queensland Pipeline System.
  This system is owned by Epic Energy (which is owned by APA Group) and has a transmission capacity of 253Terra Joules (TJ) per day.
  - The Seagas pipeline system which links to the Victorian gas fields.
    This system is owned by Seagas (which is 50% owned by APA Group) and has a transmission capacity of 303TJ/day.

These lines are shown in the figure overleaf.
Gas supply to South Australia is dependent on overall demands from the eastern states. At current demand rates it is forecast that the existing supply basins have capacity for a further 50 years.

The current usage of the MAPS and Seagas transmission systems is generally well below the system capacity (although goes closer to capacity at times of peak demand), indicating that there is likely to be capacity for additional gas supply if required.

Gas supply to the Eyre and Western Region is limited to a connection from the MAPS pipeline to Whyalla (as shown on the above diagram). This connection has a capacity of 24TJ/day of which a large percentage is used within Whyalla. It is therefore expected that there is only limited capability to supply gas to the Eyre and Western Region without significant capital expenditure.

Assessment of existing infrastructure

Existing Eyre and Western freight, power and water infrastructure were assessed to ascertain their condition, capacity and capability to meet current mining demand. Current infrastructure demand refers to the aggregate requirements of the major mines. The score scale used for this assessment is outlined in the table overleaf.
Table 5.1: Infrastructure assessment scale

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
</table>
| ![Good](image) | Good | • Infrastructure presents a low risk to mining operations/performance  
• Infrastructure considered adequate to meet current requirements  
• No immediate action required |
| ![Moderate](image) | Moderate | • Infrastructure presents a moderate risk to mining operations/performance  
• Moderate risk that emerging issues will impact infrastructures ability to meet current requirement  
• Short to medium term action likely |
| ![Poor](image) | Poor | • Infrastructure presents a high risk to operations, threatening overall performance  
• Significant risk that infrastructure will be unable to meet current demand requirements  
• Immediate action required |
| ![Not Applicable](image) | Not Applicable | • No infrastructure required, alternative infrastructure solution(s) are sufficient at this time  
• No current mining demand in area requiring infrastructure  
• No immediate action required |

The results of this assessment are summarised in the table below. This assessment was guided by the infrastructure benchmarks attached at Appendix D that outline the expected capacity, condition and capability standard of the alternate infrastructure.

Table 5.2: Assessment of infrastructure to meet current demand

<table>
<thead>
<tr>
<th>Mine Cluster</th>
<th>Ports</th>
<th>Rail</th>
<th>Roads</th>
<th>Power</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Condition</td>
<td>Capacity</td>
<td>Capability</td>
<td>Condition</td>
<td>Capacity</td>
</tr>
<tr>
<td>Central Eyre</td>
<td><img src="image" alt="Green" /> <img src="image" alt="Green" /> <img src="image" alt="Green" /></td>
<td><img src="image" alt="Green" /> <img src="image" alt="Green" /> <img src="image" alt="Green" /></td>
<td><img src="image" alt="Green" /> <img src="image" alt="Green" /> <img src="image" alt="Green" /></td>
<td><img src="image" alt="Green" /> <img src="image" alt="Green" /> <img src="image" alt="Green" /></td>
<td><img src="image" alt="Green" /> <img src="image" alt="Green" /> <img src="image" alt="Green" /></td>
</tr>
<tr>
<td>Mount Christie</td>
<td><img src="image" alt="Red" /> <img src="image" alt="Red" /> <img src="image" alt="Red" /></td>
<td><img src="image" alt="Red" /> <img src="image" alt="Red" /> <img src="image" alt="Red" /></td>
<td><img src="image" alt="Red" /> <img src="image" alt="Red" /> <img src="image" alt="Red" /></td>
<td><img src="image" alt="Red" /> <img src="image" alt="Red" /> <img src="image" alt="Red" /></td>
<td><img src="image" alt="Red" /> <img src="image" alt="Red" /> <img src="image" alt="Red" /></td>
</tr>
<tr>
<td>South Gawler</td>
<td><img src="image" alt="Red" /> <img src="image" alt="Red" /> <img src="image" alt="Red" /></td>
<td><img src="image" alt="Green" /> <img src="image" alt="Green" /> <img src="image" alt="Green" /></td>
<td><img src="image" alt="Green" /> <img src="image" alt="Green" /> <img src="image" alt="Green" /></td>
<td><img src="image" alt="Green" /> <img src="image" alt="Green" /> <img src="image" alt="Green" /></td>
<td><img src="image" alt="Green" /> <img src="image" alt="Green" /> <img src="image" alt="Green" /></td>
</tr>
<tr>
<td>Southern Eyre</td>
<td><img src="image" alt="Red" /> <img src="image" alt="Red" /> <img src="image" alt="Red" /></td>
<td><img src="image" alt="Red" /> <img src="image" alt="Red" /> <img src="image" alt="Red" /></td>
<td><img src="image" alt="Red" /> <img src="image" alt="Red" /> <img src="image" alt="Red" /></td>
<td><img src="image" alt="Red" /> <img src="image" alt="Red" /> <img src="image" alt="Red" /></td>
<td><img src="image" alt="Red" /> <img src="image" alt="Red" /> <img src="image" alt="Red" /></td>
</tr>
<tr>
<td>Western Sands</td>
<td><img src="image" alt="Green" /> <img src="image" alt="Green" /> <img src="image" alt="Green" /></td>
<td><img src="image" alt="Green" /> <img src="image" alt="Green" /> <img src="image" alt="Green" /></td>
<td><img src="image" alt="Green" /> <img src="image" alt="Green" /> <img src="image" alt="Green" /></td>
<td><img src="image" alt="Green" /> <img src="image" alt="Green" /> <img src="image" alt="Green" /></td>
<td><img src="image" alt="Green" /> <img src="image" alt="Green" /> <img src="image" alt="Green" /></td>
</tr>
</tbody>
</table>

The assessment demonstrates that existing infrastructure can adequately accommodate the mining output being produced by major mines in the Eyre and Western region. The bulk freight solutions available (and adopted by operators) coupled with the low output profile for the region placed the infrastructure in a strong position to meet current mining demand. While power and water have been identified as needing to be improved to support an expanded mining footprint, at this stage current demand requirements are being accommodated by. This emerging power and water issue is discussed further in Chapter 7.
6. Future mining demand

Analysis presented in chapter 5 demonstrates infrastructure in the Eyre and Western Region is sufficient to support existing mining operations. This chapter presents forecasts of future mining activity, and resultant infrastructure demand, under high, medium and low global economic growth scenarios.

Chapter 7 presents our analysis of the extent to which the existing infrastructure examined in chapter 5 is able to accommodate the future demands discussed in this chapter. Investigating ways to address the gap between the state of current infrastructure and demands of future mining is at the core of the RMIP project.

Future infrastructure needs will be driven by the mining production activity and freight and logistics task expected to take place in the region. Separate from the availability of infrastructure, the progression of mines from prospects to developments and developments to major mines will be based on the underlying profitability of each mine. Establishing an objective, transparent and robust forecast for this future mining activity is central to understanding what are and will be the pressing and emerging infrastructure needs for the region. This chapter presents the results of this mining demand forecast.

Demand modelling

A four step approach was undertaken to model the future mining demand for the Eyre and Western region. An overview of this approach is presented below. Data was collected on the nature and level of mining activity in the region during the preliminary stages of the project. Sources for this data included mining company annual reports, public statements by mining companies in relation to future mining plans, government databases and outputs from the previous RESIC survey. This material was augmented by private consultations with the leading mining companies, who assisted in validating and refining the information that had been collected.
This process underpinned the development of a mining project database which included the following detail:

Table 6.1: Project mine data collected

<table>
<thead>
<tr>
<th>Project</th>
<th>Resources</th>
<th>Demand estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operator</td>
<td>Target metals</td>
<td>Base Production Rate</td>
</tr>
<tr>
<td>Phase</td>
<td>Total resource deposits</td>
<td>Export Freight</td>
</tr>
<tr>
<td>DMITRE status</td>
<td>Grade of deposits</td>
<td>Import Freight</td>
</tr>
<tr>
<td>Region</td>
<td>Beneficiation process</td>
<td>Peak Power</td>
</tr>
<tr>
<td>Mine life</td>
<td>Main product</td>
<td>Electricity Consumption</td>
</tr>
<tr>
<td>Estimated lead time</td>
<td>Ore Mining Rate</td>
<td>Water Consumption</td>
</tr>
<tr>
<td>Logistics path(s)</td>
<td>Concentrate Grade</td>
<td>Potential Gas Use</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Potable Water Requirement</td>
</tr>
</tbody>
</table>

In parallel to this exercise commodity price data was collected for iron ore, copper, uranium and gold along with cost data for the respective mine operations and freight and logistics tasks.

Commodity price forecasts were drawn from Consensus Economics’ quarterly energy and metals forecasts, published December 2012. Consensus Economics develops forecasts using predictions submitted by more than 30 commodity forecasters (of which Deloitte Access Economics is one), including private sector consultancies and leading investment and commercial banks. The median of these forecasts is taken to be the most likely international economic scenario and the highest and lowest forecast are the high and low growth scenarios respectively.³

Using this data cost and revenue per tonne estimates were calculated and the profitability of respective mines determined for high, medium and low global economic growth scenarios. Based on the mines profitability, a total resource output was determined and associated freight, power and water demand requirements forecast for the relevant mining clusters and region. The results of this analysis are presented in the following tables⁴ ⁵.

Following consultation and more detailed assessment of potential infrastructure projects, operating costs for supporting infrastructure relevant to clusters of prospective mining projects will be refined. The impact on individual mine viability will be assessed and regional infrastructure demand cases restated through an iterative process to assess ideal regional common user infrastructure outcomes.

³ Refer to Appendix E for further details on these commodity price forecasts.
⁴ Mine to gate and gate to port operating costs are still to be finalised for each project. For the purposes of this interim report conservative estimates have been used. The analysis presented will be refined as this updated cost data is available and reported in the final of the plan.
⁵ In assessing the path to market solutions for each region, we have included mining clusters from neighbouring regions where for some clusters appear multiple times (i.e. in more than one plan) and subsequently caution should be taken if aggregating the demand totals from the three plans.


**Low case scenario**

Demand and prices indicated under the low global growth scenario are unlikely to support significant investment in new mining projects in the Eyre and Western Region.

Production from existing lower cost iron ore developments would be expected to continue over the effective life of existing projects, some low cost haematite DSO developments may be feasible however investment in new large scale iron ore production would be unlikely.

Mineral sands production in the Western Sands Region is under significant cost pressures at current market prices. Under a low global growth scenario, it would be anticipated that production would reduce and new developments would be unlikely.

**Table 6.2: Low case forecast infrastructure demand**

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Annual Mineral/ Concentrate Production (Mt p.a.)</th>
<th>Bulk Freight Task (Mt p.a.)</th>
<th>Peak Power Demand (MW)</th>
<th>Energy Consumption (GWh p.a.)</th>
<th>Water Consumption (ML p.a.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Eyre</td>
<td>0.24</td>
<td>1.52</td>
<td>0.04</td>
<td>0.26</td>
<td>1.67</td>
</tr>
<tr>
<td>Mount Christie</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>South Gawler</td>
<td>6.00</td>
<td>6.00</td>
<td>6.00</td>
<td>6.60</td>
<td>6.60</td>
</tr>
<tr>
<td>Southern Eyre</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Western Sands</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Other</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Total</td>
<td>6.24</td>
<td>7.52</td>
<td>6.04</td>
<td>6.86</td>
<td>8.27</td>
</tr>
</tbody>
</table>

- **Mining production volumes and requirement for infrastructure dominated by low cost Arrium haematite deposits.**
- **Heavy mineral sands production is omitted from the low growth scenario in light of Iluka market announcement of 21 February 2013 regarding possible idling of Jacinth-Ambrosia.**
- **Central Eyre production driven by short-life DSO haematite mining.**
- **Given minimal processing requirement for haematite DSO projects, relatively low infrastructure requirements.**
- **Water demand driven by iron ore production.**
Medium case scenario

Demand and prices indicated under the base case global growth scenario is expected to result in significant investment in new mining projects in the Eyre and Western Region in the medium to long term.

Iron ore prices are expected to moderate as additional global supply comes on-line and growth in demand eases however prices are expected to remain significantly above long term historic levels. Production from existing iron ore developments would be expected to continue over the effective life of existing projects along with projects to extend mine life, prices are also expected to be sufficient to support some larger scale magnetite developments in the Central Eyre region as well as smaller DSO developments throughout the region.

Mineral sands production in the Western Sands Region in existing developments is expected to continue however new developments would be unlikely whilst global demand remains soft.

Table 6.3: Medium case forecast infrastructure demand

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Annual Mineral/Concentrate Production (Mt p.a.)</th>
<th>Bulk Freight Task (Mt p.a.)</th>
<th>Peak Power Demand (MW)</th>
<th>Energy Consumption (GWh p.a.)</th>
<th>Water Consumption (ML p.a.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Eyre</td>
<td>0.24 31.34 40.04</td>
<td>0.26 34.47 44.04</td>
<td>0.5 270.9 361.2</td>
<td>2 1,375 1,828</td>
<td>48 39,052 52,007</td>
</tr>
<tr>
<td>Mount Christie</td>
<td>0.00 0.00 0.00</td>
<td>0.00 0.00 0.00</td>
<td>0.0 0.5 1.2</td>
<td>0 13 33</td>
<td>0 12 30</td>
</tr>
<tr>
<td>South Gawler</td>
<td>6.00 9.00 11.00</td>
<td>6.60 9.90 12.10</td>
<td>19.8 43.6 59.6</td>
<td>65 205 299</td>
<td>3,900 7,500 9,900</td>
</tr>
<tr>
<td>Southern Eyre</td>
<td>0.12 3.14 2.79</td>
<td>0.13 3.45 3.07</td>
<td>0.1 11.1 16.4</td>
<td>10 238 155</td>
<td>144 3,768 3,349</td>
</tr>
<tr>
<td>Western Sands</td>
<td>0.82 0.33 0.00</td>
<td>1.63 0.65 0.00</td>
<td>9.4 3.8 0.0</td>
<td>24 10 0</td>
<td>176 70 0</td>
</tr>
<tr>
<td>Other</td>
<td>0.00 0.00 0.00</td>
<td>0.00 0.00 0.00</td>
<td>0.0 0.0 0.0</td>
<td>0 0 0</td>
<td>0 0 0</td>
</tr>
<tr>
<td>Total</td>
<td>7.18 43.81 53.83</td>
<td>8.63 48.48 59.21</td>
<td>29.6 329.8 438.4</td>
<td>101 1,841 2,315</td>
<td>4,268 50,402 65,286</td>
</tr>
</tbody>
</table>

Medium growth scenario prices anticipated to support multiple small-scale haematite DSO and magnetite projects
Central Eyre magnetite developments assumed to be commercially viable at medium case long-term prices scenario
Scale of Central Eyre magnetite mines drive power and water needs of Eyre Peninsula in this growth scenario
The cumulative development of Central Eyre and South Gawler magnetite mines would lead to a considerable need for power and water per tonne shipped
South Gawler production expansion assumed to come from magnetite mines, considerably increase power, energy and water requirement
High case scenario

Demand and prices indicated under the high global growth scenario is expected to result in significant investment in new mining projects in the Eyre and Western Region in the medium to long term.

Iron ore prices are expected to return to near historic highs supporting new projects to extend mine life as well as new larger scale magnetite developments in the Central Eyre region and smaller DSO developments throughout the region.

Mineral sands production in the Western Sands Region in expected to continue at an accelerated rate and developments of new deposits would extend the use of existing processing and supporting infrastructure.

Table 6.4: High case forecast infrastructure demand

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Annual Mineral/Concentrate Production (Mt p.a.)</th>
<th>Bulk Freight Task (Mt p.a.)</th>
<th>Peak Power Demand (MW)</th>
<th>Energy Consumption (GWh p.a.)</th>
<th>Water Consumption (ML p.a.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Eyre</td>
<td>0.68</td>
<td>38.12</td>
<td>45.04</td>
<td>0.75</td>
<td>41.93</td>
</tr>
<tr>
<td>Mount Christie</td>
<td>0.00</td>
<td>1.60</td>
<td>0.36</td>
<td>0.00</td>
<td>1.76</td>
</tr>
<tr>
<td>South Gawler</td>
<td>8.34</td>
<td>10.65</td>
<td>11.00</td>
<td>9.17</td>
<td>11.80</td>
</tr>
<tr>
<td>Southern Eyre</td>
<td>0.12</td>
<td>4.16</td>
<td>7.83</td>
<td>0.13</td>
<td>4.60</td>
</tr>
<tr>
<td>Western Sands</td>
<td>1.42</td>
<td>0.85</td>
<td>0.07</td>
<td>2.83</td>
<td>1.69</td>
</tr>
<tr>
<td>Other</td>
<td>0.00</td>
<td>0.04</td>
<td>0.10</td>
<td>0.00</td>
<td>0.05</td>
</tr>
<tr>
<td>Total</td>
<td>10.56</td>
<td>55.42</td>
<td>64.40</td>
<td>12.88</td>
<td>61.83</td>
</tr>
</tbody>
</table>

Some small-scale Mount Christie magnetite production expected to be commercially viable in high growth scenario. Production peaks in second time period due to small deposits.

Investment in Western Mineral Sands production above medium growth scenario assumed. Production expected to tail-off as deposits reach end of commercial life.

Both haematite and magnetite projects expected to drive increase in production tonnage above medium growth scenario. Also, silver mining assumed to operate in the second time period, however production does not materially impact infrastructure needs.

Not a considerable increase in production in Central Eyre compared to medium growth scenario due to major developments in this cluster expected to proceed in medium growth scenario.

Central Eyre infrastructure needs increase considerably relative to the medium growth case, in line with increased.
The table below presents a consolidated regional demand profile for bulk freight, power and water across the high, medium and low global growth scenarios.

Figure 6.2: Consolidated regional demand profile
Little growth in the mining industry is expected above the level of activity already observed in the low growth scenario and mining production is not expected to exceed 10mt in any year. The profile of expected growth in mining industry production is similar in the medium and high global growth scenarios. Little production above current level is expected until 2018 in the medium growth scenario and 2017 in the high growth scenario. From these years production increases rapidly to a peak of approximately 60mt in the medium growth scenario and just over 70mt in the high growth scenario in 2020. Having reached these peaks, mining production in each of the scenarios declines slightly, but is largely stable over the period forecast. The rapid growth in mining production in the medium and high growth scenarios creates the need for investment in infrastructure over a relatively short time period, after production peaks have been reached the focus turns to operating and maintaining the infrastructure which has already been put in place.
7. Future infrastructure demands

The chapter consolidates the analysis presented in chapters 5 and 6 to present an understanding of the extent to which existing infrastructure in the Eyre and Western Region is able to meet the forecast needs of the mining industry. The difference between current infrastructure and future needs is the gap to be examined by the RMIP project.

Infrastructure demand for this analysis was based on the medium global growth scenario. The analysis was undertaken to identify the critical infrastructure deficiencies that are likely to hinder the development of South Australia’s mining sector in the region.

The ability of current infrastructure to meet the forecast demand from the mining sector is presented in the below tables. The analysis considers the infrastructure’s condition, capacity and capability to meet this demand over the 0-5 year, 6-10 year and 11-20 year time periods from 2013 to give an appreciation of how adequacy of infrastructure changes over time.

The second half of this chapter distils identified infrastructure deficiencies to critical infrastructure issues which must be addressed to facilitate the development of the mining sector. Again, these issues are presented with reference to the time periods in which they manifest.

Legend

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>↑</td>
<td>Adequacy of infrastructure to meet identified need improved compared to previous period</td>
</tr>
<tr>
<td>↓</td>
<td>Adequacy of infrastructure to meet identified need reduced compared to previous period</td>
</tr>
<tr>
<td>—</td>
<td>Adequacy of infrastructure to meet identified need the same previous period</td>
</tr>
<tr>
<td>*</td>
<td>New infrastructure demand in current period</td>
</tr>
</tbody>
</table>
### Table 7.1: Assessment of existing infrastructure to meet 0-5 year demand

<table>
<thead>
<tr>
<th>Mine Cluster</th>
<th>Ports</th>
<th>Rail</th>
<th>Roads</th>
<th>Power</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Condition</td>
<td>Capacity</td>
<td>Capability</td>
<td>Condition</td>
<td>Capacity</td>
</tr>
<tr>
<td>Central Eyre</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>Mount Christie</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>South Gawler</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>Southern Eyre</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>Western Sands</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
</tbody>
</table>

Source: Deloitte and SMEC (2013)

### Table 7.2: Assessment of existing infrastructure to meet 6-10 year demand

<table>
<thead>
<tr>
<th>Mine Cluster</th>
<th>Ports</th>
<th>Rail</th>
<th>Roads</th>
<th>Power</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Condition</td>
<td>Capacity</td>
<td>Capability</td>
<td>Condition</td>
<td>Capacity</td>
</tr>
<tr>
<td>Central Eyre</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>Mount Christie</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>South Gawler</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>Southern Eyre</td>
<td>★</td>
<td>★</td>
<td>★</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>Western Sands</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
</tbody>
</table>

Source: Deloitte and SMEC (2013)
Table 7.3: Assessment of existing infrastructure to meet 10 - 20 year demand

<table>
<thead>
<tr>
<th>Mine Cluster</th>
<th>Ports</th>
<th>Rail</th>
<th>Roads</th>
<th>Energy</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Condition</td>
<td>Capacity</td>
<td>Capability</td>
<td>Condition</td>
<td>Capacity</td>
</tr>
<tr>
<td>Central Eyre</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Mount Christie</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>South Gawler</td>
<td>-</td>
<td>-</td>
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<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Southern Eyre</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Western Sands</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: Deloitte and SMEC (2013)

**Emerging infrastructure issues**

Discussed below are the key deficiencies in the current infrastructure which are an impediment to the development of the mining industry.

- **Issue A:** Lack of suitable bulk commodities export port accessible by South Gawler, Central Eyre and Southern Eyre mines

The volumes of ore assumed to be produced by mines in the South Gawler, Central Eyre and Southern Eyre will require transportation to markets by large bulk vessels to be commercially viable. This requires bulk commodities export facilities at which these vessels can be loaded.

There are multiple bulk commodity export ports (including gain and mining, and noting Port Bonython exports gas only) on the eastern side of the Eyre Peninsula, however limitations in relation to the size of vessels which can be loaded at these ports limit their capability to service future mining demand. While Port Lincoln is able to load large vessels, landside infrastructure limitations represent considerable challenges.

South Gawler, Central Eyre and Southern Eyre mines will have no commercially viable access to markets for their product in the absence of access to a suitable bulk commodities export port.

- **Issue B:** Inadequate electricity transmission links to South Gawler, Central Eyre and Southern Eyre mines

Mining activity requires considerable electricity for the operation of extraction and processing activities. Much of the infrastructure which may be necessary to support mining activities, such as ports and desalination plants, have significant electricity demands.

Existing electricity transmission infrastructure on the Eyre Peninsula is near capacity under existing loads and close to the end of its economically useful life. Upgrade to the existing electricity infrastructure have been identified which would extend its economically useful life and provide some additional capacity, however this would not meet the significant demands of mining and associated infrastructure.

Many of the major mining projects in these clusters involve the mining and processing of magnetite ores which is particularly electricity intensive. Provision of suitable access to electricity will be critical to the development of these large scale mining projects.
• **Issue C:** Lack of mine to port bulk transport links for Central and Southern Eyre mines

The ability of miners to safely and efficiently transport bulk commodities to ports for export is critical to miners’ ability to reach their markets.

The existing rail Eyre Peninsula rail network was designed in a previous era predominantly to service the grain industry. This is a narrow gauge with significant limitation in relation to load capacity, train length and maximum speeds. The location of the existing network is not well located in relation to likely suitable bulk commodity export ports and requires key townships to be traversed.

The existing road network on the Eyre Peninsula whilst generally suitable to meet current needs, will not be able to handle volume and load requirements of bulk mineral transport. Significant investment such as town bypasses, road realignments and shoulder sealing would be required as a minimum for the existing road network to form part of the mine to port bulk transport task.

• **Issue D:** No identified suitable source of water for South Gawler, Central Eyre and Southern Eyre mines

Mining projects have a range of water needs, including dust suppression, processing, slurry operation and potable supply.

Parts of the Eyre Peninsula are connected to the SA Water supply network via the Mannum Whyalla pipeline. The capacity of the existing pipeline is expected to be insufficient to meet the needs existing users of the reticulated supply networks on the Eyre Peninsula in the medium-term. Desalination has been proposed to supplement existing SA Water potable supply; however the scale of proposed infrastructure would be insufficient to meet mining demand.

There is also groundwater extraction in the region for human and agricultural use. There is insufficient information in relation to the groundwater resources in the Eyre Peninsula to accurately assess the adequacy to meeting mining demand and impact this would have on the environment and existing extractors.

The table below summarises the key deficiencies in current infrastructure which are an impediment to the development of the mining industry in the Eyre and Western. Each of the identified issues are geographically presented in map overleaf.

Table 7.4: Key emerging mining infrastructure issues for the Eyre and Western region (2013 – 2032)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Lack of suitable bulk commodities export port accessible by South Gawler mines</td>
<td>Lack of suitable bulk commodities export port accessible by South Gawler, Central Eyre and Southern Eyre mines</td>
<td>Lack of suitable bulk commodities export port accessible by South Gawler, Central Eyre and Southern Eyre mines</td>
</tr>
<tr>
<td>B</td>
<td>Inadequate electricity transmission links to South Gawler mines</td>
<td>Inadequate electricity transmission links to South Gawler and Central Eyre mines</td>
<td>Inadequate electricity links to South Gawler, Central Eyre and Southern Eyre mines</td>
</tr>
<tr>
<td>C</td>
<td>Lack of mine to port bulk transport links for Central and Southern Eyre mines</td>
<td>Lack of mine to port bulk transport links for Central and Southern Eyre mines</td>
<td>Lack of mine to port bulk transport links for Central and Southern Eyre mines</td>
</tr>
<tr>
<td>D</td>
<td>No identified suitable source of water for South Gawler mines</td>
<td>No identified suitable source of water for Central Eyre and South Gawler mines</td>
<td>No identified suitable source of water for Central Eyre, Southern Eyre and South Gawler mines</td>
</tr>
</tbody>
</table>
Figure 7.1: Map of key emerging infrastructure issues for the Eyre and Western region
8. Potential infrastructure solutions

This chapter presents the infrastructure projects, and their associated grouping, which have been identified as having the potential to address the issues detailed in chapter 7. A summary of each of the projects is presented to provide an understanding of their underlying technical attributes.

The relative merits of each of these projects are not discussed here. Identified potential projects will be assessed as part of a detailed prioritisation process which will be informed by the feedback received on this paper. The detailed prioritisation process will identify:

- Groups of projects which have the ability to support mining in South Australia
- Interdependencies between projects
- Timing for how these projects may be staged
- Potential role for government in supporting the delivery of these projects
- An assessment of the implications of the implications of the identified projects for social infrastructure
- The economic benefits of these projects.

The prioritisation process is discussed in greater detail in Chapter 9.

Projects identified

Projects with the potential to address the issues discussed in chapter 7 have been identified through consultation with infrastructure proponents, mining proponents and peak bodies.

The table below summarises all the projects which were identified and considered. Through the course of our investigations it was established some of the identified projects would not be likely meaningfully address issues identified in chapter 7.

<table>
<thead>
<tr>
<th>Project</th>
<th>Issue addressed</th>
<th>Considered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Path to market</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whyalla Port expansion</td>
<td>No – current expansion to 12mtpa is significant and effective use of this transhipment option for significant volumes beyond this is considered unlikely.</td>
<td></td>
</tr>
<tr>
<td>Lucky Bay</td>
<td>No – does not address regional mining issues, would be a low volume solution only.</td>
<td></td>
</tr>
<tr>
<td>Northern Eyre Peninsula port base case</td>
<td>A and C</td>
<td>Yes</td>
</tr>
<tr>
<td>Northern Eyre Peninsula port base case + new slurry link</td>
<td>A and C</td>
<td>Yes</td>
</tr>
<tr>
<td>from Central Eyre cluster</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northern Eyre Peninsula port base case + rail link from</td>
<td>A and C</td>
<td>Yes</td>
</tr>
<tr>
<td>Eyre Peninsula</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central Eyre Port Base case</td>
<td>A and C</td>
<td>Yes</td>
</tr>
<tr>
<td>Potential infrastructure solutions</td>
<td>Region</td>
<td>Status</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>Central Eyre Port Base case + rail link from Central Eyre cluster</td>
<td>A and C</td>
<td>Yes</td>
</tr>
<tr>
<td>Central Eyre Port Base case + upgrade of existing rail corridors</td>
<td>A and C</td>
<td>Yes</td>
</tr>
<tr>
<td>Central Eyre Port Base case + slurry link to Central Eyre cluster</td>
<td>A and C</td>
<td>Yes</td>
</tr>
<tr>
<td>Port Lincoln port and upgraded rail links</td>
<td>A and C</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Energy**

<table>
<thead>
<tr>
<th>Energy</th>
<th>Region</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eyre transmission upgrade</td>
<td>B</td>
<td>Yes</td>
</tr>
<tr>
<td>Spencer Gulf undersea link</td>
<td>B</td>
<td>Yes</td>
</tr>
<tr>
<td>Gas line to on-site generation from Whyalla branch line</td>
<td>B</td>
<td>Yes</td>
</tr>
<tr>
<td>On-site diesel generation</td>
<td>B</td>
<td>Yes</td>
</tr>
<tr>
<td>Transmission link from Cultana</td>
<td>B</td>
<td>Yes</td>
</tr>
<tr>
<td>On-site LPG power station to service individual sites</td>
<td>B</td>
<td>Yes</td>
</tr>
<tr>
<td>Renewable Generation to support Mining loads</td>
<td>B</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Water**

<table>
<thead>
<tr>
<th>Water</th>
<th>Region</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groundwater investigation (Eyre Peninsula)</td>
<td>D</td>
<td>Yes</td>
</tr>
<tr>
<td>On-coast desalination plant and transmission to Central Eyre</td>
<td>D</td>
<td>Yes</td>
</tr>
<tr>
<td>On-coast desalination plant and transmission network</td>
<td>D</td>
<td>Yes</td>
</tr>
<tr>
<td>Southern on-coast desalination plant with SA Water integration</td>
<td>D</td>
<td>Yes</td>
</tr>
<tr>
<td>Transmission of raw seawater and on-site desalination plant/t</td>
<td>D</td>
<td>Yes</td>
</tr>
<tr>
<td>Morgan-Whyalla pipeline to storage points</td>
<td>D</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Regional solutions

The figure below is provided to give an understanding of the geographic alignment of the identified infrastructure projects relative to sensitive environmental areas.
**Path to market**

Identified freight projects have been grouped into paths to market which integrate potential ports with land transport infrastructure able to deliver product the port. It is necessary to group freight projects focused around the port for export because of the dependency between the port and landside infrastructure.

The “base case” for each port described in this section includes the port option and minimum land transport links necessary to provide sufficient throughput of bulk commodity for the port to be commercially viable. Land transport links proposed in addition to the base case for each port have the potential to service the port, but are not critical for commercial viability.

The eight paths to market which have been derived in response to issues identified in the Eyre and Western are:

- PTM1: Far Northern Eyre Peninsula port base case
  - Far North region land transport links
  - Road upgrades from South Gawler to port
- PTM2: Northern Eyre Peninsula port base case + new slurry link from Central Eyre cluster
- PTM3: Northern Eyre Peninsula port base case + rail link from Eyre Peninsula
- PTM4: Central Eyre Port Base case
- PTM5: Central Eyre Port Base case + rail link from Central Eyre cluster
- PTM6: Central Eyre Port Base case + upgrade of existing rail corridors
- PTM7: Central Eyre Port Base case + slurry link to Central Eyre cluster
- PTM8: Port Lincoln port and upgraded rail links
PTM1: Northern Eyre Port Links Base case

Project description: A range of initiatives including rail connection to Whyalla, partial duplication and upgrade of rail to Wirrida, and road upgrades from the Port to South Gawler.

Issue addressed:
A. Lack of suitable bulk commodities export port accessible by South Gawler, Central Eyre and Southern Eyre mines
C. Lack of mine to port bulk transport links for Central and Southern Eyre mines

Capital cost: Port: $750m - $1b
Rail: $500m
Road: $120m

Capacity: 20 mtpa

Scalability of capacity and planned upgrades: Port and rail connection to existing freight corridor initially established for 20mtpa and expandable for in excess of 50mtpa. Rail upgrades of existing corridors can be done in stages as demand requires. Road upgrades can be done in stages as demand requires.

Lead time to operation: 4 years

Clusters and industries serviced:
Clusters - Mount Woods, Tarcoola, Mount Christie, Braemar, South Gawler, Central Eyre
Supported Industries - Fuel, mining consumables, grain

Key technical construction and operational risks:
Two port locations in this region have previously been identified by others;
- Port Bonython (adjacent to the existing Port Bonython jetty) has been identified due to its access to deep water and close proximity to road, rail and utility services. The Spencer Gulf Ports Link consortium has undertaken feasibility assessments and is currently conducting an Environmental Impact Study for the site.
- Port Nonowie, south of Whyalla, has been identified by the Alternative Ports Working Party. Detailed feasibility assessments have not been undertaken for this site.
Key technical and operational considerations are:

- Proximity to deep water. This will impact capital cost
- How sheltered the deep water is, from both weather and tidal impacts. This will impact capital and operating costs.
- Shipping channel depths and capacity. The shipping channel to a Northern Eyre Peninsula Port has high levels of available capacity
- Proximity to road, rail and utility services – impacts capital cost.
- Community impacts – during construction and operation
- Environmental impacts

Rail
- Geographic, hydrology and flooding – unknown levels
- Geotechnical conditions – existing terrain not investigated
- Signalling system upgrade likely to be required
- Much of the corridor has sufficient width for duplication but some land acquisition would be required.
- Port Augusta triangle required (to enable trains to bypass Port Augusta going to/from Whyalla).
- Additional and busier level crossings (currently 3 No. excluding Port Augusta)

**General comments:** Irrespective of where a Northern Eyre Peninsula Port is located;

**Advantages**
- Being centrally located, the Port could support the Far North, Eyre and Western and Braemar regions of the state
- Good opportunity to connect to the main standard gauge freight rail network – maximises use of rail for freight
- Well positioned for road access from South Gawler Cluster
- Well positioned for power and water connections to the Port
- Opportunity for increased local employment across the port and rail developments both during construction and operations
- Rail upgrades may benefit broader rail users
- May be an efficient alternative port for grain export
- Port is well positioned for the import of mining consumables

**Disadvantages**
- A number of issues associated with increased rail use, particularly in relation to road crossings
- May not be the ‘most efficient’ option for Eyre and Western and Braemar Regions.
- Large central port may require additional land transport
- High capital cost
PTM2: Northern Eyre Port Links Base case + new Slurry link from Central Eyre

**Project description:** As for project PTM1 plus new Slurry link from Central Eyre region.

**Issue addressed:**
A. Lack of suitable bulk commodities export port accessible by South Gawler, Central Eyre and Southern Eyre mines
C. Lack of mine to port bulk transport links for Central and Southern Eyre mines

**Capital cost:** Slurry link from Central Eyre; $450m (excludes water supply)

**Capacity:** 20 mtpa

**Scalability of capacity and planned upgrades:** Pipe arrangement within the corridor can be structured to enable future expansion (ie; install additional pipes). System can operate in 'batch mode' during lower capacity periods.

**Lead time to operation:** 2 years

**Clusters and industries serviced:**
- Clusters – Central Eyre, South Gawler
- Supported Industries – Nil

**Key technical construction and operational risks:**

- Requires suitable water (unlikely that seawater is suitable although product specific assessment is needed to confirm this). For 20mtpa, estimated water requirements are 13GL per annum.
- Requires suitable power source for pumping. For 20mtpa, estimated power demand is 11 MW.
- Requires suitable method of disposal of de-watered product OR method of recycling water at higher cost.
- Management of risk of leaks.
- Requires easement corridor for installation.
- Geotechnical issues associated with construction.

**General comments:**

**Advantages**
- As a result of the underground installation of the Slurry Pipe system, community impacts are minimised. Eg; no impact on road crossings or ongoing use of farming land following installation.
• Can consolidate impacts from several mines by using common corridor
• Is a long-life solution with limited maintenance requirement.

Disadvantages
• Significant associated water and power supply requirements.
• Limited opportunity for this infrastructure to benefit other sectors, other than possibly associated with water and power supply solutions.
Potential infrastructure solutions

PTM3: Northern Eyre Port Links Base case + rail link from Eyre Peninsula

Project description: As for project PTM1 plus new rail link from Central Eyre Region.

Issue addressed:
A. Lack of suitable bulk commodities export port accessible by South Gawler, Central Eyre and Southern Eyre mines
C. Lack of mine to port bulk transport links for Central and Southern Eyre mines

Capital cost: Rail link from Kimba; $500 - $750m
Rail link from Central Eyre Region to Kimba; $250 - $400m

Capacity: 20 mtpa

Scalability of capacity and planned upgrades: Initial rail corridor will cater for approx. 20mtpa. If sufficient corridor width is provided, additional capacity can be obtained via additional passing loops or duplication. There is opportunity to link into the existing narrow gauge corridors, although upgrade of these corridors will be required.

Lead time to operation: 3-4 years

Clusters and industries serviced:
Clusters – Central Eyre, South Gawler, possible expansion to include Southern Eyre
Supported Industries – Grain, mining consumables, fuel

Key technical construction and operational risks:
- Requires establishment of substantial new rail corridor – impacts on land owners and adjacent land use.
- Road / Rail interface issues
- Geotechnical and topography aspects may add to capital costs
- Environmental interfaces
- Facilities for maintaining rollingstock may also need to be procured

General comments:
Advantages
- Versatile infrastructure with broader potential benefits for the region
Potential infrastructure solutions

- Efficient operating solution for a number of mines / precincts
- Employment during construction, operation and maintenance.

Disadvantages
- A number of issues associated with rail corridor, particularly in relation to road crossings and impacts on adjacent land use
- High capital cost
Potential infrastructure solutions

PTM4: Central Eyre Port Base case

*Project description:* Central Eyre Peninsula Deep Water Port with road access.

*Issue addressed:*

A. Lack of suitable bulk commodities export port accessible by South Gawler, Central Eyre and Southern Eyre mines

C. Lack of mine to port bulk transport links for Central and Southern Eyre mines

---

**Capital cost:** Port; $250 - $600m (varies depending on wharf length and land storage capacity)

Road Upgrades; $250m (will vary according to demand on individual roads)

**Capacity:** 5 - 20 mtpa

**Scalability of capacity and planned upgrades:** Wharf and landside storage can be designed for future capacity increases. Road upgrades can be undertaken as demand dictates.

**Lead time to operation:** 3-4 years

**Clusters and industries serviced:**

*Clusters* – Central Eyre, South Gawler, Southern Eyre

*Supported Industries* – Grain, mining consumables

**Key technical construction and operational risks:**

Two potential port locations have been identified by others;

- Port Spencer (Sheep Hill), north of Tumby Bay, has been proposed by Centrex Metals and Wuhan Iron and Steel Corporation. Conditional approval has been granted to establish a Stage 1 facility to export 2 mtpa of Haematite and 1 mtpa of grain.
- Cape Hardy, between Port Neill and Tumby Bay, has been proposed by Iron Road Mining.

Key technical and operational considerations are;

- Significant road freight increases will have an impact on other road users and adjacent property owners. Will require careful consideration of the extent of road upgrade. May be appropriate to provide purpose built routes in some instances.
- Road freight is less efficient than rail or slurry for higher volumes over a long period.
- Road upgrades likely to require some land acquisition, native vegetation impacts etc.
- Tidal and weather exposure risks for Port.
- Remote nature of Port may require additional Pilots and tugs.
- Electricity and water requirements for Port.

General comments:

Advantages
- Port is well positioned for Central Eyre region.
- Provides a well-positioned alternative to Port Lincoln for Southern Eyre Region.
- Short wharf lengths to deep water for Cape-size ships (0.5km to 1.6km), enables lower capital cost.
- Versatile infrastructure with broader potential benefits for the region.
- Flexible staging beneficial for start-up phases
- Good opportunity for large adjacent storage capacity.
- Employment during construction, operation and maintenance.

Disadvantages
- Managing tidal / weather exposure
- Managing impacts of significant road freight task
- If used for grain, impacts on broader grain export supply chain need to be considered. Also need to consider impacts of integrating grain and mineral facilities.
- Detailed environmental assessments to be undertaken
PTM5: Central Eyre Port Base case + rail link from Central Eyre Region

Project description: As for project PTM4 plus new rail link from Central Eyre Region.

Issue addressed:
A. Lack of suitable bulk commodities export port accessible by South Gawler, Central Eyre and Southern Eyre mines
C. Lack of mine to port bulk transport links for Central and Southern Eyre mines

Capital cost: Rail; $700m
Capacity: 20 mtpa

Scalability of capacity and planned upgrades: Limited scalability as a single rail line will have approx. 20mtpa capacity. Increased capacity can be added in the future via additional passing loops or duplication if sufficient corridor width is provided.

Lead time to operation: 3-4 years

Clusters and industries serviced:
Clusters – Central Eyre
Supported Industries – Grain, mining consumables

Key technical construction and operational risks:
- Requires establishment of substantial new rail corridor – impacts on land owners and adjacent land use.
- Road / Rail interface issues
- Geotechnical and topography aspects may add to capital costs
- Environmental interfaces
- Facilities for maintaining rollingstock may also need to be procured. May be opportunities to link to GWA network if a narrow gauge link is constructed.
- Rollingstock likely to need to be procured.

General comments:
Advantages
- Efficient operating solution for Central Eyre mines
- Potential long-term benefits for the region including grain export option.
- Removes large portion of road freight by comparison with option PTM4
- Employment during construction, operation and maintenance.

Disadvantages
- A number of issues associated with rail corridor, particularly in relation to road crossings and impacts on adjacent land use
- High capital cost
PTM6: Central Eyre Port Base case + rail link from Central Eyre Region and upgrade of existing rail corridors

Project description: As for project PTM4 plus new rail link from Central Eyre Region.

Issue addressed:
A. Lack of suitable bulk commodities export port accessible by South Gawler, Central Eyre and Southern Eyre mines
C. Lack of mine to port bulk transport links for Central and Southern Eyre mines

Capital cost: Upgraded Rail link from Buckleboo; $550m

Capacity: 10 - 15 mtpa

Scalability of capacity and planned upgrades: Corridor can be upgraded in stages.

Lead time to operation: 3-4 years

Clusters and industries serviced:
Clusters – South Gawler
Supported Industries – Grain, mining consumables

Key technical construction and operational risks:
- May require some geometric improvements to existing corridor to accommodate higher speeds if desired.
- While this is an existing functional corridor and therefore currently manages level crossing issues, a significant increase in frequency / size / speed of trains may still generate substantial issues to be addressed in this regard.
- Additional corridor width may be required in areas, particularly if additional passing loops are required.
- Construction staging impact on current grain freight use.
- Facilities for maintaining rollingstock may also need to be procured / expanded

General comments:
Advantages
- Versatile infrastructure with broader potential benefits for the region
- Efficient operating solution for mines in South Gawler precinct
- Removes further road freight traffic by comparison with projects 4 and 5
• Employment during construction, operation and maintenance.

Disadvantages
• A number of issues associated with rail corridor, particularly in relation to road crossings and impacts on adjacent land use
• High capital cost
PTM7: Central Eyre Port Base case + Slurry link to Central Eyre Region

Project description: As for project PTM4 plus new slurry pipeline link from Central Eyre Region

Issue addressed:
A. Lack of suitable bulk commodities export port accessible by South Gawler, Central Eyre and Southern Eyre mines
C. Lack of mine to port bulk transport links for Central and Southern Eyre mines

Capital cost: Slurry Pipeline; $300m (excluding water supply)

Capacity: 20 mtpa

Scalability of capacity and planned upgrades: Pipe arrangement within the corridor can be structured to enable future expansion (ie; install additional pipes). System can operate in ‘batch mode’ during lower capacity periods.

Lead time to operation: 3-4 years

Clusters and industries serviced:
Clusters – Central Eyre
Supported Industries – Nil

Key technical construction and operational risks:
- Requires suitable water (unlikely that seawater is suitable although product specific assessment is needed to confirm this). For 20mtpa, estimated water requirements are 13GL per annum.
- Requires suitable power source for pumping. For 20mtpa, estimated power demand is 11 MW.
- Requires suitable method of disposal of de-watered product OR method of recycling water at higher cost.
- Management of risk of leaks.
- Requires easement corridor for installation.
- Geotechnical issues associated with construction.

General comments:
Advantages
- As a result of the underground installation of the Slurry Pipe system, community impacts are minimised. Eg; no impact on road
crossings or ongoing use of farming land following installation.

- Is a long-life solution with limited maintenance requirement.

Disadvantages

- Significant associated water and power supply requirements.
- Limited opportunity for this infrastructure to benefit other sectors, other than possibly associated with water and power supply solutions.
**PTM8: Port Lincoln Port + upgraded rail links**

*Project description:* Upgrade rail corridors from Buckleboo to Cummins and from Wudinna to Cummins to Port Lincoln

**Issue addressed:**

A. Lack of suitable bulk commodities export port accessible by South Gawler, Central Eyre and Southern Eyre mines

C. Lack of mine to port bulk transport links for Central and Southern Eyre mines

---

**Capital cost:** Rail upgrades; $1.3b

**Capacity:** 10-15 mtpa

**Scalability of capacity and planned upgrades:** Rail corridor can be upgraded in stages.

**Lead time to operation:** 3-4 years

**Clusters and industries serviced:**

- Clusters – Central Eyre, South Gawler
- Supported Industries – Grain, mining consumables, fuel

**Key technical construction and operational risks:**

- May require some geometric improvements to existing corridor to accommodate higher speeds if desired.
- While this is an existing functional corridor and therefore currently manages level crossing issues, a significant increase in frequency / size / speed of trains may still generate substantial issues to be addressed in this regard.
- Additional corridor width may be required in areas, particularly if additional passing loops are required.
- Construction staging impact on current grain freight use.
- Facilities for maintaining rollingstock may also need to be procured / expanded
- Rail arrangements in Port Lincoln require several shunting movements through the town centre. Expansion of these movements will be a significant impact to Port Lincoln. It is likely a storage facility outside the town would be required with a covered conveyor system connecting to the Port. The location of this system to be determined.
- Limited ability for the Port in its current form to handle significant additional minerals volumes. Expansion would be required.
- Integration of minerals Port use with existing fishing and grain use is likely to result in a need for full separation of the handling equipment and processes, requiring additional infrastructure.
General comments:

Advantages

- Port Lincoln Port has natural deep water (although not deep enough for loaded Cape size vessels)
- No need to construct greenfield port
- Existing rail corridor links to Port Lincoln simplify the establishment of rail connections from Central and Eyre Peninsula.
- Rail upgrade can provide benefits to other sectors, particularly grain

Disadvantages

- number of issues associated with rail corridor, particularly in relation to road crossings and impacts on adjacent land use
- High capital cost of suitable rail upgrades
- Difficulty of moving significant mineral product through the city of Port Lincoln – likely to generate a number of community concerns
- Difficulty associated with integrating large volumes of mineral product with existing wharf use
- Overall capacity of Port Lincoln Port
**Energy**

The seven energy projects have been derived in response to issues identified in the Far North are:

- E1: Eyre transmission upgrade
- E2: Spencer Gulf undersea link
- E3: Gas line to on-site generation from Whyalla branch line
- E4: On-site diesel generation
- E5: Transmission link from Cultana
- E6: On-site LPG power station to service individual sites
- E7: Renewable Generation to support Mining loads

### E1: Eyre Transmission Upgrade

**Project description:** Upgrade of the Eyre Peninsula ElectraNet transmission network to a dual circuit 275kV system

**Issue addressed:**
B. Inadequate power electricity links to South Gawler, Central Eyre and Southern Eyre mines

**Capital cost:** $910 million

**Capacity:** 1000 MW @ 275kV

**Scalability of capacity and planned upgrades:**
Project can be staged by building the 275kV section between Cultana and Yadnarie and the 275kV to 132kV substation at Yadnarie first, with the remainder of the project works delayed until required.

**Lead time to operation:** 2-3 years (from the time a transmission agreement is signed)

**Clusters and industries serviced:**
Clusters - South Gawler, Central Eyre, and Southern Eyre.

Supported Industries – renewable energy generation, community, water supply, ports

Key technical construction and operational risks:
- Alignment of these works with the regulatory processes or support as a non-regulated project.
- Establishment of easement / corridor for the works.
- Timeframes for construction, including long lead time equipment.
- Capability of upstream transmission network to support the project, particularly in the context of possible works for the Far North and other regions.

General comments:
- This Project is consistent with the existing ElectraNet proposal for this region. ElectraNet have commenced the Regulatory process.
- This project provides additional capacity in the Eyre and Western regional network to accommodate the forecast increase in mining loads. It also provides better capacity for the connection of renewable energy assets in the region.
- The existing 132kV transmission network on the Eyre Peninsula is relatively old and will require gradual upgrade / replacement over the next 10-15 years.
- The Eyre Peninsula is recognised as having strong renewable energy demand (wind and wave), however the existing transmission network cannot support transmission of this generation back to the grid.

Advantages:
- Improved electricity supply security to the region
- Replaces old asset with new
- Enables opportunity for additional renewable energy generation within the region.

Disadvantages:
- High capital cost
- Impact on landowners associated with establishing suitable route/easements
E2: Spencer Gulf Undersea Link

**Project description:** Eyre to Yorke undersea transmission link and upgrade

**Issue addressed:**
B. Inadequate power electricity links to South Gawler, Central Eyre and Southern Eyre mines

- **Capital cost:** $800 million
- **Capacity:** 1000MW

**Scalability of capacity and planned upgrades:**
The project does not lend itself to being staged.

- **Lead time to operation:** 4 years

**Clusters and industries serviced:**
Clusters - South Gawler, Central Eyre, Southern Eyre, and Yorke.

**Supported Industries** – renewable energy generation, community

**Key technical construction and operational risks:**
- Alignment of these works with the regulatory processes or support as a non-regulated project.
- Establishment of easement / corridor for the works.
- Timeframes for construction, including long lead time equipment.
- Installation of undersea cable.

**General comments:**
- Direct supply to the high load areas on Eyre Peninsula would reduce/remove the demand to upgrade the Eyre Peninsula transmission network.

**Advantages:**
- Additional capacity in the Eyre, Western regional and Yorke networks to accommodate the forecast increase in mining loads.
- Better capacity for the connection of renewable energy assets in both the Eyre Peninsula and Yorke Peninsula regions.
• Improved Electricity supply security to both regions.
Disadvantages:
• Limited flexibility for changes in scale
• High capital cost
• Does not improve condition of aged assets on Eyre Peninsula
E3: Gas line to on-site generation from Whyalla branch line

*Project description:* Install new gas supply line connected to existing Moomba / Adelaide branch line to Whyalla to South Gawler region and establish local gas generation plant

*Issue addressed:*

B. Inadequate power electricity links to South Gawler, Central Eyre and Southern Eyre mines

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**Capital cost:** $3 million (gas line), $84 million for onsite power generation

**Capacity:** 8 TJ per day (for generation of 40MW)

**Scalability of capacity and planned upgrades:** Generation capacity can be increased in a modular way in line with demand, providing initial gas supply pipe is sized to enable this.

**Lead time to operation:** 2 years

**Clusters and industries serviced:**

Clusters: South Gawler

Supported Industries – potential for other community gas / power supply

**Key technical construction and operational risks:**

- Unknown topography / geology – may encounter rock etc
- Availability of gas from the Whyalla branch line would need to be checked. 8TJ represents approximately 30% of this lines capacity.
- Requires establishment of an easement – land owner interfaces, construction disruption
- For power at more than one site a localised distribution system will be required, or additional generation facilities at additional cost.

**General comments:**

**Advantages**

- Lower cost electricity for significant volumes on a long-term basis, than on-site diesel generation.
- Underground pipeline has minimal ongoing community impact.
- Improved electricity and gas security to area
Disadvantages

- Risk of gas supply availability and/or need to augment Whyalla branch line capacity
- Higher cost option than transmission connection to Cultana.
- Temporary disruption during construction
E4: On-site diesel generation

Project description: Provision of on-site diesel storage to fuel on-site power generation at localised site/s

Issue addressed:
B. Inadequate power electricity links to South Gawler, Central Eyre and Southern Eyre mines

Capital cost: $1.0 million per MW

Capacity: 2 – 300 MW

Scalability of capacity and planned upgrades: High flexibility - Capacity can be added or removed in line with demand.

Lead time to operation: < 1 year

Clusters and industries serviced:
Clusters - All
Supported Industries - Nil

Key technical construction and operational risks:
- High operating cost for large demand

General comments:
- Solution already adopted at a number of existing mine sites – generally with relatively low power demand

Advantages
- High flexibility to ramp up or down with demand
- Short lead time to operation
- Low capital cost for low demands

Disadvantages
- Cost of transporting diesel
- Environmental impacts from diesel emissions
- Reliability of supply – backup generation may be appropriate in some circumstances
- High operating costs for larger demands
E5: Transmission link from Cultana

**Project description:** Installation of 275 / 132kV substation at Cultana and single circuit 132kV transmission line to South Gawler Region

**Issue addressed:**

B. Inadequate power electricity links to South Gawler, Central Eyre and Southern Eyre mines

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**Capital cost:** $50 million (transmission line); $15 million (substation)

**Capacity:** 200MW

**Scalability of capacity and planned upgrades:** The project does not lend itself to being staged as the 132kV line is required in the first stage of the project. Cannot be scaled up without effectively replacing the system.

**Lead time to operation:** 2 years

**Clusters and industries serviced:**

- Clusters - South Gawler
- Supported Industries – potential for other community power supply, may support renewable generation

**Key technical construction and operational risks:**
- Unknown topography / geology
- Requires establishment of easement

**General comments:**

**Advantages**
- Common approach to provision of electricity supply
- Potential for use by others in the region – strengthens electricity supply security
- Potential to support renewable generation in the region

**Disadvantages**
- Limited scalability options, therefore may be a high capital cost for initially low demand in order to protect higher use options later.
E6: On-site LPG Power Station to service individual sites

Project description: Provision of on-site LPG storage to fuel on-site power generation at localised sites

Issue addressed:
B. Inadequate power electricity links to South Gawler, Central Eyre and Southern Eyre mines

Capital cost: $2.1 million per MW

Capacity: 2 – 300 MW

 Scalability of capacity and planned upgrades: Capacity can be added or removed in line with demand.

Lead time to operation: 1 year

Clusters and industries serviced:
Clusters - All
Supported Industries - Nil

Key technical construction and operational risks:
- Freight task for LPG
- High Operating cost for larger demands

General comments:
Advantages
- Short lead time to operation
- High flexibility

Disadvantages
- High operating cost for larger / longer term demands
- Reliability of supply may warrant backup system
E7: Renewable Generation to support Mining loads

Project description: Renewable generation plant/s as required to provide Electrical supply to mining loads. Generation could be via; Solar, Wind, Wave, Geothermal or Hybrid technologies.

Issue addressed:

B. Inadequate power electricity links to South Gawler, Central Eyre and Southern Eyre mines

Capital cost: Solar; $7m - $10m / MW
Wind; $2 - $3m / MW
Geothermal; $5 - $10m / MW

Capacity: As required

Scalability of capacity and planned upgrades: Plants can be established in a ‘modular’ approach as demand requires.

Lead time to operation: 1-3 years

Clusters and industries serviced:
Clusters - All
Supported Industries – community if connected to transmission network grid, renewable energy sector

Key technical construction and operational risks:
- Often higher capital cost but lower operating cost
- Solar and Wind are an intermittent source and will require ‘backup’ supply. Backup supply could be via alternative on-site generation (such as diesel or gas generation), or via hybrid solutions (such as diesel / solar / batteries) or via connection to the grid transmission network.
- Geothermal is a potential ‘base load’ supply.
- New or establishing technology in some areas. Wind and Solar are established commercial methods, Geothermal or Wave are developing technologies. Large scale storage is a developing technology.
- Proximity of suitable generation location may still require transmission to power demand point/s
General comments:

Advantages
- Aligns with South Australian Renewable Energy plan and South Australian Strategic Plan
- Does not necessarily rely on network transmission upgrade
- Possible entitlement to ‘green energy funds’

Disadvantages
- May be a higher up-front cost solution overall (depending on available options for funding support), particularly if two generation sources are required (ie; backup supply) – although may be cost effective over a longer period of time due to low operating costs
- Proximity of available generation to demand – particularly for Geothermal
- Potential community concerns; eg; wind farms in some locations
- Possible requirements for land if facilities not able to be located on mine site
- Limited broader community benefits unless integrated with the electricity grid
Water

The six water projects have been derived in response to issues identified in the Eyre and Western area:

- **W1**: Groundwater investigation (Eyre Peninsula)
- **W2**: On-coast desalination plant and transmission to Central Eyre
- **W3**: On-coast desalination plant and transmission network
- **W4**: Southern on-coast desalination plant with SA Water integration
- **W5**: Transmission of raw seawater and on-site desalination plant/treatment
- **W6**: Morgan-Whyalla pipeline to storage points

### W1: Groundwater Investigation

**Project description**: Undertake a high level overview analysis, building on existing knowledge bases, of the potential for further groundwater use in the Eyre Peninsula. Include consolidation of existing available data for easy and consistent access.

**Issue addressed**: D. No identified suitable source of water for Central Eyre, Southern Eyre and South Gawler mines

**Capital cost**: $2 - $5 million

**Capacity**: N/A

**Scalability of capacity and planned upgrades**: N/A

**Lead time to operation**: N/A

**Clusters and industries serviced**:
- **Clusters**: Southern Eyre, Central Eyre, South Gawler
- **Supported Industries**: agriculture, tourism, community
Key technical construction and operational risks:
- Undertake in partnership with DEWNR and NRM to ensure appropriate processes are followed and outcomes are maximised.

General comments:

Advantages
- Improved early understanding of groundwater conditions will assist in early identification of environmentally sustainable solutions for planning and development.
- Compliments existing research programs
- May improve overall levels of confidence of the understanding of environmental impacts of proposals
- Consolidated database may assist mining, farming and other community water supply planning by minimising the extent of investigation works required to establish confidence (or otherwise) in the feasibility of a water supply option.
- May assist Government approval processes where water supply proposals can be demonstrated to be consistent with improved knowledge of groundwater availability and conditions.

Disadvantages
- Capital cost
W2: On-coast Desalination Plant and transmission to Central Eyre

Project description: Desalination plant at coast to provide water to Potable quality.

Issue addressed:
D. No identified suitable source of water for Central Eyre, Southern Eyre and South Gawler mines

Capital cost; $600 million

Capacity: 12 GL/a

Scalability of capacity and planned upgrades: Limited scalability - initial intake / outlet sizing and transmission main should be sized for maximum forecast demand. Modular booster pumping can be incorporated.

Lead time to operation: 3 years

Clusters and industries serviced:
Clusters – Central Eyre
Supported Industries – agriculture, tourism, community

Key technical construction and operational risks:
- Environmental method of reusing / disposal of desalination process waste brine
- Transmission main route will require easement / construction disruption
- Power requirement for desalination plant and pumping (approximately 3-4 MW)

General comments:
- The desalination plant can be designed to desalinate seawater to different salinities to suit different end-uses. This option assumes desalination to the salinity level required for potable water but a re-mineralisation process is required to bring the mineral content of the desalination water to normal levels.
- If desalination is undertaken to a lesser extent (eg suitable for mine processing, dust suppressant etc), the ability to use this water for other sectors and the broader community is reduced without further subsequent desalination.
Advantages
- Opportunities to supply other potential users from the transmission pipeline and increase water security for these users. Outlet points could be provided at minimal additional cost. Outlet points could also be used for fire-fighting.

Disadvantages
- A centralised desalination point cannot produce water of varying quality for different users.
- Power supply availability
- High capital cost
W3: On-coast Desalination plant and Transmission network

*Project description:* Desalination plant at coast to provide water to Potable quality with transmission to key demand areas on Eyre Peninsula.

*Issue addressed:*

D. No identified suitable source of water for Central Eyre, Southern Eyre and South Gawler mines

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**Capital cost:** $1,050 million

**Capacity:** 15 GL/a

**Scalability of capacity and planned upgrades:** Limited scalability - initial intake / outlet sizing and transmission main should be sized for maximum forecast demand. Modular booster pumping can be incorporated.

**Lead time to operation:** 3 years

**Clusters and industries serviced:**

- Clusters – Southern Eyre, Central Eyre and South Gawler
- Supported Industries – agriculture, tourism, community

**Key technical construction and operational risks:**
- As for project W2

**General comments:**
- As for project W2

**Advantages**
- As for project W2
- Greater economy of scale benefit from the cost of a single larger desalination plant
- Well positioned to support largest mining demand as well as support broader community

**Disadvantages**
- As for project W2
- Greater level of impact from easement / construction / operator
- Higher capital cost
W4: Southern On-site Desalination Plant with SA Water integration

Project description: Desalination plant at coast to provide water to Potable quality with transmission to key demand areas on Eyre Peninsula.

Issue addressed:

D. No identified suitable source of water for Central Eyre, Southern Eyre and South Gawler mines

Capital cost: $1.5b

Capacity: 15 GL/a

Scalability of capacity and planned upgrades: Greater level of scalability than options W3 and 11 above as desalination plant can use existing SA Water mains initially with sections replaced or augmented as demand requires. Intake – Outlet for desalination plant should be sized to forecast maximum demand initially.

Lead time to operation: 3 years

Clusters and industries serviced:
Clusters – Southern Eyre, Central Eyre, South Gawler
Supported Industries – agriculture, tourism, community, renewable generation

Key technical construction and operational risks:
- Environmental method of reusing / disposal of desalination process waste brine
- Transmission main route can follow existing main route, although it is not known if there is sufficient room in the easement to install an additional pipe.
- Power requirement for desalination plant and pumping – may be opportunity to connect directly to renewable generation

General comments:
- SA Water have previously investigated possible sites for a Southern desalination plant. Larger desalination plant may require review of preferred location. Alternative sites on west coast of Eyre Peninsula may be considered – although high cliffs likely to add to capital cost.
- The desalination plant in this application would need to produce water to a ‘drinking water’ standard as it integrates with existing community supply systems.
Advantages
- Integrates mining water supply needs with water security for community.
- The new water mains can be sized to replace the existing mains with new providing a further ongoing benefit to the community.
- Scalable transmission main upgrade / replacement may have cash flow benefits.
- Option aligns with previous SA Water proposal for a southern desalination plant to strengthen the region’s water security.

Disadvantages
- Risk of damage to existing mains and therefore disruption of supply during installation of adjacent mains.
- Potential for higher quality of water to be provided for mining than is required.
- Power supply.
- High capital cost
W5: Transmission of raw seawater and on-site desalination plant/s

**Project description:** Pump raw seawater via transmission mains to one or more sites where the required portion of water is desalinated locally.

**Issue addressed:**
D. No identified suitable source of water for Central Eyre, Southern Eyre and South Gawler mines

**Capital cost:** $400 million

**Capacity:** 13 GL/a

**Scalability of capacity and planned upgrades:** Limited scalability for raw seawater pump and transmission main - initial intake / outlet sizing and transmission main should be sized for maximum forecast demand. Modular booster pumping arrangements can be incorporated. Individual desalination plants can be applied or removed as demand dictates.

**Lead time to operation:** 3 years

**Clusters and industries serviced:**
Clusters – Central Eyre  
Supported Industries - agriculture, tourism, community

**Key technical construction and operational risks:**
- Management of pipeline durability from saline water
- Management of risks of brine spills or leaks during operation. May require detection system, ‘sleeving’ or regular detention ponds
- Treatment / reuse / disposal of waste brine at individual desalination sites.
- Transmission main route will require easement / construction disruption
- Power requirement for desalination at individual sites

**General comments:**

**Advantages**
- Product water quality can be tailored to suit each individual user’s requirements. An individual user can use raw seawater or desalinated water for different purposes.
• Good flexibility for other users to use the pump and transmission pipeline system and apply their own desalination.
• Construction phase employment

Disadvantages
• Management of the risk of seawater leaks
• Management / reuse / disposal of waste brine at individual sites
• Provision of power for desalination
W6: Morgan – Whyalla Pipeline to Storage Points

Project description: Use existing mains water system to maximum capability by storing water in periods of low demand.

Issue addressed:
D. No identified suitable source of water for Central Eyre, Southern Eyre and South Gawler mines

Capital cost: $20 m
Capacity: up to 1.0GL/a
Scalability of capacity and planned upgrades: Storage tanks can be provided at individual sites based on demand
Lead time to operation: < 1 year
Clusters and industries serviced:
Clusters - South Gawler, Central Eyre, Southern Eyre
Supported Industries - community
Key technical construction and operational risks:
- Reliability of available water supply
- Maintaining quality of stored water
General comments:
- This option may assist to meet a mines potable water demand and may therefore enable a lower water quality solution to be more viable for the majority of mine use.

Advantages
- Low capital cost
- Storage may assist fire fighting

Disadvantages
- Pushes existing system to maximum capability.
- May not be a reliable supply.
- May not be an adequate volume of supply.
9. Next steps

**Stakeholder consultations**

The consultation process is open to all those who have an interest in the content of the final RMIP plans. The release of the interim reports has been accompanied by a media release, advertisements in local media and displays in regional councils.

The release of the plans with supporting documentation is accompanied by drop in information sessions open to the general public and targeted group specific workshops. Additionally, roving interviews will be conducted with parties which have specific knowledge critical to the effective development of the final plans.

Consultation is expected to include a diverse cross section of government, industry and the community, including:

- Regional Development Australia
- Peak industry bodies
- Councils
- Mining interests
- Environmental groups
- Existing and potential infrastructure owners and developers
- Regulators
- Industries with an interest in mining
- Other impacted industries
- Community groups and individuals
- Businesses.

**Prioritisation**

A process of detailed prioritisation of projects and solution clusters will follow the receipt of feedback from interested parties.

**Purpose**

The prioritisation process will seek to identify those projects which have the greatest ability to deliver wide-ranging benefits to South Australia and when they will ideally be delivered.

Clearly, the approach to the assessment and prioritisation of potential infrastructure projects is central to determining the relative merits of each project. A prioritisation framework was developed for the RMIP project which is based on the published strategic priorities of the South Australian and Commonwealth Governments.
The prioritisation framework is a systematic and objectives-driven approach to prioritise and rank potential infrastructure projects.

**Approach to prioritisation**

The prioritisation framework which will be utilised is an objectives-driven approach to assessing the relative merits of different infrastructure initiatives and solutions. Prioritisation based on this approach is an efficient means of filtering and identifying solutions that are more likely to meet identified strategic priorities.

Alignment to the two objectives noted below will be measured using a multi-criteria assessment (MCA) framework. The MCA framework will provide a useful means of summarising the performance of particular infrastructure solutions against multiple metrics to arrive at an overall prioritisation score. The MCA framework will permit sufficient flexibility to assess impacts that are either quantitative or qualitative in nature.

The development of the MCA framework for this project included the following steps:

1. **Identify objectives**: these are themes and statements relating to what seeks to be achieved
2. **Identify criteria**: criteria are defined to measure the achievement of each objective. One or more criteria may be used to measure the achievement of identified objectives. In some instances, criteria may be defined as ‘showstoppers’, in which case initiatives or solutions which do not meet these criteria will not be considered further
3. **Weight criteria**: some criteria may be considered more important than others, this is reflected in the analysis by weighting criteria in alignment with their relative importance in measuring alignment to identified objectives
4. **Develop a portfolio of initiatives and solutions**: a discrete set of infrastructure initiatives or solutions that may meet the defined objectives is selected
5. **Scoring**: for each infrastructure initiative or solution, a score is assigned against each criterion. Scores will be based on available metrics and indicators, predicative models or professional judgment
6. **Rank initiatives and solutions**: using predefined weights, scores are combined to calculate the weighted score for each option. The calculated score will be used for the initial ranking of infrastructure initiatives or solutions.

The first four stages of this process have been undertaken and the final two will be completed after consultation on this interim report has been finalised.

**Prioritisation objectives**

The prioritisation framework assesses each infrastructure project for alignment to against two objectives:

- The **strategic objective** is a reflection of the extent to which the project aligns to the strategic objectives of government
- The **deliverability objective** is a reflection of the extent to which the project exhibits or lacks barriers to implementation.

Assessment against each of the objectives above will be undertaken separately. While it is ultimately the hope of the RMIP project to identify projects with strong strategic and deliverability merit, separate scoring permits the identification of projects with strong strategic merit, but require further investigation and planning.
**Strategic objective**

The prioritisation framework is based on the following published South Australian and Commonwealth documents:

- Regional Infrastructure Fund Guidelines
- South Australia’s Seven Strategic Priorities
- South Australia’s Strategic Plan
- Strategic Infrastructure Plan for South Australia
- 30 Year Plans for Regional South Australia
- Infrastructure Australia’s Principles for Regional Infrastructure Planning
- RDA Roadmaps.

The strategic priorities in the documents listed above were distilled five assessment criteria:

- Efficiency of delivery (strategic importance to multiple mines)
- Facilitation of growth in the mining and minerals processing industries
- Contribution to economic prosperity
- Regional and community impact
- Environmental benefit/costs.

**Deliverability objective**

It is likely many of identified projects will have strategic merit, the ability for them to be implemented will be considered when assessing against the deliverability objective. The assessment of the deliverability of each project will give consideration to:

- Affordability
- Legislative and political risks
- Planning gaps (does an effective planning regime exist for the project?)
- Constructability
- Commercial feasibility
- Ongoing commercial viability
- Ability to leverage partner funding for government and the private sector.

**Ranking of solutions**

Rather than combining the strategic objective and deliverability object scores, the scores will be kept separate. By keeping these two scores separate, it will be possible to identify solutions that score well against both objectives or are relatively strong in one only. This granularity will highlight what needs to be addressed in other to improve the overall desirability of solutions.

Scores for each initiative or solution will be mapped as demonstrated in Figure 9.1 overleaf.
One of three classifications will be assigned to each potential solution based on its position in the chart. Table 9.1 provides a description of how categorisation of initiatives or solutions in each of the three classifications may be interpreted.

Classifications are visually represented in Figure 9.2.

**Table 9.1: Assigned Classifications**

<table>
<thead>
<tr>
<th>Assigned Classification</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest Priority</td>
<td>High level of confidence that an initiative or solution is of high strategic value with a high level of confidence that there are limited barriers to its development.</td>
</tr>
<tr>
<td>Moderate Priority</td>
<td>An initiative or solution may be of strategic value but require more planning, analysis and design to confirm.</td>
</tr>
<tr>
<td>Lowest Priority</td>
<td>Given the long lead times for delivering infrastructure projects, this window will include many of the most important major investments for South Australia that are still at a formative stage – these initiatives and solutions may still have a game changing impact on South Australian mining industry and economy.</td>
</tr>
</tbody>
</table>
Outcomes of prioritisation

Solutions that demonstrate high strategic and deliverability alignment will be assigned the highest priority development.

Solutions that demonstrate high strategic alignment but low deliverability shall be investigated for additional planning and investment to remove or reduce barriers to investment or identify mitigations to key risks.

Solutions that demonstrate low strategic alignment but high deliverability will require consideration of possible changes to the solution in order to deliver greater strategic benefit.

The role for government

Whether or not there is a role for government in facilitating the delivery of the preferred infrastructure solutions will follow the identification of a suite of prioritised projects.

The potential role for government in the delivery of the prioritised projects will be classified into the categories below:

- Regulation reform to better facilitate private sector investment
- Policy reform to better facilitate private sector investment
- Intervention to reduce the level of risk borne by one or multiple private sector parties.

In addition to the environmental factors listed above, a role for government will also be identified where market structures do not exist which will facilitate a desirable South Australia-wide investment.

Each prioritised project will be assessed to determine if it will proceed in the absence of government action, and if it will not, the appropriate course of action to facilitate development.
At the completion of this process the preferred roles of government and the private sector will be clearly articulated.

**Economic modelling**

Following the identification of prioritised infrastructure projects an assessment of the expected economic implications of these projects will be undertaken. The economic assessment will be undertaken using the Deloitte Access Economics-Regional General Equilibrium Model (DAE-RGEM). The model is sensitive to the linkages between different industry sectors in the three regions considered in this study and the rest of South Australia as well as the impact of potential royalties paid by miners. The DAE-RGEM is a practical way of tracing the myriad of economic effects that follow the implementation of the projects which will be prioritised. These effects will be aggregated to form and economy-wide understanding of the impact of the plan.

The outputs of the economic modelling will be a series of macroeconomic indicators which give a clear understanding of the economic benefits of prioritised projects for the region, South Australia and Australia. Outputs of the economic modelling will include forecasts of:

- Gross state product (GSP)
- Industry shares of GSP
- Investment activity
- Employment levels
- Wage levels
- Intrastate, interstate and international trade.

**Social assessment**

The economic modelling will be complemented by an assessment of the social implications of the infrastructure prioritised and associated mining developments.

The starting point for the social assessment will be the regional profiles in chapter three of this document which detail the prevailing socio-economic conditions in the region. The experience of similar communities which have experienced considerable change as a result of mining development will inform the types of impacts expected to manifest.
10. How you can provide feedback

Feedback from stakeholders will be a critical to ensuring the final plan is sensitive to the interests of a wide range of community members.

Feedback is sought in relation to the questions below for each of the three types of infrastructure (freight, water and electricity):

- Are the future infrastructure gaps and/or issues adequately identified?
- Have all feasible potential infrastructure solutions been identified?
- When assessing potential solutions, what are the key issues which should be considered (e.g. economic, environmental and social implications)?
- Are barriers to the development of priority infrastructure solutions government may seek to address adequately identified?
- Are there any other issues in relation to the RMIP project you wish to raise?

Interested stakeholders are invited to submit their responses electronically at the link below or make a hard copy submission. If you wish to make a hard copy submission, please contact your RDA to receive a copy of the feedback form.

Link to access submission portal: www.dpti.sa.gov.au/infrastructure/infrastructure_projects/regional_mining_and_infrastructure_planning_project
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Appendix A - Approach

Stage 1 – Review of existing infrastructure
Stage 1 is focused on understanding the state of the infrastructure currently servicing regional mining activity along with the expected future demand profile for freight, water and power that will be required to support growth in the sector.

Task 1.1 – identify existing regional infrastructure
A detailed understanding of the mining sector in South Australia was gained through information gathering from the following sources:

- Mining company annual reports
- Public statements by mining companies in relation to future mining plans
- Private consultations with mining companies
- Review of State Government databases
- Outputs from RESIC’s IDS
- Consultation and validation with the Department of Manufacturing, Innovation, Trade, Resources and Energy
- Published feasibility reports and environmental impact statements for mining projects
- Technical mining and infrastructure assessment by a specialist mining consultancy.

To develop a holistic understanding of the existing infrastructure environment, additional insights were gained through face to face consultations and workshops with industry bodies, government agencies, RDAs, infrastructure operators and other interested parties.

Information was gathered on a mine by mine basis in relation to each mine’s respective infrastructure requirements over the 20 year life of the plans. This included any planned or proposed infrastructure solutions identified by the mine proponents.

Task 1.2 – assess existing regional infrastructure
The focus of this task was to establish a comprehensive understanding of existing infrastructure capabilities. This assessment determines the condition, capacity and capability of existing infrastructure to meet current and emerging mining infrastructure demands and highlights the likely infrastructure deficiencies across the region.

The consultations discussed above included exploration of the extent to which existing infrastructure is likely to be suitable to support the development of the South Australian mining industry. Information gathering was tailored to reflect the unique nature of each type of infrastructure and is detailed in Appendix C.
Task 1.3 – forecast future mining infrastructure demand

Using the data collected and refined in tasks 1.1 and 1.2, mining infrastructure demand was forecast over the period to 2037.

Mining industry data led to the development of clusters which grouped mines likely to have common infrastructure needs. The clusters were developed by grouping mines in close proximity to each other with relatively homogeneous mineral production profiles.

The likelihood of individual mines proceeding to production was modelled with reference to:

- Forecasts of commodity prices
- Estimates of likely mine operating cost
- Estimated mine and direct procured (by mine proponent) infrastructure capital cost
- Estimated cost of feasible mine to port transport solutions
- Allowance for minimum market benchmark return on invested capital.

Commodity price forecasts (i.e. for iron ore, copper, uranium and gold), were drawn from leading international forecasters Consensus Economics. Consensus Economics develops forecasts using predictions submitted by more than 30 commodity forecasters, including private sector consultancies and leading investment and commercial banks. The forecasts of each contributor are aggregated using a proprietary Consensus Economics’ moderation technique to develop a weighted forecast for each commodity.

Prospective mines whose fully burdened cost (including return on capital) are lower than the relevant long-run forecast commodity price were included in the forecast mining activity for the cluster (and region). Demand forecasts based on high, medium and low world economic growth scenarios were produced.

Using this forecast mining output, demand for freight, water and power infrastructure supply was established for each individual mine, with results consolidated for reporting at the cluster level. In collecting the data to enable this analysis, commercially sensitive information (not publicly available) was disclosed to the project team by established and developing miners. As a result, key mine level data and operating assumptions have not been disclosed in the regional mining infrastructure plans and forecasts have been presented at a mine cluster level.

Stage 2 – Identify supply chain solutions

The objective of the second stage was the development of a list of infrastructure projects able to contribute to meeting the needs of the South Australian mining industry. Both tasks 2.1 and 2.2 involved a preliminary identification and a workshop refinement process.

Task 2.1 – identify potential infrastructure gaps and issues

Based on the assessment of existing infrastructure in task 1.2 and the future cluster demand profiles established in task 1.3, the gaps and issues faced by existing infrastructure to service growing mining infrastructure requirements were identified. The analysis drew on findings contained in previous studies (including the 2011 Infrastructure Demand Study commissioned by RESIC), along with commentary from mining proponents and interest groups to establish a base list of mining project inhibitors or challenges. This list was then refined through targeted stakeholder workshops focused on freight and logistics, water and power (electricity and gas).
Task 2.2 – identify potential infrastructure solutions

Following detailed technical research, industry consultation with key mining proponents and industry stakeholders, the project team was able to articulate for each of the regions:

- The current state of relevant infrastructure
- The likely future infrastructure gaps
- Key issues impeding existing infrastructure meeting future demand (i.e. prohibitive commercial or access arrangements, reliability concerns, environmental or social issues)
- Solutions which have been proposed by miners or infrastructure proponents.

This information was presented to targeted stakeholder workshops for consideration. Structured group discussions among workshop participants were used to first test the issues identified and subsequently augment the list of infrastructure solutions which could be capable of addressing the identified infrastructure needs and issues. The ideas of the individual groups were consolidated to produce a complete list of potential infrastructure projects (Refer to Chapter 8 for a complete list of these projects).

Following this workshop the list was refined and any approved or funded projects were removed from further consideration by this project. Further projects determined to be unlikely to meaningful contribute to the strategic delivery of infrastructure for mining in South Australia were removed from the list. This included projects that addressed the requirements for a single mine only and projects so closely aligned it was not meaningful to investigate the projects separately.

Stage 3 – Technical consideration

The objective of the third stage was to gather technical information for each of the identified infrastructure projects, to identify potential path to market solutions (i.e. from mine clusters to port) that address the identified infrastructure deficiencies. This involved grouping dependent and interconnected infrastructure projects into solutions for the alternate mining clusters across the regions.

Task 3.1 – review technical merits of identified projects

This task involved gathering data to establish a deep understanding of the technical merits of each project. To develop this understanding a comprehensive information gathering exercise was undertaken, including the collection and review of the following key metrics:

- Capital cost
- Operating cost
- Capacity
- Mining clusters which would be serviced
- Potential for scalability
- Estimated life
- Supporting infrastructure required
- Key technical and operational risks
- High level pro’s and con’s
- General social, environmental and commercial commentary.
Workshop attendees were consulted where the key metrics identified in task 3.1 could not be sourced from within our project team. This also gave the opportunity for issues to be discussed which could not be raised in the workshops due to time constraints or commercial concerns of workshop participants.

**Task 3.2 – identify alternate infrastructure solutions**

Using the technical information gathered in task 3.1, the project list was consolidated into alternate path to market solutions. The paths are designed to address the needs of regional clusters while reducing unnecessary infrastructure duplication and enabling public benefits. The paths group interrelated, dependent and optional infrastructure projects that would be involved in activating these paths over the twenty year life of the plans. Specifically the freight and logistics projects are grouped by the exit port solution they potentially service. Potential solutions were grouped into packages capable of servicing one or more of the mining clusters.

While energy and water are central to the operation of mines and their associated freight solutions, their demands can be equally addressed (from a technical perspective) by distributed or onsite solutions. Consequently the alternate water and energy solutions that have been identified are decoupled from the path to market solutions and presented separately as standalone solution options.

**Stage 4 - Undertake public consultations**

Before the infrastructure projects are prioritised, an interim report outlining the key regional gaps and issues and the list of infrastructure projects and potential path to market solutions is being released for public consultation – this interim report. This process enables the key drivers of the RMIP project to be discussed and validated with a broad range of community and industry stakeholders to ensure a robust foundation for determining the priority activities for driving development and growth of regional mining activity and growth and development.

**Task 4.1 – release interim reports**

All relevant information gathered over the course of the project to date has been compiled in interim reports for the consideration of interested stakeholders.

The interim reports are not a detailed inventory of the full range of investigations undertaken and information gathered over the course of the project to date. The interim reports present a consolidated summary of the factual and material findings of the project to date which are able to inform submissions of interested stakeholders.

It is intended the accuracy of the findings summarised in the interim reports will be improved or validated during this consultation phase.

The analysis of the forecast mining infrastructure gaps and the infrastructure projects which may potentially address these gaps are contained with the interim report released for public comment.

The interim report gives interested parties an understanding of:

- The nature and level of mining activity in the region
- Forecast nature and level of mining activity in the region
- Key risks to the forecast level of mining activity being achieved
- Forecast infrastructure gap
- Our initial assessment of the proposed projects.
The insight of stakeholders, particularly in relation to the questions posed in chapter 1, will further enhance the understanding of the relative merits of each of the infrastructure proposals under consideration.

**Task 4.2 – stakeholder consultations**

A range of consultation activities are being undertaken to give the greatest possible opportunity for interested parties to provide comment on the interim reports. These consultation activities include:

- Roving interviews
- Drop in information sessions
- Invitee workshops
- Request for hard copy or electronic submissions.

Respondents to the consultation process are being asked to provide their thoughts on the interim reports with respect to four specific questions:

- Are the future infrastructure gaps and/or issues adequately identified?
- Have all feasible potential infrastructure solutions been identified?
- When assessing potential solutions, what are the key issues which should be considered?
- Are barriers to the development of priority infrastructure solutions government may seek to address adequately identified?
- Are there any other issues in relation to the RMIP project you wish to raise?

The information gathered in the project to date (including the consultation processes) will be collated for each of the potential infrastructure solutions. This information will be the basis of a detailed process of prioritisation of which the ultimate intention is identifying viable path to market, energy and water infrastructure solutions. Consideration of the timing of the delivery of infrastructure capacity will be critical to the development of clusters.

Projects will be prioritised based on their alignment to the criteria below:

- Efficiency of delivery (strategic importance to multiple mines)
- Facilitation of growth in the mining and minerals processing industries
- Contribution to economic prosperity
- Regional and community impact
- Environmental.

Further details of the prioritisation process developed are provided in chapter 9.

**Task 4.3 – refine solution list**

It is expected feedback from consultations will further the project team’s understanding of the implications of each of the project clusters under consideration.

The feedback provided by interested stakeholders will be used by the project team to further refine the list of potential solutions and their clustering. Shortlisting of the projects based on the outcomes of consultation will further focus the deliberations of the project team.

Further details on stage 4 can be found in Chapter 9 – “Next Steps”.
**Stage 5 - Infrastructure assessment**

The objective of the fifth stage is to identify the priority paths to market solutions and infrastructure projects for each region. The assessment applies a multi-criteria approach that considers a range of economic, financial, strategic, environmental, and social and government criterion. The assessment considers the priority of projects over the twenty year life of the plans based on the evolving demand from the regions.

**Task 5.1 – assess strategic alignment**

The prioritisation process will identify projects with the greatest strategic alignment to the intended outcomes of this project. The prioritisation process will identify which projects are the most important to the development of the South Australia mining industry and the time period in which the project needs to be delivered.

**Task 5.2 – assess deliverability**

In addition to assessing the strategic alignment, the deliverability of the identified solutions will be assessed. The deliverability assessment will analyse the extent to which the identified solutions are able to be implemented in South Australia.

**Task 5.3 – prioritise infrastructure solutions**

At the completion of the prioritisation process a priority ranking will be given to each of the infrastructure projects. The priority ranking will also outline the expected relative timing for each of the projects.

Strategically important areas are those in which infrastructure delivery is able to support the development of multiple mines and/or provide demonstrable community benefits.

Further details on this prioritisation process can be found in Chapter 9 – “Next Steps”.

**Stage 6 - Identify actions required**

The objective of the sixth stage is to identify the key actions that would facilitate the development of priority infrastructure. This will particularly focus on how the State Government can assist in reducing the risk of projects through policy and regulation reform, process improvement, capital investment, coordination and strategic planning and commercial collaboration or facilitation.

**Task 6.1 - identify scope for government and private sector involvement in projects**

Having identified the priority infrastructure projects, consideration will be given to the potential role for government and the private sector in facilitating investment in the preferred infrastructure. The core principle driving the identification of the role for government will be focusing on removing impediments to the private sector delivering the necessary infrastructure.

Consideration of the potential role for government will focus on projects which are:

- Likely to alleviate ‘blockages’ preventing further private sector investment
- Market failures in which agents pursuing individual interests are not motivated to pursue outcomes which are optimal from a state wide perspective.

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7 This will involve the roles that all tiers of government (i.e. local, State and Commonwealth) can contribute to facilitating the delivery of priority projects.
Examples of the identified role for government in facilitating the preferred infrastructure solution may include, policy change, partnering and direct financing, among many others.

**Task 6.2 - identify means and timing of government involvement**

Having identified the role for government in facilitating the delivery of the prioritised infrastructure to support the development of the mining sector in South Australia, consideration will be given to the most effective means of intervention.

Consideration will be given to the most effective and efficient means of government intervention to address the gaps identified in Subsection 6.1. The recommended role for government will be that which is most likely to deliver the desired infrastructure with the fewest expected negative consequences.

**Stage 7- Finalisation of plans**

**Task 7.1 – finalise regional mining infrastructure plans**

The final task of the project will be the preparation and finalisation of the regional mining infrastructure plans. The final plan will build on the technical assessments and demand modelling presented in this interim report and include a summary of feedback (and refinements) from the community and stakeholder consultations, the assessment of infrastructure priorities and discussion of the key activities required to facilitate development of critical mining freight, water and power related infrastructure. This will also include the role of government and identification of likely regional social infrastructure requirements.

**Task 7.2 – policy and project proposals**

The finalised plans will identify the priority mining infrastructure projects and supporting activities required to enable the growth of the mining sector. These plans will be used over this period to guide the development of policy and project proposals in support of the State Government’s involvement in facilitating these priorities. As required, the policy and project proposals will present, to a preliminary or feasibility level of detail, the case for project action, the required involvement of government (and the private sector), options for the projects and governments involvement and affordability and delivery considerations. This proposal will be used to seek endorsement from Cabinet for policy, regulatory and/or procedural changes to be pursued or alternatively for a detailed business case to be developed seeking funding or commercial engagement (i.e. for joint ventures) approval.
Appendix B – Eyre and Western environmental assets

Matters of National Environmental Significance protected under the Environment Protection and Biodiversity Conservation Act 1999 for the Eyre and Western include:

- One threatened ecological community:
  - Peppermint Box (*Eucalyptus odorata*) Grassy Woodland of South Australia (Critically Endangered Community) likely to occur within area

- Other significant ecological communities
  - Drooping Sheoak (*Allocasuarina verticillata*) woodland
  - Rough-barked Manna Gum (*Eucalyptus viminalis ssp. cygnetensis*) woodland

- Significant Species
  - 72 listed threatened species
  - 59 listed migratory species
  - 102 listed marine species
  - 30 listed cetacean species

- Example threatened species and habitats
  - Mallee fowl (*Leipoa ocellata*), Sandhill Dunnart (*Sminthopsis psammophila*), Fat-leaved Wattle (*Acacia pinguifolia*) and Yellow Swainson-pea (*Swainsona pyrophila*) in mallee habitats
  - Thick-billed Grasswren (eastern) (*Amytornis textilis modestus*) and Slender-billed Thornbill (western) (*Acanthiza iredalei iredalei*) in chenopod shrublands.
Appendix C – Alignment of mines to DMITRE Pipeline

General points on the mines we have excluded:

Our list has been based primarily on the Department of Manufacturing, Innovation, Trade, Resources and Energy (DMITRE) triangle and available information (eg information from the RESIC Infrastructure Demand Study, Invest in SA commodity data, information from miners); anything not on the DMITRE triangle was only included in our assessment if it would have a significant infrastructure demand (eg Hawsons project in NSW - Braemar).

We have not included the north west corner of South Australia (Musgraves, Far North Region) because:

- the timelines for development of resources in the region are uncertain
- most of the projects in this region (except Metals X's Wingellina project in Western Australia) are not advanced
- the commodities in this area are produced in low volumes (nickel, zinc, uranium).

Points on the mines we have included

Our assessment focuses on iron ore projects as it is an infrastructure intense commodity – it is a bulk product with significantly greater freight, power and water demands than any other commodity due to the volumes involved (ie Mtpa vs ktpa) – we have included almost every iron ore project on the DMITRE triangle except for five (all of which are not very advanced).

Copper and uranium commodities are also assessed because:

- copper and uranium are SA’s biggest mineral export earners
- there is information available on the development of these commodities (eg Invest in SA).

We have also concentrated on the operations for which we have the most comprehensive and accurate data; the less advanced a project is, the more uncertainty there is as to its potential infrastructure requirements. Therefore, if we included all prospects in their initial exploration phases the resultant demand estimates would have included a lot of variability which would have skewed the curves and provided little value to the planning process.

Summary of included and excluded projects

Some projects included in the DMITRE triangle were excluded from our assessment for the reasons below:

- associated with other projects White Dam North, Olympic Dam Expansion, Beverley South, Four Mile
coal projects (not included in this project as they energy related, infrastructure supporting Leigh Creek included in considerations of projects), Leigh Creek, Clinton, Arckaringa, Lock out of the region, Kingston
focus on commodities outside scope this project, Beltana
sufficient information is not available to robustly assess the infrastructure needs to develop these deposits, Jungle Dam, Parkinson Dam, Baggy Green, Barns, Black Hills, Golf Bore, Mainwood, Monsoon, Tomahawk/Tunkillia area 191, Mongolata, Sheoak, Skye, Ultima Dam, Yanyarrie, Mount Christie Siding, Willy Willy, Glenrae, Mount Woods, Stuart, Mount Cora, Mount Brady, Jamieson Tank, Pollinga, Claude Hills, Mount Davies, Pindari, Kenmore II, Mount Caroline, Telephone Dam, Menninnie Dam, Weednanna, Alvey, Kangaroo Dam, Taurus, Prospect Hill, Samphire, Armchair, Yadglin, Yarramba, Radium Hill, Aristotle, Oakdale, Malache, Arona 2, Blinman, Emmie Bluff, Emmie North, Moorilyanna, Bagot Well, Burra, Miranda, Moonta, Netherleigh Park, Princess Royal, Punt Hill, Titan, Toondula, Torrens South JV, Wirrda, Eurinilla Dome, Melton, North Kalkaroo, North Portia, Shylock, Willamulka, Blue Rose, Mount Gunson, Mutooroo, Netley Hill, Zeus, Winjabbie East, Flinders Island, Eurelia, Barton West, Dromedary, Gullivers, Mojave, Notrab mining largely complete, White Dam
outside the regions in the plans, Bird-in-Hand, Deloraine, Lady Jane, Kanmantoo, Mount Torrens, Springfield, Mindarie, Angas, Wheal Ellen
Appendix D – Infrastructure assessment benchmarks

The assessment of the adequacy of infrastructure to meet the current and future infrastructure needs of the mining industry were undertaken with reference to the data sets below.

**Roads**

The heavy vehicle routes in each of the regions were assessed with reference to:
- the current condition of roads
- the capability of the roads to cater for heavy vehicles
- the location and proximity of routes to possible mine sites
- the traffic volumes on routes to determine if capacity exists
- the proximity of routes to other freight (particularly rail) to determine if intermodal opportunities exist
- current use patterns by mining and non-mining traffic.

**Rail**

Reference material was reviewed and infrastructure proponents interviewed to assess rail infrastructure in relation to:
- the location and proximity of routes to possible mine sites
- the traffic volumes on routes to determine if capacity exists
- the proximity of routes to other freight (particularly roads) to determine if intermodal opportunities exist
- rail gauge
- ability to accommodate different commodities
- current use patterns by mining and non-mining traffic
- the current condition and compatibility with national rail network
- ownership structure and access regime
- capability of lines (i.e. to handle axle loads)

**Ports**

The review of ports infrastructure included the following key areas for assessment:
- shipping channel and swing basin specifications and dimensions, including maximum vessel sizes
- prevailing subsea geology, tide and current conditions and related maintenance dredging
- towage and pilotage service capacity (equipment and labour force)
- aids to navigation inventory
- berth size and wharf conditions (including all mooring and fendering)
- cargo handling equipment – both ship and stevedoring and terminal related
- cargo storage capacity and operating constraints
- other considerations such as covered loading requirements
- encroachment of incompatible land uses
- community or local government expectations and concerns
• ownership structure and access arrangements
• environmental implications such as proximity to marine parks and recreational facilities
• land transport access (road and rail).

Energy
Gas and electricity providers were identified in each of the regions and information gathered in relation to existing infrastructure affecting the region included:
• location and extent of network
• capacity
• capability (pressure, interruptible etc.)
• upgradability
• current condition and remaining economic life
• constraints and opportunities to optimise use of existing infrastructure
• current and expected demand for commercial and industrial use
• opportunities and challenges of connecting to renewable energy supply
• regulatory and commercial environment
• ownership of assets
• security of supply.

Water
Key information in relation to water assets and potential constraints on supply was reviewed in each of the regions, including:
• population growth forecasts
• climate change and demand impacts
• water allocation (River Murray, prescribed wells, Great Artesian Basin)
• demand projections
• yield capacity and water quality potential water sources, including:
  • prescribed and non-prescribed groundwater resources
  • surface water catchments
  • stormwater reuse
  • wastewater and effluent reuse
• reservoir capacities
• transfer pipeline capacities
• water treatment plant capacities and water quality
• desalination plant capacities and water quality
• existing operating rules.
Appendix E – Commodity price scenarios

Deloitte Access Economics (DAE) has developed three forecast scenarios for commodity prices over the next 10 years. DAE’s forecasts for commodity prices reflect three different set of assumptions in relation to international macroeconomic conditions; a base case, high growth and low growth scenario.

The commodity price forecasts are drawn from Consensus Economics’ quarterly energy and metals forecasts. Consensus Economics develops forecasts using predictions submitted by more than 30 commodity forecasters (of which DAE is one), including private sector consultancies and leading investment and commercial banks. The forecasts of each contributor are aggregated using Consensus Economics’ moderation process to develop a weighted forecast for each commodity. Drawing forecasts from a range of parties supports the consideration of the forward outlook from a broad range of international perspectives.

The weighted forecast for iron ore, copper, gold and uranium published in Consensus Economics’ December 2012 energy and metals forecast is the base case which has been adopted by DAE.

The outlook for Australian macroeconomic conditions is not considered in detail because forces impacting commodity prices are determined by international markets and minimally impacted by Australian economic conditions.

The following commentary for each scenario provides a background to the likely international economic conditions that would be expected to underpin each commodity price scenario. Charts of the forecast price paths are provided following the commentary.

**Base case**

This is the forecast most likely scenario for international economic conditions.

**Scenario overview**

Significant risk remains present in the global environment as a result of continuing sovereign debt problems in the Eurozone and uncertainty in China. However, these risks are lower than observed in recent years and global growth prospects are greater than they have been in recent times. Economic growth in the United States in the short-term in this scenario is supported by a turnaround in the housing market and cheap energy.

Suppressed by potential downside risks from the Eurozone, United States debt issues, declining Chinese investment and possible disruptions to oil supplies, global economic growth in the short-term is lower than the long-term average. Developing nations, while not returning the rates of growth seen pre-GFC, would be expected to continue to outperform the developed nations and will be key to global growth over the next decade in this scenario.

Commodity prices continue on a relatively volatile path, particularly over the short-term as a result of the uncertainly detailed above. Base commodity prices trend downward over the next decade. Investment from developing countries cools, while new supply enters the market as investment in new export capacity gradually leads to increased levels of production.

**Country expectations**

This scenario is predicated upon improving conditions in the housing market, the addition of cheap energy and the willingness of the US Federal Reserve to persist with aggressive monetary policy easing being enough for the United States to start to deliver some much needed momentum to the global economy.

Confidence in the business sector would be expected to improve and economic growth would be expected to provide a stronger employment outlook which would lead to the unemployment rate trending down. This scenario assumes the United States’ fiscal issues are negotiated without incident in 2013, but the need to consolidate debt over the long term ensures average economic growth over the next decade is lower than in the previous decade. After a period of adjustment the United States economy would be expected to make a
solid recovery with economic growth, unemployment and consumer spending all returning to more normal levels by the decade end.

This scenario assumes China’s willingness to support steel-intensive, investment driven activity will remain the key driver of China’s economic growth over 2013 and will keep global commodity prices elevated (albeit at lower peaks than seen in 2012). Credit growth in China has also been strong, however this may soon begin to drag on economic growth as interest repayments make up a greater share of spending. This scenario envisions the Chinese economy still being heavily reliant on manufacturing and export growth. The share of output from industry is expected to shrink at the same time as the services sector expands as incomes continue to rise over the long-term (a higher income population places additional demand on services). China's export share of gross domestic product (GDP) is expected to shrink while imports increase as the share of output from industry decreases. These changes would be slow to manifest. Overall, this scenario assumes income growth in China is solid throughout the next decade and consumption slowly accounts for a greater share of the economy over time.

Europe is the major risk to the global economic outlook over the next decade – its banks are undercapitalised, making it hard for them to finance new growth and political divisions threaten the recovery process. In this scenario recession in Europe’s periphery creeps towards its core and economies on Europe’s southern fringe remain on the back foot for some years until wage costs are restrained (relative to those in Germany and France). Unemployment within the Eurozone is expected to remain at record rates for a few more years and with austerity measures on top it is unlikely Europe’s economy will return to positive economic growth in the short-term. The Eurozone is expected to drag on global economic growth for some years in this scenario with a long period of adjustment and austerity over the next decade.

Japan faces a unique mix of economic and demographic challenges to be addressed over the next decade. Government debt in Japan is a larger multiple of national income than in Greece and economic growth has been almost stagnant for the past decade. Japan’s population is shrinking and ageing rapidly. In this scenario Japan is expected to undergo a period of structural adjustment and debt consolidation over the next decade resulting in only modest rates of real economic growth.

India, Brazil and Turkey all slowed in 2012, meaning the outperformance of emerging economies over the past decade suffered some headwinds, while Asia’s Tigers (Korea, Taiwan, Hong Kong, Singapore, Thailand, Malaysia, Indonesia and the Philippines) are also seeing more modest growth prospects. This scenario assumes growth in these economies will trend above global averages, but be lower than has been recorded over the past decade.

Commodity price outlook

Iron ore prices bounced back from their lows in September 2012. Strong investment led growth in China is expected to ensure excess supplies accumulated over the latter half of 2012 are quickly used up and prices remain high over 2013. The massive surge in investment in iron ore projects across many countries earlier in the decade will result in a gradual ramping up of supply in this scenario. The increase in supply is expected to cause prices ease a little after 2014, but continuing strong growth from emerging economies would be expected to support prices for most of the next decade. As China moves from an investment-driven to a consumption-driven economy, global demand for iron ore is expected to ease somewhat and cause prices to cool toward the latter half of the next decade.

The high rates of investment expected to keep the iron ore price strong in 2013 are expected to do the same for copper. More positive business sentiment and stronger residential housing construction in developed countries over the short-term would be expected to help support the copper price at current highs in this scenario. After that, prices are expected to cool as new supply becomes available and Chinese economic growth slows over the next decade.

After good gains over 2012, a better global economic outlook for 2013 would drive the price of gold downward over the short-term as investors seek higher returns in riskier assets. The record prices seen at the end of 2011 do not return in this scenario and the end of monetary easing policies from many of the world’s major central banks would be expected to place further downward pressure on the gold price into the middle of the next decade. The gold price would be expected to settle as threats to the global economy subside over the latter half of the next decade and the world enters a phase of sustained growth.

Uranium demand would be expected to return to growth over time in this scenario as the memory of the Fukushima disaster in Japan fades. Additional energy demands from developing countries with rapidly urbanising populations and growing incomes make nuclear a more attractive energy source – this is particularly pronounced in response to the growing air pollution issues in many of Asia’s major cities. This scenario assumes uranium exporting countries invest heavily in new mine capacity to keep pace with demand over the next decade. Uranium prices rise, but remain below the levels seen in recent years.

High economic growth scenario
Below is a scenario for international macroeconomic conditions which is at the higher end of expectations.

**Overview**

This scenario assumes the global economy hits its straps in 2013 after stumbling throughout 2012. Sovereign debt issues in the Eurozone subside as unconventional monetary policy from the European Central Bank (ECB) has the desired effect, while government investment in infrastructure in China drives strong economic growth in the short-term. United States growth surprises in the short-term, as a resurgence in housing construction and consumer spending drives a sustained turnaround in economic activity.

This scenario assumes the global economy moves into full recovery mode, the major economies track well and global uncertainty retreats over 2013. Developing countries, led by China, will continue to make a substantial contribution to global economic growth and outpace the economic growth of developed countries. Developing country growth in this scenario continues to be driven primarily by engineering construction investment, supporting commodity prices over the short-term. This scenario is reliant upon political unrest in a number of oil exporting nations being negotiated without any disruption to oil supplies and the world economy being positioned to make a sustained recovery.

Base commodity prices continue to be buoyed by robust demand from developing nations in this scenario. Indeed, demand for base commodities would outpace supply even in light of the massive amount of new mine capacity which would push the global output of raw materials to record levels. Uranium prices would rise in this scenario as the world demand for energy drives upward. A better global economic outlook would cause the price of gold to fall sharply in the short-term as investors chase higher returns in riskier assets.

**Country expectation**

In the scenario the United States performs strongly over 2013. Low interest rates and continued monetary easing would drive a better than expected recovery in housing construction and prices. Banks would be provided greater liquidity facilitating increased access to capital for the private sector. Exports of gas would increase significantly to underpin this scenario. The unemployment rate would fall sharply over the short-term as a resurgent United States business sector provides a platform for robust jobs growth, while better business and consumer confidence drives a turnaround in retail spending. This scenario assumes United States Government debt issues will be resolved with Congress negotiating the approaching debt ceiling without issue, while also reaching its target of 2.5 percent debt consolidation in 2013. Indeed, United States economic growth is strong enough over the next decade in this scenario to ensure the United States can consolidate its debts while not impeding economic growth.

In this scenario strong short-term growth in China is driven by engineering construction as the new government renews steel-intensive, investment driven growth. The immediate excess supplies of raw materials are expected to be quickly used up and base commodity prices rise as a result of the lift in demand. In the next five years the consumption share of output in China rises as a result of stronger income growth, particularly in China’s major cities. The rate of consumption growth overtakes growth in investment within a few years, but investment remains the most significant contributor to economic growth in the interim. As a result of increasing consumption growth, base commodity prices begin to fall after 2015 in this scenario. Over the long-term, China’s economic development follows the same pattern of the other developed nations in the region – such as Japan and Korea – with higher household income associated with a relative decline in the industrial sector and an expansion in the services sector.

Even under this scenario the outlook for the Eurozone is modest at best. The ECB’s commitment to aggressive and unconventional monetary easing ensures liquidity in the financial system. Banks begin to issue more loans resulting in some small gains in business investment and housing construction. Fiscal consolidation reduces government debt and provides some confidence in financial markets, but limits economic growth as the government sector contracts. The recessionary conditions in the periphery countries ease, though growth is slow.

Japan remains a key risk to global economic stability in this scenario, with few prospects for growth over the next decade. The Asian Tigers perform well, with economic growth riding high on an engineering construction boom which lasts well into the next decade. India negotiates its fiscal and monetary issues in this scenario – keeping inflation under control and beginning the process of reducing its fiscal deficit.

**Commodity price outlook**

Strong investment led growth in China in this scenario pushes iron ore prices higher over 2013. The massive surge in investment in iron ore projects across many countries earlier in the decade increases supply post 2013. Continuing strong growth from emerging economies ensures demand outpaces supply for at least the first half of the next decade – pushing prices up until around 2015. As China’s demand for iron ore eases toward the latter half of the next decade, prices retreat in this scenario.

Strong investment-led growth in China would also be good news for the copper price, ensuring it remains high over the short-term. New supply is expected to be significantly less than for other base metals and
Appendix E – Commodity price scenarios

Low economic growth scenario

Below is a scenario for international macroeconomic conditions which is at the lower end of expectations.

Scenario overview

In this scenario the global economy continues to stumble for a number of years. Global economic growth is plagued by a series of small financial crises as high government debts, particularly in the Eurozone and the United States destabilises financial markets. Chinese growth shudders as falling demand from the Eurozone and the United States (China’s two largest export partners) cause export volumes to fall dramatically. The global output of base commodities increases significantly in this scenario over the next few years as investment in new mine capacity from years past pushes supply to record levels. Demand for these commodities does not keep pace and prices fall as a result.

Some years after the end of the GFC, the world economy may remain in a state of flux, with low growth and high debt in high-income countries a major concern. Global growth over the short-term grinds to a halt as downside risks from the Eurozone, United States debt issues and declining Chinese investment damage global growth prospects in this scenario.

Base commodity prices suffer as demand from developing nations, particularly from China, begins to moderate. Global demand for base commodities struggles to keep up with supply as a lift in new mine capacity pushes the global output of raw materials to record levels in this scenario. Uranium prices would remain stagnant, in line with global energy demand. The price of gold would be expected to make some strong gains as investors seek to secure their wealth from volatile movements in other asset prices, including equities.

Country expectation

The United States underperforms over the short-term in this scenario. The United States housing market is expected to remain flat, with little in the way of price growth or new construction, in spite of low interest rates and continued monetary easing. Unemployment in the United States remains above 7.5 per cent leading into middle of the next decade, while business and consumer confidence is plagued by uncertainty in the financial sector and insipid retail spending remains a drag on economic performance. This scenario assumes Congress manages to negotiate the approaching debt ceiling, but without a turnaround in economic performance, the United States is unable to consolidate any of its debts over 2013. The United States does not make any significant contribution to global economic growth over the next decade in this scenario.

In this scenario China’s economy feels the pinch of a slower global economy and financial market uncertainty. Investment spending is expected to begin to cool and domestic consumption remains subdued after the most recent government stimulus package has run its course. All efforts by China’s new government to encourage growth in consumption spending in the short-term fail. Household income growth would be expected to slow and ensure China’s reliance on export growth and investment to drive economic growth continues over the medium-term. However, China’s export volumes would be expected to fall significantly, particularly in the short-term, as instability in the Eurozone and the United States cause demand for Chinese manufactures to fall. China’s economic growth is projected to slow significantly over the next decade in this scenario and contribute to the general fall in commodity prices.

Monetary easing by the ECB in this scenario is not enough to pull the countries on the periphery of the Eurozone out of recession. The economic instability felt on the fringes of the Eurozone moves towards the core. Political divisions and the varying degree of competitiveness between member countries stifle the
Eurozone’s recovery. Unemployment within the Eurozone would be expected to remains at record levels over the medium-term as a result of uncertainty and austerity measures.

Political uncertainty and a lack of policies to reduce excessive government debt damages growth in Japan in the short-term and a need to consolidate debts and a rapidly ageing population damages prospects for economic growth in the long-term in this scenario. The Asian tigers would be expected to slow as a result of weaker growth in China, Europe and the United States. India is expected to continue to struggle with high inflation on the one hand and low growth on the other. The Indian Central Bank and the government in this scenario would be limited in their ability to encourage economic growth through monetary and fiscal policy. A period of low growth relative to years past would be expected to set in for the next decade.

Commodity price outlook

In this scenario the iron ore price would be expected to begin to fall over the first half of 2013 as China does not utilise excess supplies accumulated over the latter half of 2012. The surge in supply resulting from recent investment combined with slower growth from emerging economies would mean demand struggles to keep pace with supply for at least the first half of the next decade in this scenario. The iron ore price would be expected to fall significantly in the lead-up to 2015. After that, prices settle well below current levels towards the end of the next decade.

Copper prices fall sharply in the lead-up to 2015 primarily as a result of softening Chinese investment in this scenario. This would be expected to be compounded by falling global energy demand reducing copper demand from new electricity infrastructure. The addition of new supply would be expected to place further downward pressure on copper prices. In this scenario the price of copper is expected to level off over the long-term as stability returns to global markets, but at significantly lower prices as a result of a structural shift in supply.

Weak growth in the global economy drives the price of gold upward over the short term in this scenario, as investors seek to secure their wealth. Monetary easing policies by many of the world’s major central banks extend well into the middle of the next decade and would be expected to depress currency values and place further upward pressure on gold prices. Softer global economic growth in this scenario ensures gold prices remain on an upward path over the long-term.

Governments across the globe remain wary around the use of uranium for nuclear power as the memory of the Fukushima disaster in Japan remains vivid in this scenario. Some governments may seek to reduce their use of nuclear energy and others look to increase it in pursuit of a less carbon-intensive base load energy. Uranium production would be expected to keep pace with demand over the next decade. However, a weaker global economy reduces overall global energy demand and ensures uranium prices remain relatively flat over the next decade.
Appendix E – Commodity price scenarios

Iron ore, $US / T
Australia-Japan contract, fines, 62% fe

Copper, $US / T

Forecast