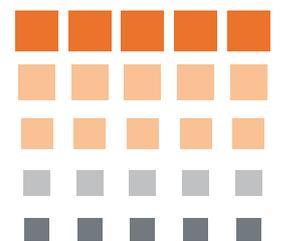


South Australian Future Mining Workforce Report 2014–2030



A study of the growth of
minerals project employment
between 2014 and 2030.



RESA
Unearthing Skills
Solutions

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SPECIAL THANKS

This report is proudly presented by RESA for the benefit of the South Australian Resources Sector.

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Andrea McCarthy



CEO, RESA
Phil de Courcey



RESA would also like to specifically acknowledge companies who went above and beyond in their contributions...



RESA would also like to extend our appreciation to the Department of Further Education, Employment, Science and Technology, the Department for Manufacturing, Innovation, Trade, Resources and Energy and the South Australian Chamber of Mines and Energy for their contribution and support to this report.



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RESA is a collaboration between the resources sector and the SA and Federal Governments as a strategic response to skills shortages in this sector.

RESA is committed to being a key point of reference for information on resources workforce planning, development and skilling requirements, as well as being an overarching advocate for the sector. RESA also undertakes SA resources and workforce research, contributes to policy development and facilitates, brokers and manages the delivery of projects to increase the number of skilled people in the sector.

The Resources Industry Definition

The broad definition of the resources industry refers to South Australian entities engaged in mining, oil and gas, engineering (planning, design, fabrication, equipment), construction and allied services in South Australia. It also includes entities engaged in activities which supply key infrastructure and services to the resources sector.

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EXECUTIVE SUMMARY

The *South Australian Future Mining Workforce Report: A study of the growth of minerals employment between 2014-2030* is a forecast of the future workforce requirements for minerals projects in South Australia. This report is a follow-up to RESA's *South Australia Resources Workforce Scoping Report 2013-2020*, which identified workforce numbers and occupational requirements for existing mining projects between 2013 and 2020.¹

The South Australian mining sector has 21 minerals projects currently in operation and 40 that are in advanced development. These developing projects will be central to South Australia's future economic and social transformation and offer thousands of workers dynamic and rewarding career opportunities.

The projects included in this report are in various stages of development and approval processes. There are 38 mines undergoing approval and two ports planned to support developing mines on the Eyre Peninsula. Forty projects in total are included in these forecasts.

The information collected and summarised in this report is drawn from first-hand data supplied directly to RESA by the project companies.

KEY FINDINGS OF THE REPORT

Research findings indicate that there will be a substantial increase in labour demand for South Australian mining projects over the next sixteen years. The findings from this report include two different scenarios; "Likely" (most probable projects are developed) and "Less Likely" (if all 40 mines are developed).

For a list of all mine sites included in this report, refer to Appendix A.

Likely Scenario

This scenario is based on employment numbers if the mines determined as being most likely to reach production (16 in total), are completed. This likelihood was assessed using the Department for Manufacturing, Innovation, Trade, Resources and Energy (DMITRE) criteria for probability assessment.

- i. Approximately **27,442** new jobs will be created in both the construction and production phases between 2014 and 2030;
- ii. Demand for employees is predicted to peak in 2028 with **11,266** new production employees forecast;
- iii. The mining sector will need to employ approximately **14,120** people to construct these 16 minerals projects;
- iv. The mining sector will need to employ approximately **13,322** people once these 16 mineral projects move into full production;
- v. The mines with the highest projected labour demand will come from copper mines, which will peak at **8,120** people (for both construction and production phases of the mines) by 2029, and iron ore mines, which will peak at **4,774** (for both construction and production phases of the mines) by 2016;
- vi. The highest occupation category in demand will be for **skilled workers** (mainly production and process operators) with a peak of **4,127** workers required by 2021, and **technical workers** (mainly technicians) with a peak of **2,874** workers required by 2021.

Note: All occupations within each category are listed in Appendix B.

¹ RESA: South Australia Resources Workforce Scoping Report 2013 – 2020

“ Approximately 27,442 new jobs will be created in both the construction and production phases between 2014 & 2030 ”

Less Likely Scenario

This scenario is based on potential employment numbers if all 40 minerals and infrastructure projects surveyed and analysed within this report reach production. This is a ‘best case’ scenario for employment numbers but a less likely outcome.

- i. More than **36,366** new jobs will be created in both the construction and production phases, this will more than double current mining employment in South Australia between 2014 and 2030;
- ii. Demand for employees will peak in 2028 with **13,926** production employees forecast;
- iii. The mining sector will need to employ approximately **19,335** people to construct these 40 projects;
- iv. The mining sector will need to employ approximately **17,031** people once these mines move into full production.
- v. The mines with the highest projected labour demand will come from copper mines, which will peak at **8,920** people (for both construction and production phases of the mines) by 2029, and iron ore mines, which would peak at **6,200** (for both construction and production phases of the mines) by 2017;
- vi. The highest occupation category in demand would be for **skilled workers** (see occupations below) with a peak of **4,869** workers required by 2021, and **technical workers** (see occupations below) with a peak of **3,105** workers required by 2021.

“ More than **36,366** new jobs will be created in both the construction and production phases, this will more than double current mining employment in South Australia between 2014 and 2030 ”

AGGREGATED WORKFORCE EMPLOYMENT 2014 – 2030

Likely Scenario

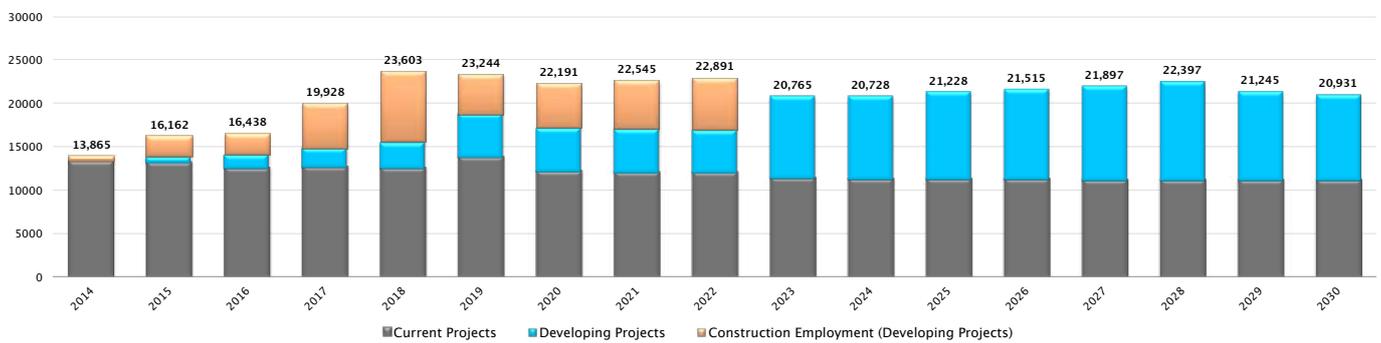
The workforce for mine sites that are currently operating, combined with the workforce data for developing mines, paints an overall picture of employment across all major mining projects in South Australia. The total employment for the 21 currently operating mines in SA has been combined with the 16 probable developing projects in Chart A.

In the “Likely Scenario” (the 16 probable projects to be developed), total employment across currently

operating mines and developing projects (including construction employment) will start at 13,865 in 2014 and peak at 23,603 in 2018.

Factoring in an average mining industry turnover rate of 14% per annum, the total figure for job openings across currently operating mines and developing projects (including construction employment) will start at 15,806 in 2014 and peak at 26,907 in 2018.

Chart A: Aggregated Workforce (Likely Scenario)



Less Likely Scenario

In the “Less Likely Scenario” (if all 40 projects are developed), total employment across currently operating mines and developing projects (including construction employment) will start at 13,865 in 2014 and peak at 27,790 in 2018.

Factoring in an average industry turnover rate of 14% per annum, the scenario will start at 15,806 in 2014 and peak at 31,681 in 2018.

In both scenarios, the rapid increase in employment between 2016 and 2019 is due to the 24 new mines that are predicted to enter production at a similar time during this period. Without sufficient supply of a suitably skilled workforce, South Australia may experience a skills shortage over this period.

Chart B: Aggregated Workforce (Less Likely Scenario)



ANNUAL JOB GROWTH

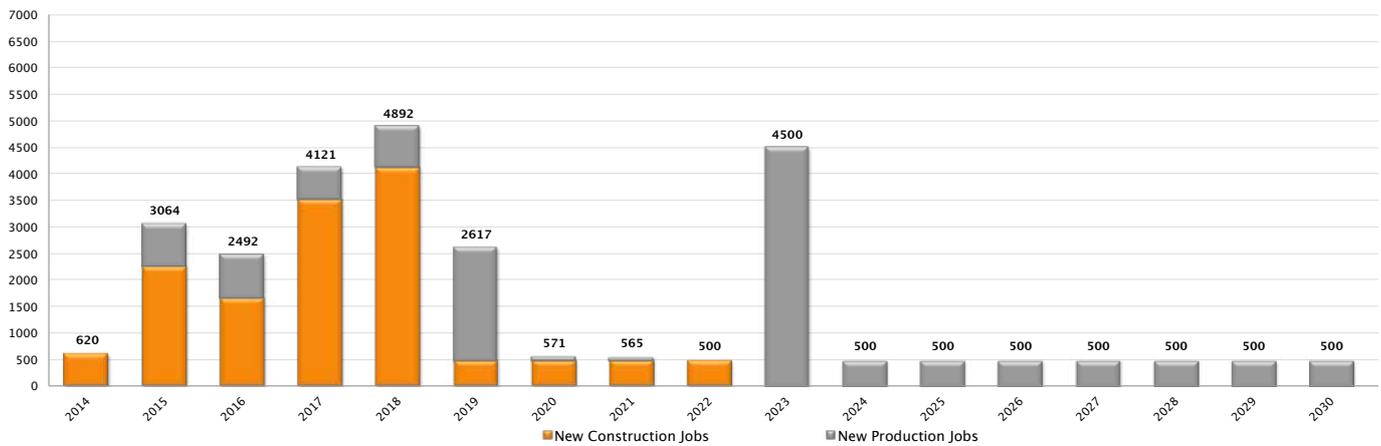
Chart C below displays the number of new jobs forecast to be created in both the construction and the production phases for new mines. It is important to note that this section specifies the number of new jobs created over the period of 2014 - 2030, not necessarily the number of people employed in these roles. For example, while the mine construction phase is short-lived, some people working in this phase may move to the production phase soon afterwards and fill some of these new roles.

Likely Scenario

A total of 14,120 new roles will be created in the construction phases of these projects (2014-2022). In addition, 13,322 ongoing jobs will be created during the production phase, over the course of 2014 to 2030. Combined, there will be 27,442 new jobs created in South Australia over this period.

The rapid increase of employment in 2023 is mostly due to the increased number of new people employed once a number of new projects reach the production phase.

Chart C: New Jobs (Likely Scenario)

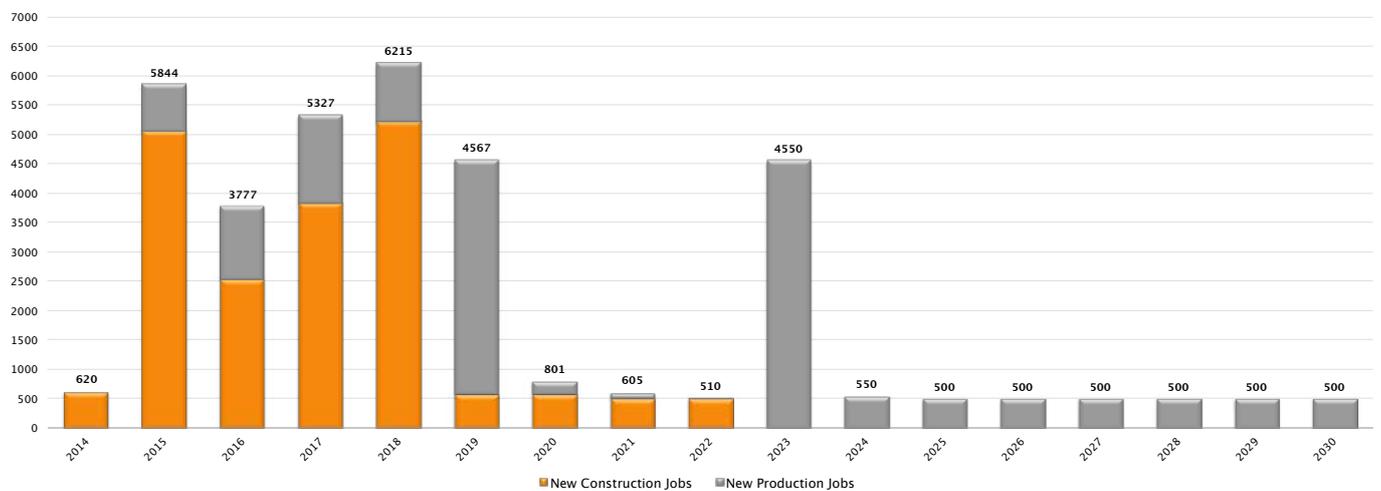


Less Likely Scenario

A total of 19,335 new jobs will be created in the construction phases of these projects (2014-2022). While the mine construction phase is short-lived, it has the highest workforce requirements.

In addition, 17,031 non-construction phase will be created during the production phase, over the course of 2014 to 2030. Combined, there will be 36,366 new jobs created in South Australia over the 2014 – 2030 period.

Chart D: New Jobs (Less Likely Scenario)





SKILL AND LABOUR SHORTAGES

The occupation category with the greatest forecast demand will be for skilled and technical employees. Skilled employees include mobile plant and machinery operators, and technical employees include technicians, surveyors and draftspersons. Refer to Appendix C for a list of the occupations in these two categories.

To maximise benefits to the state, South Australia must have a skilled and job-ready workforce prepared for employment. A robust state workforce development strategy to attract and retain these people into the mining sector will be essential.

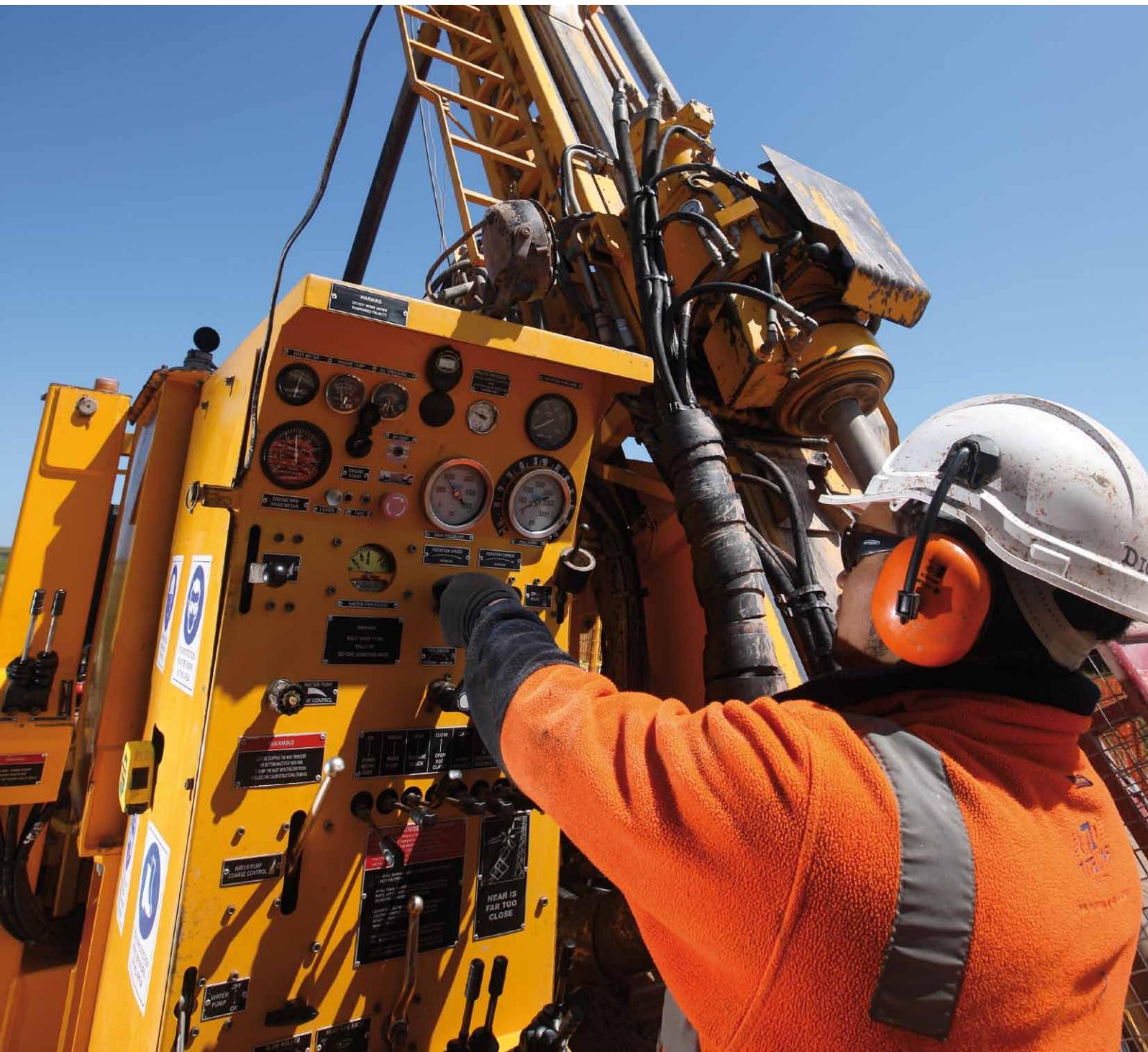
However, as mining technology advances and new processes are created, future training and workforce requirements for these sites may be affected, with automation likely to play a large role in future mining operations.

Additional challenges that may face the mining sector include interstate competition for talent, public perception of career opportunities and workforce mobility issues. Unless these factors are addressed, South Australia will struggle to meet demand for skilled workers, potentially impairing future mining developments.

As mining technology advances and new processes are created, future training and workforce requirements for these sites may be affected, with automation likely to play a large role in future mining operations.

If South Australia's mining sector requires an additional 27,442 and averaging 1,715 new people per annum (likely scenario), or 36,366 and averaging 2,272 new people per annum (less likely scenario) between 2014 and 2030, there will need to be a focus on attraction and retention strategies in the near future. If this does not occur, it is obvious that there will be a skills and labour supply shortage. These skills gaps are also likely to be exacerbated by an ageing workforce.

“ Labour shortages will pose a serious challenge for South Australia once the rapid development of projects occurs. ”



INTRODUCTION

The South Australian Future Mining Workforce Report: A study of the growth of minerals employment between 2014-2030 is a workforce analysis of mineral, mining and infrastructure projects currently being assessed for approvals across South Australia.

There are 40 mineral and infrastructure projects included in this report, which summarises their anticipated construction and production workforce numbers and their likely occupational structure.

This report is a follow on from RESA's "South Australia Resources Workforce Scoping Report 2013-2020" of current major mines in SA. That report identified and analysed the total workforce demand and occupations for approved and currently operating mines in South Australia.

This report projects the workforce and occupation requirements for developing mines and infrastructure between 2013 and 2030. It was compiled on the basis of first-hand information from the exploration companies themselves.

When the mining projects outlined in this report come to fruition, the economic revitalisation for certain parts of the State will be remarkable.

The Department for Manufacturing, Innovation, Trade, Resources and Energy (DMITRE) is currently case managing these developing mines through the approvals process, to abide by regulations in the Mining Act 1971.

These projects are in various stages of undertaking, or have completed, feasibility studies, mine proposals and other assessments and approvals.

The scale of expansionary activity facing the sector in South Australia is substantial. These developing projects have the potential to bring a significant increase in revenue and employment to South Australia and contribute considerably to State economic activity. When the mining projects outlined in this report come to fruition, the economic revitalisation for certain parts of the State will be remarkable.





“ The South Australian mining sector has 21 currently operating minerals mine sites and at least 40 projects currently in the “advanced development” phase. ”

BACKGROUND TO THE STUDY

OBJECTIVE

The purpose of this study is to aggregate and analyse the workforce requirements for both existing minerals and infrastructure projects, and those presently being assessed for government approvals.

RESEARCH AND ANALYSIS PROCESS

This study aggregates workforce data from the major exploration projects and developing mines in South Australia. The projects in question are sourced from the Department for Manufacturing, Innovation, Trade, Resources and Energy's (DMITRE) "developing projects" directory and DMITRE's Major Projects Development Directory. Two infrastructure projects that support developing mine sites have also been included in the research.

The methodology used to gather this workforce data and analyse it employed both a quantitative and qualitative approach. The companies undertaking development of these mines were approached to participate in this study in July 2013.

Responses were obtained from managing directors, project managers and directors of these companies; with all conclusions drawn from first-hand information.

Given the emerging status of many of these projects, a blended approach of face-to-face, phone and email interviews were conducted where necessary. Employment forecasts are confined to on-site activities only; with corporate and head office workforce not included in these figures.

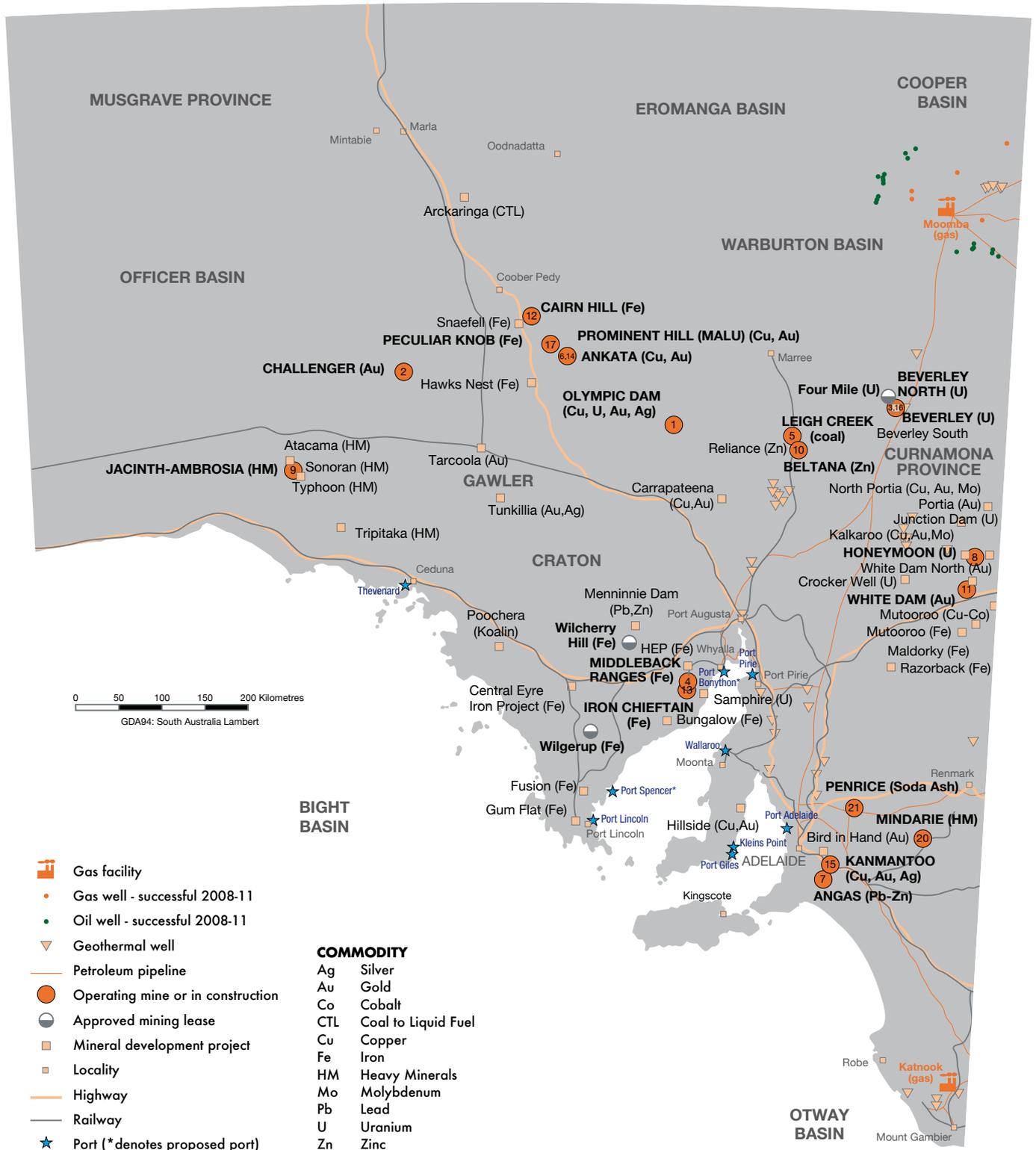
The information sought from companies included:

- Forecast demand for labour until 2030 for minerals and select infrastructure projects across South Australia once in the construction phase,
- Forecast demand for labour until 2030 for minerals and select infrastructure projects across South Australia once in the operational phase,
- Occupational breakdown across six classifications including:
 - Administration
 - Professionals
 - Technical
 - Trade
 - Skilled
 - Semi-Skilled,
- Issues that may prevent a mine from becoming approved.

For a breakdown of the occupations that are assigned to each category, refer to Appendix B.



South Australia's Major Operating Mine and Development Projects





In some categories of this report, mine sites are grouped by the main commodity they produce. Mines that produce multiple commodities are classified by the dominant commodity produced. For example, the Olympic Dam Expansion is classified as a copper mine, instead of a uranium, gold or silver mine, because there will be a greater production of copper than other commodities.

The main commodities that are grouped in this report are:

1. Copper
2. Iron Ore
3. Uranium
4. Gold
5. Other (Lead, Zinc, Silver, Heavy Mineral Sands, Kaolin, Coal and Coal-to-Liquids)

For a full listing of which mines are grouped into which commodities, refer to the section South Australia's Current and Future Minerals Projects in Appendix A.

Information derived from mining companies was plotted along a timeline of 2014 to 2030. Workforce data was allocated to each mine site according to the years of construction and years of production along the mine's life span. The information on mining duration has been compiled from various documents produced from DMITRE as well as from information from the mine companies themselves.

The workforce data is presented in the scenarios:
a. Mines most likely to go ahead ("Likely Scenario"),
b. Mines less likely to go ahead ("Less Likely Scenario").

A total of 16 mineral projects were included in the likely scenario and all 40 mineral projects in the less likely scenario. To categorise the mines and projects as more or less likely to proceed, the status of the mines was amended according to DMITRE's Mine Matrix and Major Project's list. Any mine that was either a concept or undertaking feasibility studies

to the point of definitive feasibility at the time of publishing this report was categorised as less likely to proceed. Any mine that was at the bankable feasibility stage, project execution or approved for construction stage was categorised as more likely to proceed. Refer to Appendix A for a list of mineral projects included in this report.

Workforce data was also derived from RESA's "South Australia Resources Workforce Scoping Report 2013 – 2020" to include statistics for minerals projects currently in operation. The data from that report was modified to omit oil and gas projects and Wilcherry Hill and Wilgerup mines, which were instead included in the developing mines data, as they are not yet in operation.

CONFIDENTIALITY OF DATA

The workforce data obtained is under protocols of the strictest confidentiality. Data is presented only in aggregated form to protect the commercial interests of the companies who supplied this data exclusively to RESA.

DATA LIMITATIONS

While every attempt has been made to ascertain valid and reliable data for this report, given the uncertainties surrounding the time-frames of these developing projects, these workforce forecasts are best estimates and have been provided in good faith by the interviewed companies. Our analysis, while accurate for now, does not suggest that the workforce, occupational ratios and timings will not change over time. Notwithstanding the substantial commitments and investments being made by the proponent companies, there is no certainty that specific projects will proceed to operation. Approvals depend on access to infrastructure, finance, the cost of extracting and exporting commodities, commodity prices, government approvals and international market conditions.



“ A total of 16 mineral projects were included in the likely scenario and all 40 mineral projects in the less likely scenario. ”

OVERVIEW OF THE MINING SECTOR IN SOUTH AUSTRALIA

SOUTH AUSTRALIA'S VIBRANT MINING SECTOR

Mining has been the backbone of South Australia's development since the 1800's. The state has a proud history of mining and was founded on copper mining, which has played a key role in the development of the state since European settlement in 1836.

South Australia is a leader in the exploration and discovery of key minerals, possessing almost 40% of the world's known recoverable uranium reserves and significant volumes of copper, gold and silver. South Australia is also ranked the 4th most prospective location in the world for mining, according to Canada's Fraser Institute. The South Australian mining sector has at least 21 major mines, 38 minerals projects in advanced development and two major related infrastructure projects to support some of these mines once in operation. These projects are vital to South Australia's economic and social transformation and will offer thousands of people exciting and rewarding employment opportunities.

Facts on the South Australian Mining Sector:

- South Australia is a leader in the exploration and discovery of uranium, copper-gold and mineral sands. Exploration activity over the past seven years has led to numerous exciting development projects.
- South Australia has approximately 40% of the world's known recoverable uranium reserves, 25% of Australia's inferred resources of gold, and approximately 70% of Australia's copper resources;
- Copper is the most explored for and exported commodity;
- South Australia is emerging as the second largest producer of iron ore in Australia (second to WA), accounting for more than 5% of the total Economic Demonstrated Resources;
- First discovered in SA in 1906, we have by far the largest reserves of uranium in the world¹;
- South Australia currently hosts 3 major gold mines; Olympic Dam (fifth biggest gold resource in the world), Challenger and Prominent Hill;

- We are home to one of the world's biggest copper, gold and uranium mines, Olympic Dam, and two of Australia's largest undeveloped copper projects at Carrapateena and Hillside;
- South Australia's Outback (Far North and APY) has approximately 400,000km² under exploration lease. The region possesses deposits of lead, nickel, zinc, gold, copper, magnetite, chromium, tin, coal and diamonds, and;
- We are home to the world's largest single-stream lead smelter at Port Pirie, where refined zinc, copper and silver are also produced.

REGIONAL REVITALISATION

The expansion of developing minerals projects has the potential to significantly impact the economies and communities of regional and remote South Australia. Mines in the development stage such as Hillside, Carrapateena, Central Eyre Iron Project, Four Mile and Kalkaroo are just some of the mines which can give an economic revitalisation to the state. The Eyre Peninsula, in particular, may benefit greatly as a result of many of these minerals projects, particularly those in iron ore.

The region with the largest mining activity in South Australia is the Far North; an area which covers 80% of South Australia's total land mass and contains 72% of South Australia's current mineral projects. The mining towns of Roxby Downs and Leigh Creek are located in the Far North.

These developing minerals projects are geographically positioned in the regions defined by Regional Development Australia in Table 1.

¹ Geoscience Australia



ECONOMY, EXPLORATION AND EXPORTS

Mining is a key economic driver for South Australia. It is a major contributor to the growth and development of our state now and into the future. Market conditions for commodities mined in South Australia are influenced by global economic performance, as well as demand for minerals from some urbanising economies.

The strength of the South Australian economy is reliant on the maintenance of a healthy mining investment pipeline. In the past decade, South Australia has experienced a record investment in minerals exploration; copper being the number one commodity most explored for and exported.

At present, there is a level of uncertainty in the world economy. Ambiguity about growth prospects in China, fluctuations in equity and foreign exchange markets and a recession in the euro zone economy have all negatively impacted the price of some commodities.

Despite these complications, a strong demand for iron ore and copper for growing economies such as India and China will ensure demand for South Australia's minerals.¹

China is currently the world's largest consumer of minerals and a major importer of South Australian mined commodities. The long term growth in demand for copper is predicted to accelerate, driven in large part by the urbanisation of China and India. Our trade relationships with these countries put us in a strong position for the continuous development of the minerals sector.

Table 1: Geographic Delineation of Major Minerals and Infrastructure Projects in South Australia

South Australian Region	Operating Minerals Projects	Developing Mining Projects
Far North	12	23
Whyalla and Eyre Peninsula	3	13
Adelaide Hills, Fleurieu and Kangaroo Island	2	1
Barossa	1	0
Murraylands and Riverland	1	0
Yorke and Mid North	0	1

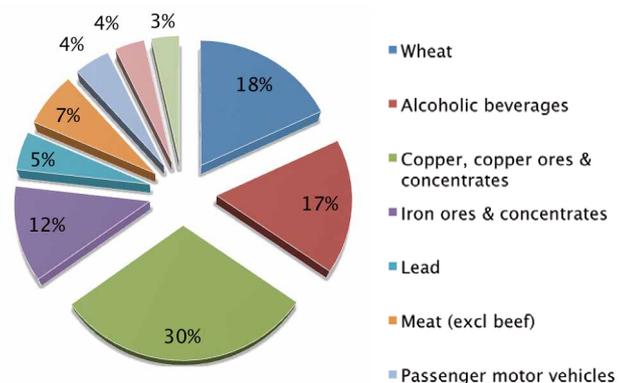
Table 2: Commodity Delineation of Major Minerals and Infrastructure Projects in South Australia

Main Commodity	Operating Minerals Projects	Developing Mining Projects
Copper	4	5
Iron Ore	4	15
Uranium	3	5
Gold	2	6
Other*	6	9

* includes kaolin, heavy mineral sands, lead, zinc, silver, coal and coal-to-liquid.

Commodity Delineation of Major Minerals and Infrastructure Projects in South Australia

Figure 1: SA Exports, 2012



Source: Department of Foreign Affairs and Trade, June 2013

AGGREGATED WORKFORCE FORECASTS AND NEW JOBS

This section analyses findings from the investigation of future workforce requirements for the 40 minerals and infrastructure projects in the advanced development stage. It does not include the workforce associated with production or exploration for oil and gas; these will be the subject of a further report.

These mineral and infrastructure projects have been selected because they have been classified by DMITRE as advanced projects and as a result the likelihood of them moving into production phase has been positively assessed.

The business cycle, global economic conditions, commodity supply, demand and resultant prices are not predictable with any degree of accuracy. As the length of time until project commencement increases, so does the uncertainty associated with its development. As a result, companies are less inclined to make long range forecasts for these projects and/or their workforce. Therefore, towards the end of the analysis period, the data becomes less reliable and tapers as projects reach their end of life. It is also important to note that this workforce forecast is based upon known and reasonably well defined resources. As further exploration occurs and, as is likely, new resources are found and defined, mine lives may be extended and new projects created.

As a result, this report puts forward a range of scenarios rather than an accurate prediction of the future.

Aggregated workforce numbers are presented for two stages of mine development: construction and production.

For a breakdown of the occupations included in each stage, refer to Appendix B.

The resulting workforce forecasts are grouped in the following manner:

- a. For the period 2014 to 2030 for employees in the project construction phase,
- b. For the period 2014 to 2030 for employees in the mining production phase,
- c. By major commodities, and
- d. By their occupational categories.

The major commodities groups are copper, iron ore (this includes the 2 infrastructure projects), uranium, and gold. The commodities are grouped as “other” are lead, zinc, silver, kaolin, heavy mineral sands and coal-to-liquid.



AGGREGATED EMPLOYMENT FOR PROJECTS CURRENTLY OPERATING AND FUTURE PROJECTS ONCE IN PRODUCTION

Sourcing data from RESA's recent *South Australia Resources Workforce Scoping Report*, the workforce for mine sites currently in operation, combined with the workforce data for developing mines, paints an overall picture of employment across all major mining projects in SA. The total employment for the 21 currently operating mines in SA has been combined with the 40 developing projects in Chart G.

The South Australia Resources Workforce Scoping Report 2013-2020 found that South Australia will experience a peak in employment in 2019 before stabilising. In both scenarios presented, the additional employment from developing projects will give a boost to workforce demand over the 2014-2030 period.

The following graph presents two different scenarios; Likely and Less Likely. The less likely scenario presents the situation of all 40 minerals projects gaining approval. The likely scenario presents only the 16 minerals projects that have been determined to have a high chance of gaining approval and then proceeding to the operation phase.

Likely Scenario

In the "Likely Scenario" (the 16 most probable projects to be developed), total employment across currently operating mines and developing projects (including construction employment) will start at 13,865 in 2014 and peak at 23,603 in 2018.

Adding in an average industry turnover rate of 14% per annum, the total figure for employment across currently operating mines and developing projects (including construction employment) would start at 15,806 in 2014 and peak at 26,907 in 2018.

Less Likely Scenario

In the "Less Likely Scenario" (if all 40 projects are developed), total employment across currently operating mines and developing projects (including construction employment) would start at 13,865 in 2014 and peak at 27,790 in 2018. This would mean that the number of those employed in this sector in South Australia is forecast to more than double.

The rapid increase in employment between 2015 and 2018 in developing mines is due to the fact that there are over 30 mines predicted to enter either construction or production during this period, in addition to mines already in operation. Without sufficient supply of a suitably skilled workforce, the state may experience a skills shortage over this period.

Adding in an average industry turnover rate of 14% per annum, the total figure for employment across currently operating mines and developing projects (including construction employment) would start at 15,806 in 2014 and peak at 31,681 in 2018.

Chart E: Aggregated Workforce (Likely Scenario)

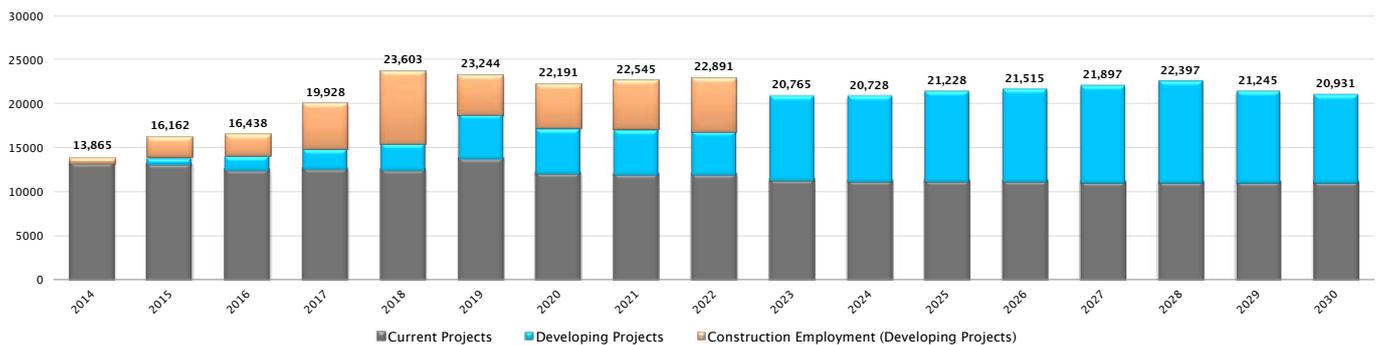
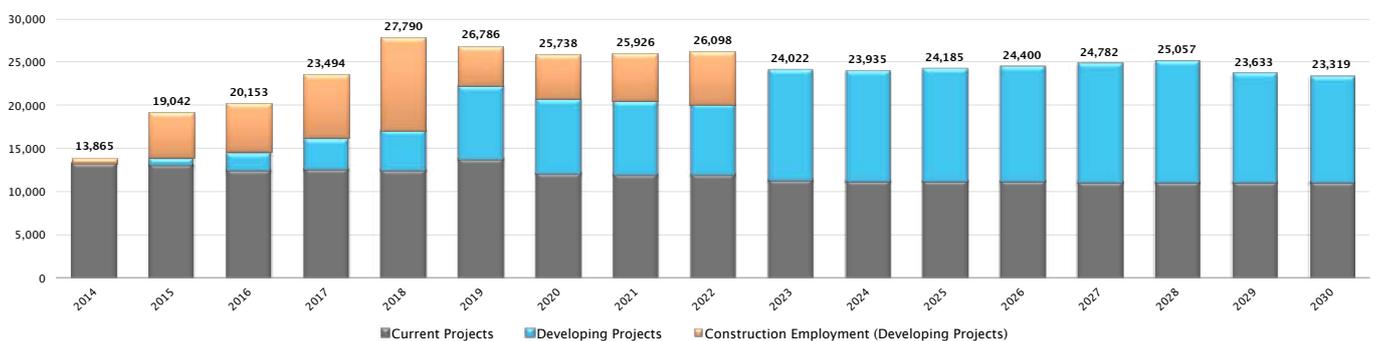


Chart F: Aggregated Workforce (Less Likely Scenario)





ANNUAL JOB GROWTH

The graphs below displays the number of new jobs forecast to be created in both the construction and the production phases for new mines.

It is important to note that this section specifies the number of new roles created over the period of 2014 - 2030, not necessarily the number of people employed in these roles. For example, while the mine construction phase is short-lived, some people working in this phase may move to the production phase soon afterwards and fill some of those new roles.

Likely Scenario

A total of 14,120 new roles will be created in the construction phases of these 16 projects over 2014 to 2022. In addition, 13,322 ongoing jobs will be

created during the production phase, over the course of 2014 to 2030. Combined, there will be 27,442 new jobs created in South Australia over the 2014 – 2030 period.

Less Likely Scenario

A total of 19,335 new jobs will be created in the construction phase of these 40 projects. While the mine construction phase is short-lived, it has the highest workforce requirements.

In addition, 17,031 non construction jobs will be created during the production phase, over the course of 2014 to 2030. Combined, there will be 36,366 new jobs created in South Australia. Generally, larger workforce numbers are required during the construction phase.

Chart G: New Jobs (Likely Scenario)

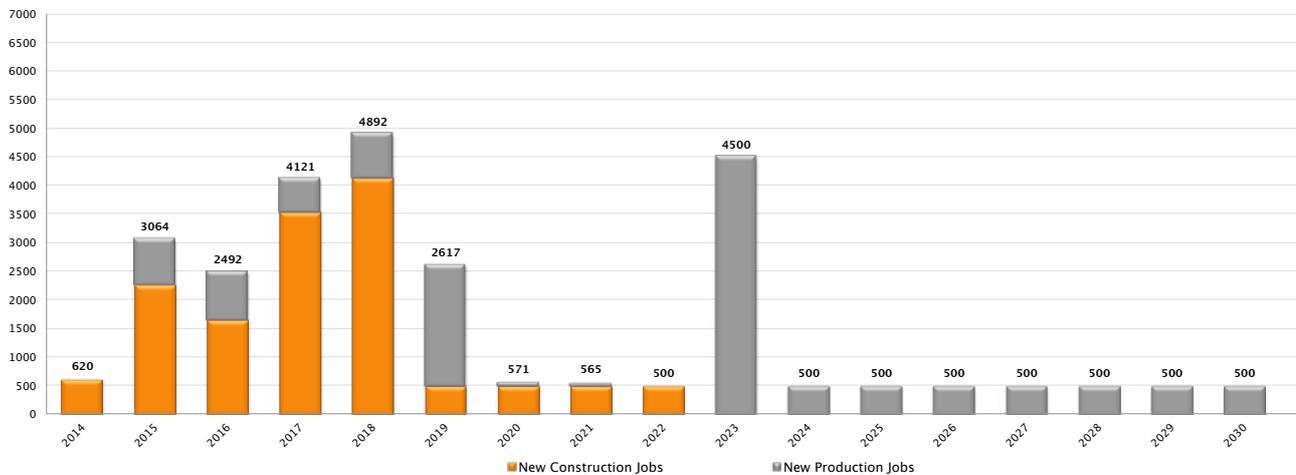
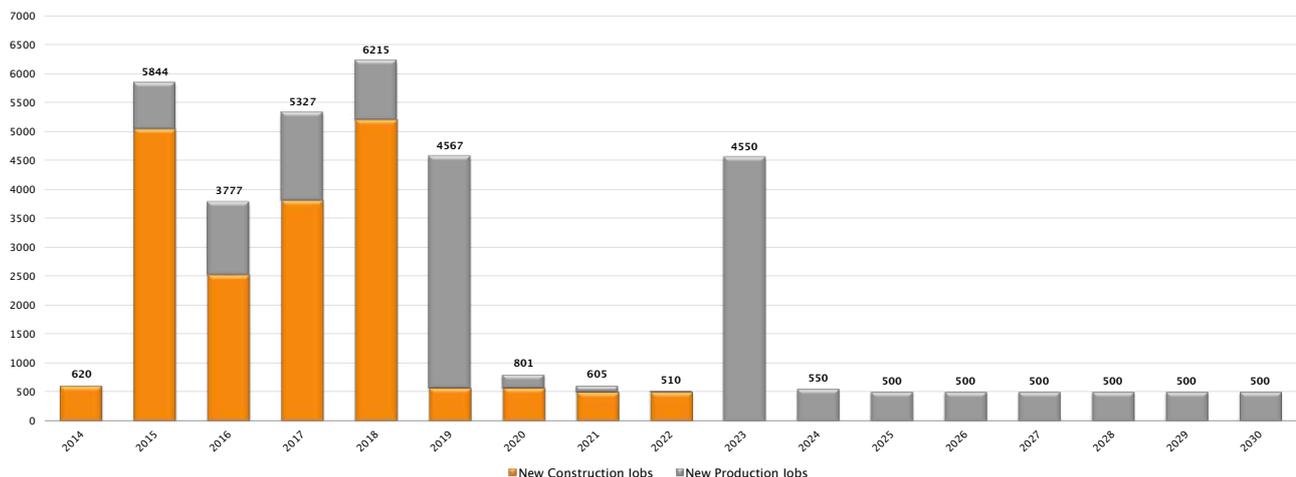


Chart H: New Jobs (Less Likely Scenario)





“ A total of 19,335 new jobs will be created in the construction phases of these 40 projects. While the mine construction phase is short-lived, it has the highest workforce requirements. ”



FUTURE WORKFORCE ACCORDING TO MAJOR PROJECT COMMODITY

AGGREGATED PROJECTIONS

This section is a glance at what the aggregated workforce forecast looks if all projects are grouped by their main commodity. In this section, the Olympic Dam Expansion is classified as a copper mine. For a breakdown of which mineral projects are assigned to which commodity, refer to Appendix A *South Australia's Major Development Projects*.

Likely Scenario

In the likely scenario (16 mineral projects developed), there is a clearly higher workforce demand for copper and iron ore mines than for uranium and gold mines.

Less Likely Scenario

In the less likely scenario (40 mineral projects developed), there is also a clearly higher workforce demand for copper and iron ore mines than for uranium and gold mines.

Chart I: Aggregated Numbers by Commodity (Likely Scenario)

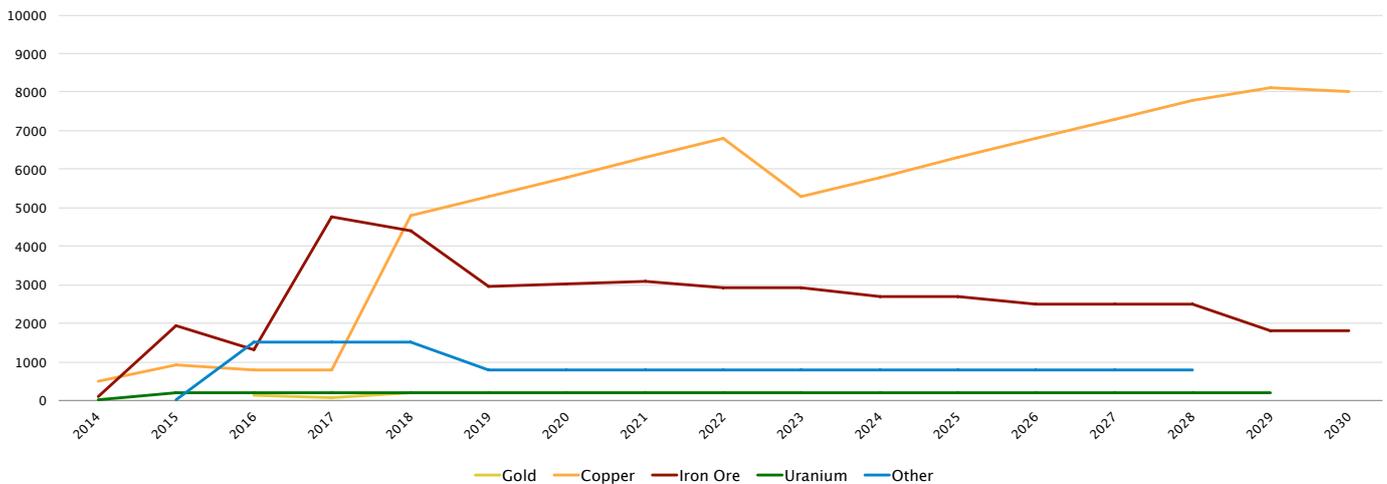
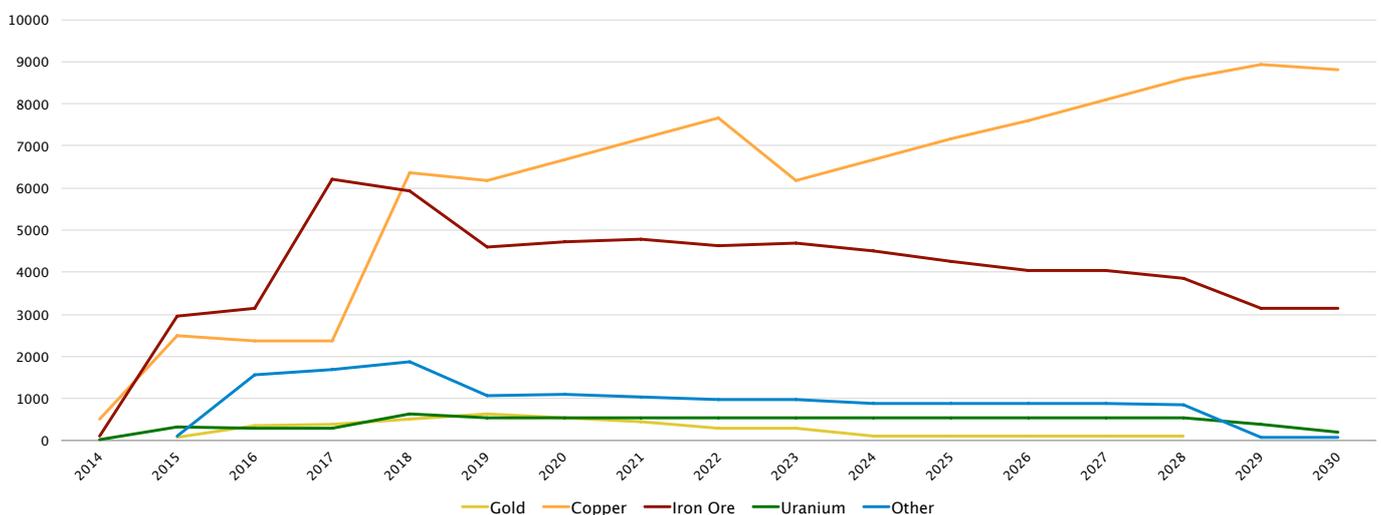


Chart J: Aggregated Numbers by Commodity (Less Likely Scenario)



OCCUPATION CATEGORY ANALYSIS

This section is a look at what the occupational structure across all developing projects is predicted to be across 2014 - 2030. For a breakdown of which occupations are assigned to which category, refer to Appendix B.

Likely Scenario

In the likely scenario (16 mineral projects developed), there is a clear higher demand for some occupational categories over others. In this most likely scenario, the demand for skilled and technical employees

is much higher in comparison to the demand for professional and manager/admin personnel.

Less Likely Scenario

In the less likely scenario (all 40 mineral projects developed), the ratio of employees required in each occupational area mimics the most likely scenario. This demonstrates that the relative ratios of skills required is similar across all mine categories, and will be useful for forward planning purposes, regardless of the number of projects that reach the production stage.

Chart K: Aggregated Occupation Demand (Likely Scenario)

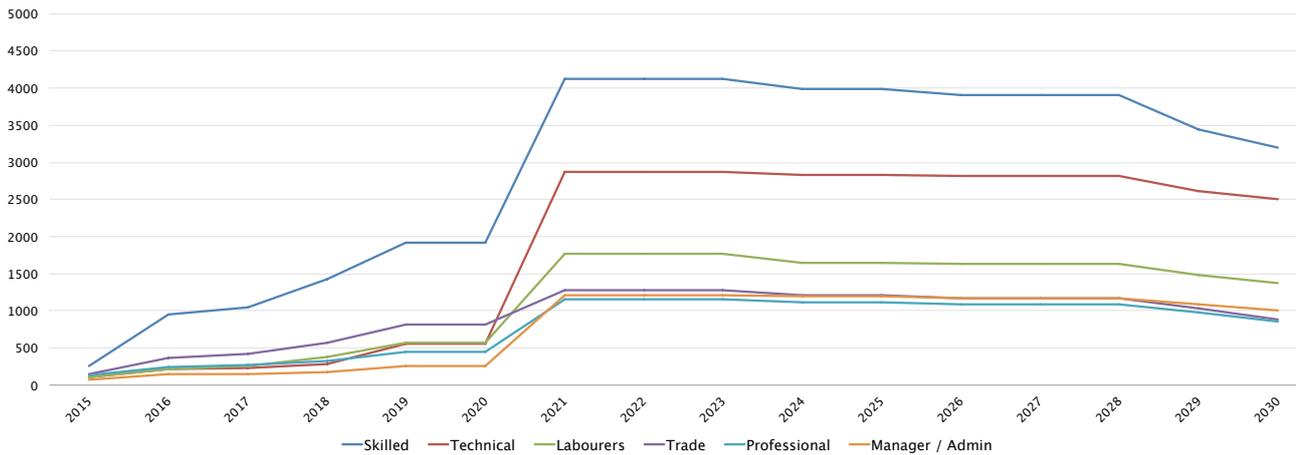
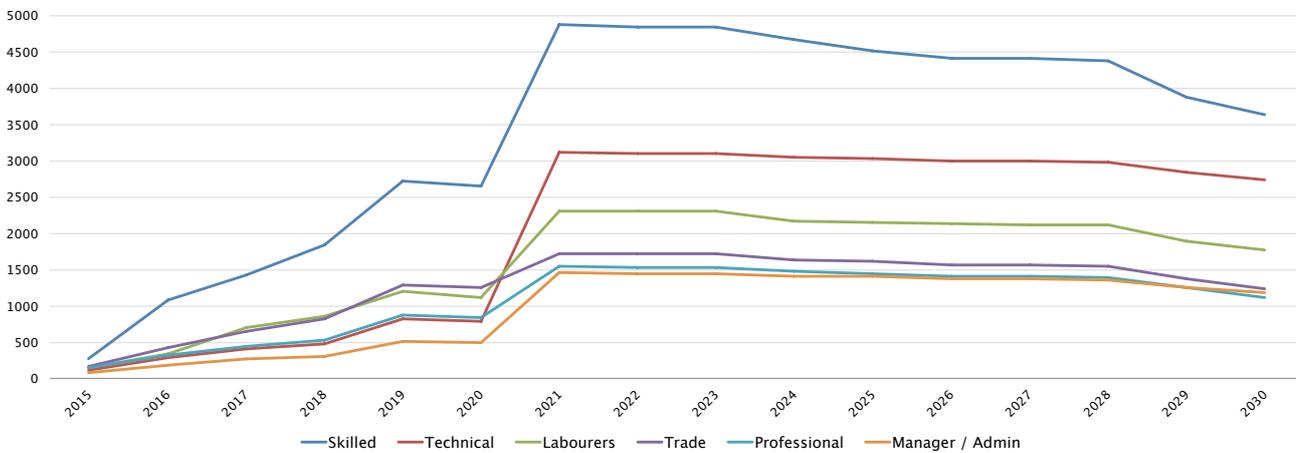


Chart L: Aggregated Occupation Demand (Less Likely Scenario)



ISSUES AND CHALLENGES

POTENTIAL LABOUR SHORTAGES

Labour shortages will pose a serious challenge for South Australia once the anticipated rapid development of mining projects occurs. If South Australia's mining sector requires an additional 27,442 and averaging 1,715 new people per annum (likely scenario), or 36,366 and averaging 2,272 new people per annum (less likely scenario) between 2014 and 2030, there will need to be a focus on attraction and retention strategies in the future. If this does not occur, it is obvious that there will be a skills and labour supply shortage. These skills gaps are also likely to be exacerbated by an ageing workforce.

Excluding the expansion of the Olympic Dam mine, there are many developing mine sites with significant skilled labour needs. It will be necessary to ensure that appropriately skilled and job-ready people are in sufficient supply to meet the projected demands, now and into the future. It will be imperative that the State and Federal government plan for these workforce requirements, including attraction, retention and succession planning through training and a range of other initiatives across the State.

There are many challenges that may pose a risk to workforce development, attraction and retention in South Australia. These challenges include interstate competition for talent, poach and pay, workforce

mobility and issues around fly-in-fly-out and a perception of career opportunities. Unless these factors are addressed, South Australia will be on the back foot for skilled people, potentially stalling future mining developments.

The type of training and skills required to meet the workforce needs of these projects may change over the years, especially as mining technology advances and new processes are created. We cannot predict at present what these changes will entail, but it is anticipated that future skill and workforce requirements will be shaped by technological improvements.

“ It will be necessary to ensure that appropriately skilled and job-ready people are in sufficient supply to meet the projected demands, now and into the future. ”

INFRASTRUCTURE CONSTRAINTS

Notwithstanding the substantial commitments and investments being made by the proponent companies, there is no certainty that these future mineral and infrastructure projects will proceed to operation. Their progress will depend on a range of factors, including access to infrastructure and access to finance, and will be dependent on the cost of extracting and exporting the commodities, commodity prices, government approvals and international market conditions.

Respondents to this study were asked to list specific issues affecting the viability of their project. The results showed that long approval processes, global economic factors, community reproach to mining and insufficient supporting infrastructure were the current major hindrances.

Issues identified include:

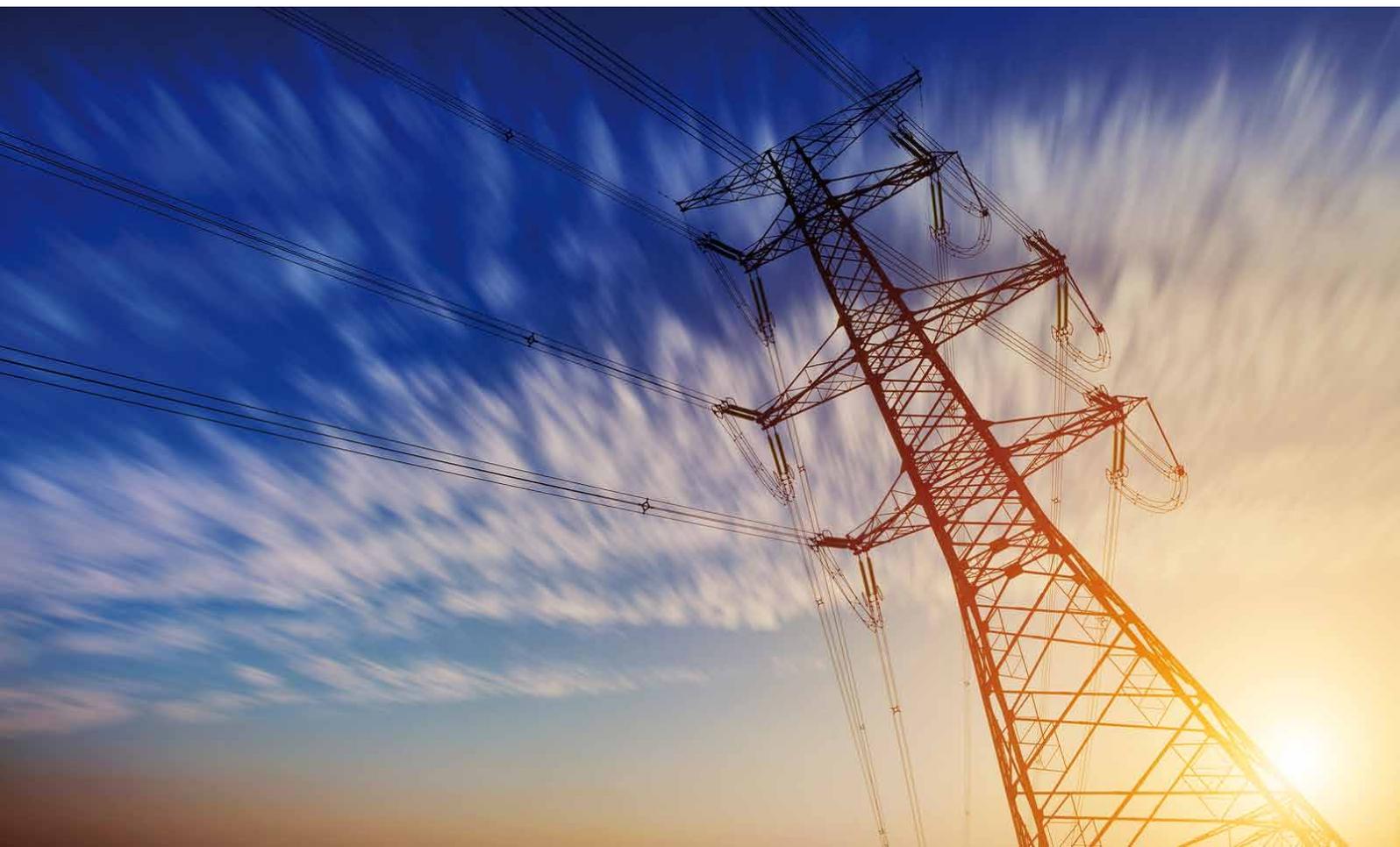
- Project capital costs such as power and water and costs associated with developing the mine;
- Lengthy government approval process to obtain approvals and mine permits;
- Multi-tier government red and green tape that is duplicated between State and Commonwealth authorities;
- Community opposition to mining developments;
- Insufficient infrastructure – some projects are challenged with access to electricity, water and gas;

- Lack of deep water bulk commodity port facilities;
- External selling prices of some commodities, and;
- Financing in the current economic climate. Despite this, some companies noted that South Australia has a stable jurisdiction for financing, thus making it viable.

It will be necessary for State and Federal governments and mining companies to work together to improve the electricity, water and transport infrastructure required to meet the needs for our future mining projects.

There are enormous costs associated with extracting ore and processing minerals and the processing of some minerals such as copper, magnetite and uranium has significant power and water requirements.

To address these infrastructure issues, the South Australian Government has commissioned the Regional Mining and Infrastructure Planning (RMIP) project to consider these problems in light of future mining requirements in SA.



CONCLUSION

South Australian minerals exploration activity over the past seven years has led to numerous exciting developments. Once in operation, these projects are likely to result in rapid employment growth over the next 16 years.

Based on first-hand information, future workforce demand in the South Australian mining sector will come from new projects that are currently in the exploration and development stage.

In a likely scenario (16 new minerals projects developed between 2014 and 2030), more than 27,442 new jobs would be created in both the construction and production phases.

In a less likely scenario (all 40 projects are developed between 2014 and 2030), more than 36,366 new jobs will be created in both the construction and production phases.

It should be noted that our calculations, being a close reflection of the future workforce for now, do not reflect the fact that there may be changes in economic cycles that may impact on the workforce, as well as changes to technology which may transform workforce requirements.

This is encouraging news for South Australia's future employment prospects, which includes large employment numbers forecast for mines including Razorback, Hillside, Carrapateena, Central Eyre Iron Project, Bungalow, Fusion, Mutooroo (Muster Dam), Haematite Expansion Project and of course the Olympic Dam Expansion.

Despite this, labour shortages will pose a serious challenge for South Australia once the rapid development of projects occurs.

If South Australia's mining sector requires an additional 27,442 and averaging 1,715 new people per annum (likely scenario), or 36,366 and averaging 2,272 new people per annum (less likely scenario) between 2014 and 2030, there will need to be a strong focus on attraction and retention strategies in the future.

If this does not occur, it is obvious that there will be a skills and labour supply shortage, which will only be exacerbated by an ageing workforce.



“ Future workforce demand in the South Australian mining sector will come from new projects that are currently in the exploration and development stage. ”

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“ Once in operation, these projects are likely to result in rapid employment growth over the next 16 years. ”

APPENDIX A: SOUTH AUSTRALIA'S MAJOR DEVELOPMENT PROJECTS

SA'S DEVELOPING COPPER

Copper is SA's number one most explored for and exported commodity in SA.

SA's current copper deposits are largely at the underground mine, Olympic Dam, which is the 4th largest copper resource in the world.

The **Hillside Copper Project** is Australia's largest undeveloped copper project.

Carrapateena is one of Australia's largest undeveloped copper.

The **Kalkaroo Copper-Gold-Molybdenum Project** has potential to develop into a major new copper mine in South Australia.

Once the expansion is¹ approved, **Olympic Dam** will be the world's biggest open cut mine.

Copper Mineral Projects Included in the Report				
Mine / Project	Company	Deposit(s)	Current Status	Region
Carrapateena	OZ Minerals Ltd	Copper, Gold	Pre-Feasibility Studies	130 km NW of Port Augusta
Hillside Copper Project	Rex Minerals Ltd	Copper, Gold	Bankable Feasibility Study Complete	12 km S of Ardrossan
Kalkaroo Copper-Gold Project	Havilah Resources NL	Copper, Gold, Molybdenum	Bankable Feasibility Study Complete	100 km W of Broken Hill
Mutooroo Copper-Cobalt Project	Havilah Resources NL	Copper, Cobalt	Feasibility Studies	60 km W of Broken Hill
North Portia	Havilah Resources NL	Copper, Gold, Molybdenum	Feasibility Studies	100 km W of Broken Hill
Olympic Dam Expansion	BHP Billiton Ltd	Copper, Uranium, Gold, Silver	Under Consideration	560 km N of Adelaide

¹ The status¹ for these projects are draw from various DMITRE sources.



SA'S DEVELOPING IRON ORE MINES

SA is emerging as the 2nd largest producer of iron ore in Australia (2nd to WA), accounting for more than 5% of the total Economic Demonstrated Resources.

The **Central Eyre Iron Project** is being championed as the 2nd largest resources project in SA history after Olympic Dam.

The **Razorback Iron Ore Project** is considered one of Australia's largest magnetite resources.

The resource at the **Mutooroo Magnetite Project** was deposited around 600 million years ago during a "snowball" earth glacial event.

The **Hematite Extension Project** is made up of 13 key iron ore projects. This mine so far has at least 7 active pits.

Port Spencer is a planned deep-water bulk commodities export port for iron ore mines on the Eyre Peninsula.

Iron Ore Mineral Projects Included in the Report				
Mine / Project	Company	Deposit(s)	Current Status	Region
Bungalow Joint Venture	Centrex Metals and Baotou Iron and Steel Group, (Baogang)	Magnetite	Bankable Feasibility Studies	10 km NW of Cowell
Cairn Hill Phase 2	IMX Resources NL	Magnetite, Copper, Gold	Feasibility Studies	55 km SE of Coober Pedy
Central Eyre Iron Project	Iron Road Ltd	Magnetite	Bankable Feasibility Studies	175 km N of Port Lincoln
Fusion Magnetite Project	Eyre Iron Pty Ltd (JV with Centrex Metals Ltd and Wuhan Iron and Steel Co.)	Magnetite	Pre-Feasibility Studies	35km N of Port Lincoln
Gum Flat	Lincoln Minerals Ltd	Hematite	Feasibility Studies	100 km W of Broken Hill
Magnetite	Bankable Feasibility Studies	20km W of Port Lincoln	Under Consideration	560 km N of Adelaide
Haematite Expansion Project	Arrium Mining Ltd	Hematite	Various Status' *	50 km W of Whyalla
Hawks Nest	Arrium Mining Ltd	Hematite	Feasibility Studies	800 km NW of Adelaide
Maldorky	Havilah Resources NL	Magnetite	Advanced Exploration	300 km E of Port Pirie
Mutooroo Magnetite Project (Muster Dam)	Minotaur Exploration Ltd	Magnetite	Definitive Feasibility Studies	90 km SW of Broken Hill
Razorback Iron Ore Project	Royal Resources Ltd	Magnetite	Pre-Feasibility Studies Complete	240 km N of Adelaide
Snaefell	IMX Resources NL	Magnetite	Definitive Feasibility Studies	12 km SW of the Cairn Hill mine
Wilcherry Hill	Ironclad Mining Ltd	Magnetite	Approved for Construction	45 km N of Kimba
Wilgerup	Centrex Metals Ltd	Hematite	Approved for Construction	30 km SE of Lock
Port Bonython Bulk Export Port Facility	Flinders Ports Pty Ltd	Infrastructure	Currently Undertaking Environment Impact Statement	25 km from Whyalla
Port Spencer	Centrex Metals Ltd	Infrastructure	Major Project Status Granted	26 km N of Tumby Bay

* Haematite Expansion Project is made up of a cluster of projects with status' ranging from projects in feasibility, awaiting approvals through to implementation.

SA'S DEVELOPING GOLD MINES

SA currently hosts 3 major gold mines; Olympic Dam (5th biggest gold resource in the world), Challenger and Prominent Hill.

The **Tunkillia Gold Project** remains one of the largest undeveloped gold deposits in South Australia.

The **Bird-in-Hand Gold Project** is one of four historic gold mines within the Adelaide Hills Gold Province.

The Tarcoola Goldfields, where the **Tarcoola Gold Project** is located, have produced 77,000 ounces of gold since discovery in 1893.

Gold Mineral Projects Included in the Report				
Mine / Project	Company	Deposit(s)	Current Status	Region
Bird-in-Hand Gold Project	Terramin Resources Ltd	Gold	Concept Stage	Near Woodside, Adelaide Hills
Portia Gold Project	Havilah Resources NL	Gold	Pre-Feasibility Studies	80 km W of Broken Hill
Tarcoola Gold Project	Tunkillia Gold (Mungana Goldmines subsidiary)	Gold	Pre-Feasibility Studies	3 km from Tarcoola
Tunkillia Gold Project	Tunkillia Gold (Mungana Goldmines subsidiary)	Gold, Silver	Bankable Feasibility Studies	600 km NW of Adelaide
White Dam North	Joint venture between Exco and Polymetals Mining Ltd	Gold	Pre-Feasibility Studies	80 km W of Broken Hill

SA'S DEVELOPING URANIUM MINES

SA has the largest reserves of uranium in the world, giving great potential to our uranium mining future.

When operational, **Four Mile** will be Australia's first new uranium mine in nearly 10 years the 10th largest uranium mine in the world. Four Mile is also the largest uranium deposit discovered in Australia in the past 25 years.

Uranium oxide concentrate from Olympic Dam, Beverley and Honeymoon is exported exclusively for the generation of electricity in civil nuclear reactors.

The uranium mineralisation at **Samphire** is contained in sediments which have been in place for some 35 million to 55 million years.

Developing Uranium Mines Included in the Report				
Mine / Project	Company	Deposit(s)	Current Status	Region
Beverly South	Heathgate Resources Pty Ltd	Uranium	Pre-Feasibility Studies	550 km N of Adelaide
Crocker Well Uranium Project	Sinosteel PepinNini Curnamona Management Pty Ltd	Uranium	Definitive Feasibility Studies	160 km W of Broken Hill
Four Mile	Heathgate Resources Pty Ltd	Uranium	Approved Mine	550 km N of Adelaide
Junction Dam	Marmota Energy Ltd	Uranium	Feasibility Studies	50 km W of Broken Hill
Samphire	UraniumSA Ltd	Uranium	Pre-Feasibility Studies	20 km S of Whyalla

SA'S OTHER DEVELOPING MINES & PROJECTS

The kaolin from the **Poochera Kaolin Mine** is the whitest and brightest deposits of kaolin in the world.

The **Paris** silver discovery has very high silver grades not seen for a long time in a new discovery in Australia.

The **Flinders-Reliance Project** will be the next major development in the northern Flinders Ranges.

Gold Mineral Projects Included in the Report				
Mine / Project	Company	Deposit(s)	Current Status	Region
Arckaringa Project	Altona Energy Plc	Coal, Coal-to-Liquids	Bankable Feasibility Studies	857 km NW of Adelaide (Arckaringa Basin)
Atacama	Iluka Resources Ltd	Heavy Minerals	Pre-Feasibility Studies	200 km NW of Ceduna
Flinders-Reliance	Perilya Ltd	Zinc	Definitive Feasibility Studies	476 km N of Adelaide
Menninnie Dam	Terramin Australia Ltd	Lead, Zinc, Silver	Feasibility Studies	110 km NW of Port Pirie
Paris	Investigator Resources Ltd	Silver	Definitive Feasibility Studies	70 km NW of Kimba
Poochera Kaolin Mine	Minotaur Exploration Ltd	Kaolin	Bankable Feasibility Studies	100 km SE of Ceduna
Sonoran	Iluka Resources Ltd	Heavy Minerals	Pre-Feasibility Studies	737 km NW of Adelaide
Tripitaka	Iluka Resources Ltd	Heavy Minerals	Pre-Feasibility Studies	670 km NW of Adelaide
Typhoon	Iluka Resources Ltd	Heavy Minerals	Pre-Feasibility Studies	200 km NW of Ceduna



APPENDIX B: MAIN OCCUPATIONS INCLUDED IN THEIR CATEGORIES

Occupations included in the SEMI-SKILLED category		
Apprentices	Driller's Assistants / Offsiders	Field Assistants
Labourers	Pit Technicians	Shotfire Assistants
Surveying Assistants	Trade Assistants	Trainees (all areas)
Qualifications: Aptitude for the work and basic literacy, numeracy, technology, skills		
Occupations included in the SKILLED category		
Crusher Operators	Dragline Operators	Drillers
Laboratory Assistants	Miners	Mobile Plant Operators
Process Plant Operators	Shotfirer's	Stationary Plant Operators
Qualifications: On the job training and experience leading to VET / TAFE recognised skills or qualification		
Occupations included in the TRADE category		
Boilermaker / Welders	Electrical Fitters	Electricians
Maintenance / Mechanical Fitters	Mechanics – Automotive	Mechanics – Diesel / Heavy Vehicle
Qualifications: Trade qualifications		
Occupations included in the TECHNICAL category		
Draftspersons	Electronics / ICT Technicians	Geoscience Technicians
GIS Technicians	Laboratory Technicians	Maintenance Technicians
Metallurgical Technicians	Mine Planner / Surveyors	Technical Officers
Qualifications: TAFE or University qualifications		
Occupations included in the PROFESSIONAL category		
Engineers (all areas)	Environmental Scientists	Exploration Managers
Geologists	Geoscientists	Managers (all areas)
Metallurgists	Mine Managers	Operations / Production Managers
Plant Managers	Safety and Health Professionals	Surveyors
Qualifications: University degree or extensive experience		
Occupations included in the ADMINISTRATION category		
Accountants	Administration Officers (multiple areas)	Business Development Professionals and Analysts
Human Resource Professionals	Marketing Officers	Sales / Promotions Officers
Qualifications: University degree or extensive experience		



“ In a likely scenario (16 new minerals projects developed between 2014 and 2030), more than 27,442 new jobs would be created in both the construction and production phases. ”

APPENDIX C: OCCUPATION ANALYSIS FOR MINERALS PROJECTS GROUPED AS COMMODITIES

This section is a closer examination of the percentage of employees required in each six occupational categories (production phase only). Following the theme of this report, this data is presented in two scenarios – likely and less likely.

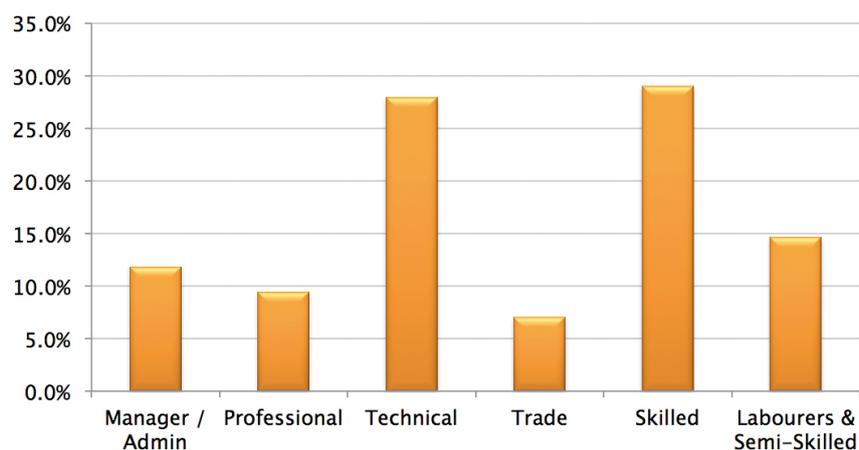
LIKELY SCENARIO

OCCUPATIONAL STRUCTURE OF DEVELOPING COPPER MINES

It is projected that technical and skilled employees are in the greatest demand for developing copper mines in South Australia.

The Olympic Dam expansion has been classified as a copper mine for the purpose of this report.

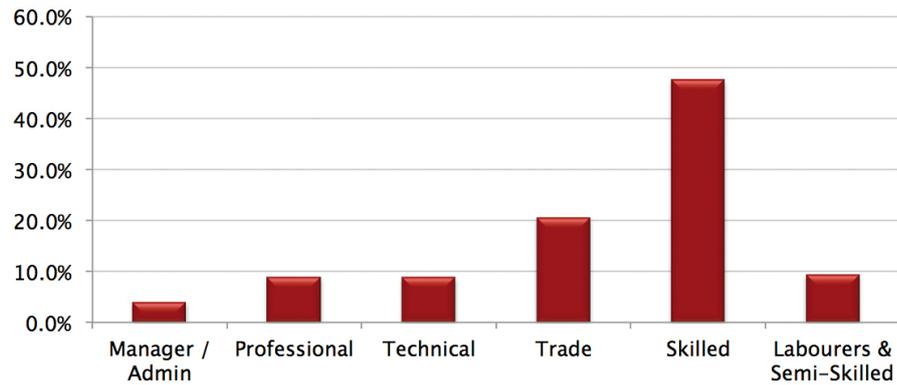
SA's Developing Copper Mines (Likely Scenario)



OCCUPATIONAL STRUCTURE OF DEVELOPING IRON ORE MINES

From the below graph, it is evident that skilled employees are in greatest demand with the smallest demand for manager / admin employees. Iron Ore mines have forecast a very high amount of skilled employees, higher than the other commodities. Interestingly, there are the only mines to forecast Trades in their top three occupational breakdown.

SA's Developing Iron Ore Mines (Likely Scenario)

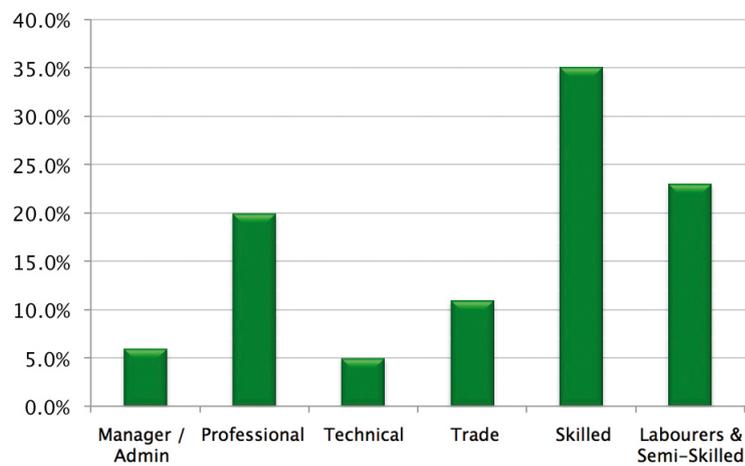




OCCUPATIONAL STRUCTURE OF DEVELOPING URANIUM MINES

From the below graph, it is evident that skilled, technical and professional employees are in the greatest demand with the smallest demand for manager / admin and trade employees.

SA's Developing Uranium Mines (Likely Scenario)

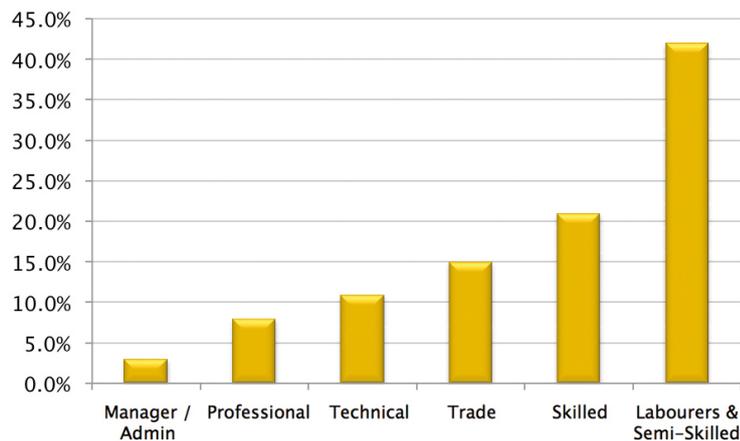


OCCUPATIONAL STRUCTURE OF DEVELOPING GOLD MINES

From the below graph, it is evident that labourers and semi-skilled employees are in the greatest demand with the smallest demand for manager/admin and trade employees.

The SA developing gold mines have the lowest percentage of managers / admin people compared with the other mines. This shows that they require a higher percentage of labourers and semi-skilled employees to professional staff.

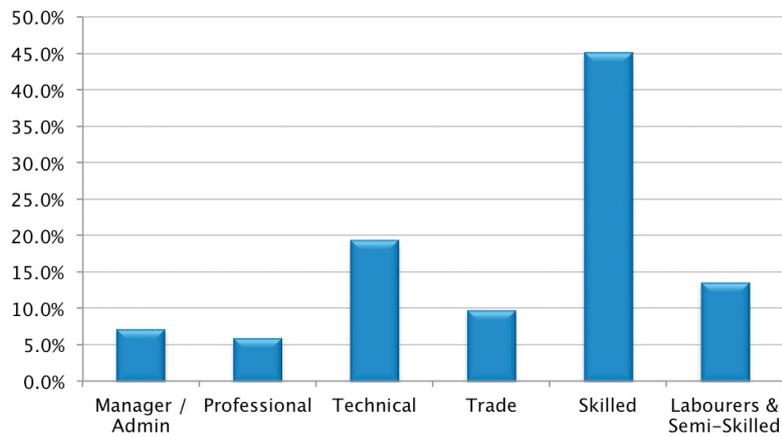
SA's Developing Gold Mines (Likely Scenario)



OCCUPATIONAL STRUCTURE OF THE OTHER COMMODITY MINES

From the below graph, it is evident that skilled employees are in the greatest demand with the smallest demand for manager / admin and professional employees.

SA's Developing Other Mines (Likely Scenario)

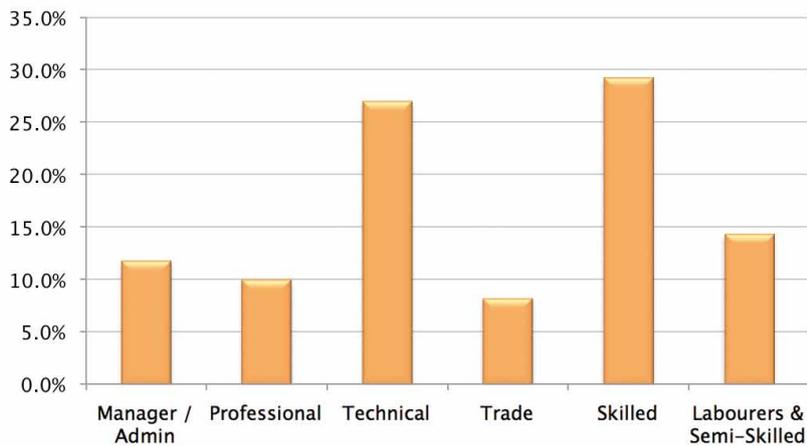


LESS LIKELY SCENARIO

OCCUPATIONAL STRUCTURE OF DEVELOPING COPPER MINES

From the below graph, it is evident that skilled and technical employees are in greatest demand with a smaller demand for trades people.

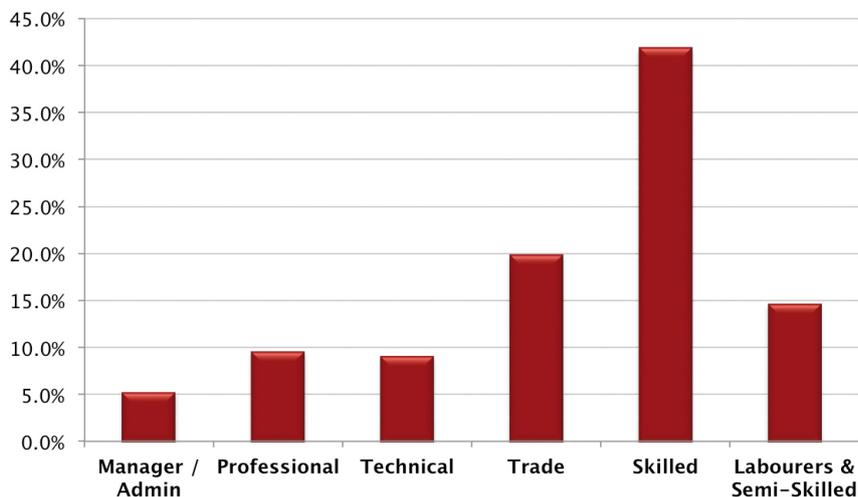
SA's Developing Copper Mines (Less Likely Scenario)



OCCUPATIONAL STRUCTURE OF DEVELOPING IRON ORE MINES

From the below graph, it is evident that skilled employees are in greatest demand with the smallest demand for manager/admin employees. Iron Ore mines have forecast a very high amount of skilled employees, higher than the other commodities. Interestingly, there are the only mines to forecast Trades in their top three occupational breakdown.

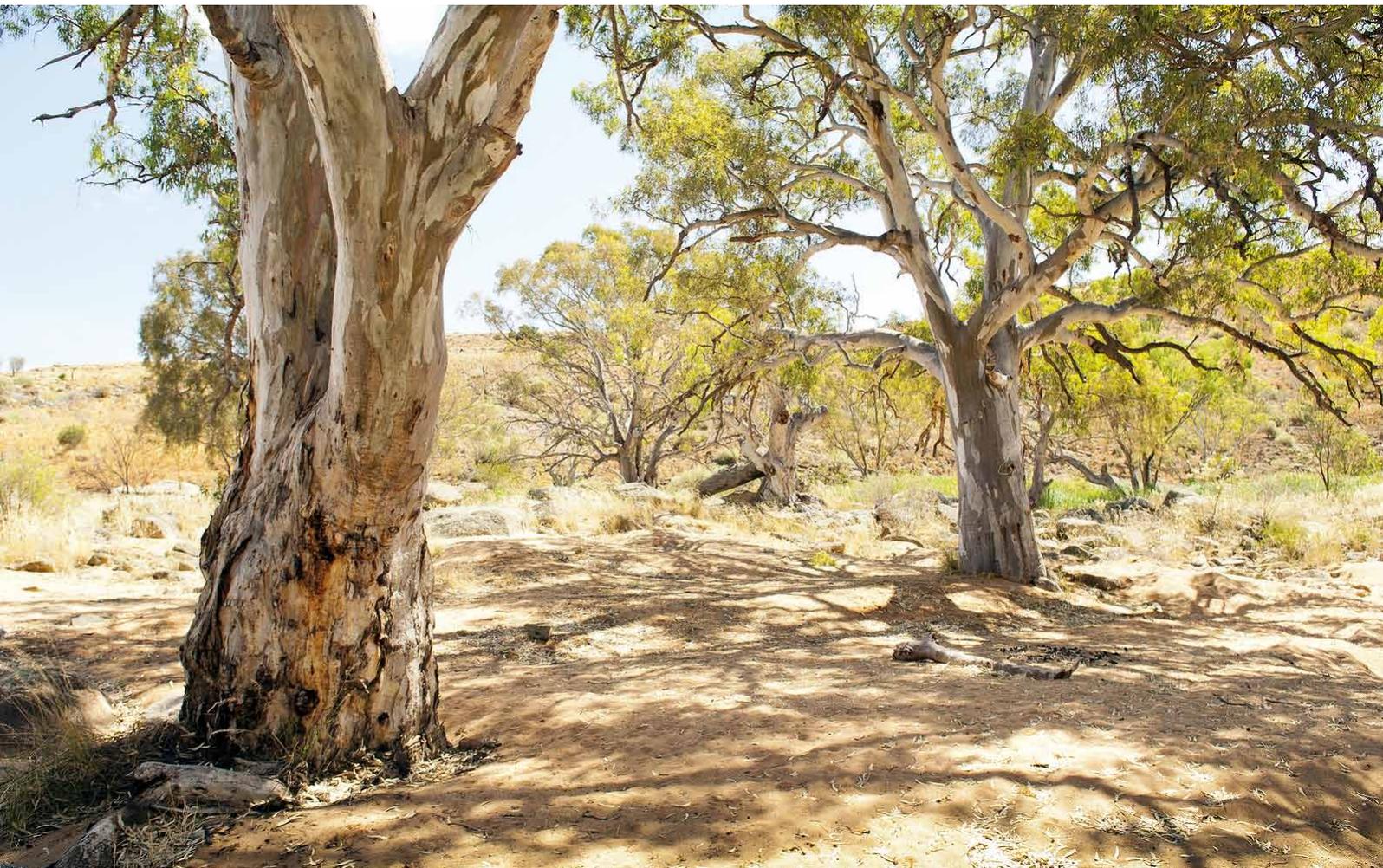
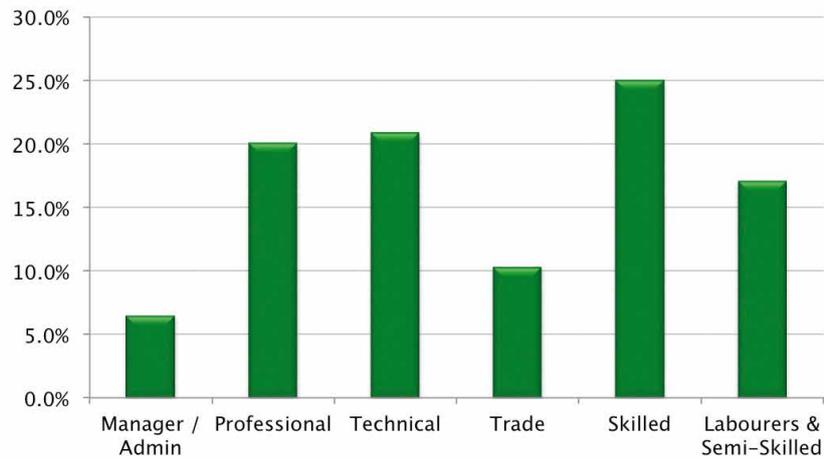
SA's Developing Iron Ore Mines (Less Likely Scenario)



OCCUPATIONAL STRUCTURE OF DEVELOPING URANIUM MINES

From the below graph, it is evident that skilled, technical and professional employees are in the greatest demand with the smallest demand for manager / admin and trade employees.

SA's Developing Uranium Mines (Less Likely Scenario)

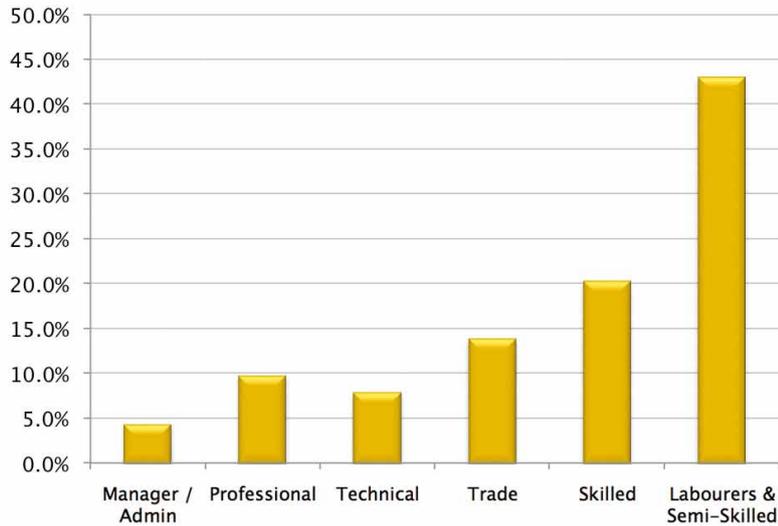


OCCUPATIONAL STRUCTURE OF DEVELOPING GOLD MINES

From the below graph, it is evident that labourers and semi-skilled employees are in the greatest demand with the smallest demand for manager/admin and trade employees.

The SA developing gold mines have the lowest percentage of managers / admin people compared with the other mines. This shows that they require a higher percentage of labourers and semi-skilled employees to professional staff.

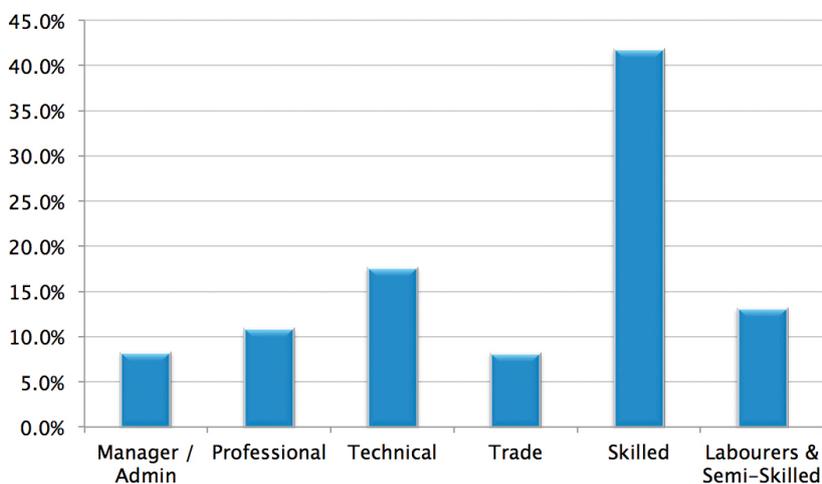
SA's Developing Gold Mines (Less Likely Scenario)

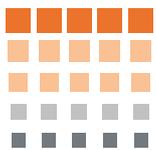


OCCUPATIONAL STRUCTURE OF THE OTHER COMMODITY MINES

From the above graph, it is evident that skilled employees are in the greatest demand with the smallest demand for manager/admin and trade employees. As previously mentioned, this category is made up of mines with lead, zinc, silver, heavy mineral sands, kaolin, coal and coal-to-liquid as major commodities.

SA's Developing Other Mines (Less Likely Scenario)





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