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Mining jobs recovery

Vacancies increase for 5th straight month

ELIZABETH FABRI

IN a sign of the revival for the sector, employment opportunities for Australian resources workers have risen by almost 20 per cent in the last six months.

DFP Mining and Resources' latest job index stated employment in the resources sector had improved by 1.5 per cent to 60.42 in November; this represented the industry's fifth consecutive monthly vacancy rise.

"Job opportunities have now risen a significant 19.6 per cent in the last six months," the report stated.

"Permanent vacancy growth stood out again, rising 2.4 per cent to 57.43, while temporary and contract roles managed a small increase of 0.4 per cent.

It found permanent job opportunities were up a healthy 14.5 per cent over the last three months, while demand for temporary and contract staff had risen 23.9 per cent in the last six months.

"[This] demonstrates that mining and resource employers are showing confidence in this early stage of the recovery phase," DFP stated.

Of the commodities surveyed, the coal industry was the top performer for the month, rising 10.7 per cent, while metal ore mining saw its first decrease since April by 3.8 per cent.

The job index results from the nation's largest mining states, WA and Queensland, only saw a 0.6 per cent rise per state, which was still WA's fifth successive rise and 'best run' since the end of the boom.

"Despite this weaker finish to the



"THE WA SECTOR, WITH ITS BROADER MIX OF PRODUCTS, HAS GOOD POTENTIAL FOR FURTHER IMPROVEMENTS AFTER THE HOLIDAY SEASON."

(continued on page 6)

The minerals sector jobs market is seeing a slight recovery.

Image: La Mancha Resources.

year, WA has still managed to increase vacancy levels by 8.4 per cent in three months and 18 per cent over six months," it stated.

"The WA sector, with its broader mix of products, has good potential for further improvements after the holiday season."

Similarly, ManpowerGroup's *Employment Outlook Survey Australia* for January to March 2017 forecast 13 per cent of Australian employers to increase employment in the next three months and just five per cent to decrease employment; the remaining 76 per cent

expected no change.

"Year-over-year, outlooks improve in three of the seven industry sectors, most notably by seven percentage points in the Mining and Construction sector," ManpowerGroup managing director Richard Fischer stated.



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REBECCA KNOL SACOME CHIEF EXECUTIVE

the interview p70

CORRECTION

The image caption for the Transportable Shade Shed editorial (Page 66, December edition, The Australian Mining Review) incorrectly read: "Transportable Shade Sheds global business manager Tyler McLaren with franchisee Ricky Wood."

The caption should read: "Transportable Shade Sheds global business manager Tyler McLaren with reseller Ricky Wood."

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IN BRIEF

NRW wins
Yandi contract

IRON ORE

PERTH-based mining contractor NRW Holdings (NRW) has won a \$40m contract to provide bulk earthworks and civil works required to sustain Rio Tinto's Yandicoogina iron ore mine in the WA Pilbara.

The Yandicoogina mine, often confused with BHP's nearby Yandi iron ore operation, is 95km north-west of Newman and has been in operation since 1998.

NRW expected to complete the works using the mine's existing civil construction fleet in the first quarter of 2018.

Albury Heath
gets green
light

GOLD

CERVANTES is looking to fast track development of its recently acquired Albury Heath gold mine in the Meekatharra area of WA, with current prices offering a rapid payback opportunity.

Substantial historical mine data has identified opportunities for early stage development of a high grade gold operation.

"It took a lot of research and hard work by Cervantes and its consultants, but we now have a fantastic historic record of all the mining and exploration data pertaining to the licence area and this has allowed us to identify a real opportunity to develop this high-grade, relatively easy-to-mine resource," Cervantes executive chairman Collin Vost said.

Cervantes is now undertaking detailed planning for the new drilling and metallurgical studies to confirm the best development options.

Iron Hill
receives
approval

IRON ORE

MOUNT Gibson Iron has received environmental approval to develop its Iron Hill mine in the WA's mid-west.

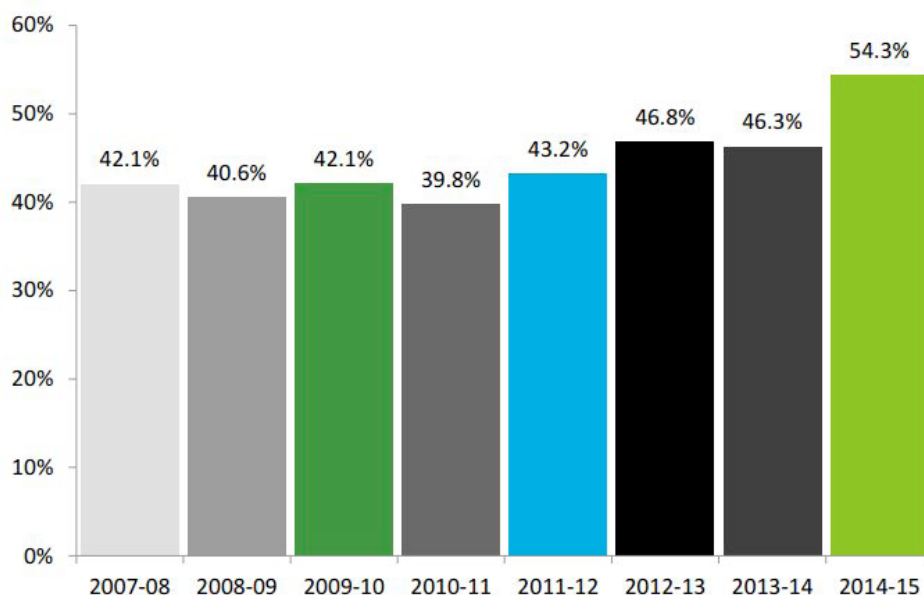
Located 3km from the recently depleted Extension Hill open pit, Iron Hill would cost between \$2 million and \$3 million to develop given Mount Gibson's existing facilities and logistic arrangements in the region.

"We welcome this important environmental approval of the Iron Hill mine, which takes us one step closer to commencing mine development in early 2017," Mount Gibson chief executive Jim Beyer said.

The company expected full year ore sales to peak to between 2.8 million and 3.1 million tonnes in FY17.

Mining tax rate soars

Chart 2.1: Total tax take ratio (all minerals)



Source: 2016 MCA tax survey

The 2014-15 effective tax rate is the highest recorded level to date by the survey.

ELIZABETH FABRI

AUSTRALIAN miners are paying more than half their profits in taxes, according to new data released by Deloitte and the Minerals Council of Australia.

The 2016 *MCA Annual Tax Survey* found the minerals industry faced an effective tax rate of 54.3 per cent in 2014-15; an eight percent rise from the 46.3 per cent paid in 2013-14.

Minerals Council of Australia deputy chief executive David Byers said the tax ratio was the highest recorded since the survey began,

and the first time it had exceeded 50 per cent.

"The effective tax rate has increased markedly over the last three years and compares to an average rate of 44.4 per cent over the eight years of survey data," Mr Byers said.

"No other sector contributes such a share of its profit to state and federal governments."

"The report should provide a final nail in the coffin of the proposal by WA Nationals' leader Brendon Grylls to increase tax on WA iron ore producers by as much as \$8 billion over the next four years.

"If the WA Nationals want to retain any economic credibility in the lead up to the state

election they must ditch the proposal."

Mr Byers said Australia's company tax rate was now five percent above the developed country average, and eight points higher than Asia.

"State jurisdictions must also be cognisant of the need to keep the overall burden of mining taxation comparable with our international competitors," he said.

"With profits low, royalties account for 60 per cent of tax collections in 2014-15.

"The high share of royalties reflects the fact that royalties do not take account of the profitability of the sector which endured tough conditions in 2014-15."

Mega mine promises jobs for QLD

CAMERON DRUMMOND

ADANI's \$21.7 billion Carmichael coal and rail project secured its final major approvals in early December and gave a commitment to source the project's workforce from regional QLD.

State Development minister Dr Anthony Lynham said the latest, and final, secondary approval was for about 31.5km of permanent rail line, as well as a temporary construction camp with up to 300 beds.

"This is another key milestone for the project, which Adani has confirmed it will start construction on next year," Dr Lynham said.

The project already had all primary approvals as well as prescribed project and critical infrastructure project status in place to reduce red tape.

The approved rail section will form part of the 389km-long heavy haul railway linking the mine to the Port of Abbot Point export facility.

Adani expected the giant 60mtpa thermal coal project to provide about 10,000 direct and indirect jobs in the region.

Premier Anastacia Palaszczuk said she had secured commitments from Adani that the workforce for its Carmichael project would be sourced from regional QLD.

Speaking from Townsville on 6 December, where she met with Adani group chairman Gautam Adani, the Premier said Adani had also committed to establish all its project offices in regional QLD.



The project's railway will connect the Gallilee Basin to the Port Abbot Point export facility.

"The coal will be mined in regional Queensland by regional Queenslanders," Ms Palaszczuk said.

"I have always made it clear: the jobs from the Carmichael Coal project are for Queenslanders [and] I am pleased Mr Adani has committed to do just that.

"Importantly, Adani has committed to up to 600 new jobs in the next

pre-construction phase of the project's development and locations for staff.

"My Government has been determined for this project to create as many jobs for regional Queensland as possible.

"Adani had originally proposed to locate its project offices in Brisbane [and] welcome the Adani commitment to locate them in our regions."

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Short term pain for nickel: report



Image: BHP Billiton Nickel West.

REUBEN ADAMS

DESPITE a strong nickel price recovery in the second half of 2016, low profitability – due to persistently low prices and higher costs – could result in project closures over the next five years, according to a GlobalData report.

The research and consulting firm stated that operating nickel mines scheduled for closure during the forecast period included Panoramic Resources' Savannah mine (currently on care and maintenance) and BHP Billiton's Mount Keith mine in WA, which faced declining margins and depleted reserves.

GlobalData stated that global refined nickel consumption would grow marginally, from just under 2mt in 2016 to 2.023mt by 2020; a compound annual growth rate (CAGR) of 1.3 per cent, which represented

a substantial fall from the previous high growth of 5.23 per cent from 2010 to 2015.

"Growth is supported by rises in the population and urbanization in emerging economies such as China and India, which are expected to invest heavily in upgrading infrastructure and expanding industrial and output capacity," GlobalData Head of Research and Analysis for Mining Cliff Smee said.

"Current low LME prices in the nickel market will shut high-cost capacity in the short to medium term, and when warehouse stock begins to deteriorate prices will revert to growth."

GlobalData believed that high prices post 2020 would support the development of new projects, including the Metals X' proposed \$2.5 billion Wingellina project, and Norilsk's Honeymoon Well project in WA.

BMI Research also stated that Australia's

nickel sector would post modest output growth between 2016 and 2020, amounting to an average of 1.4 per cent compared to 4.5 per cent over 2011 to 2015 "due to our expectations for prices to remain weak as well as rising costs of production".

"That said, we remain relatively optimistic on refined nickel production over the long term, given the ongoing development and planned expansion of several key nickel projects," BMI said in the October report.

Producers remained cautiously positive about the nickel price, which rose by more than 30 per cent from less than \$US4 a pound just before Christmas 2015 to around US\$5.13/lb, with a recent peak of US\$5.24/lb in early December 2016.

At its AGM in November Panoramic Resources, which endured a horror run in 2016, stated that a strong price recovery in

the second half of the year represented light at the end of the tunnel.

"Since June 2016, the nickel price has made a strong recovery back to \$US5 per pound, in part due to the new government of the Philippines audit of the country's mining industry, resulting in the suspension of production from approximately 10 per cent of their nickel laterite mines," the company stated.

"In addition, LME stockpiles which were at historic highs of 470,000 tonnes, or three months' of world consumption, have fallen to around 370,000 tonnes.

These are all seen as positive development as stronger demand together with the continued reduction in LME and other reported global stocks are the catalysts needed for a sustained nickel price recovery."

Vacancies increase for 5th straight month

(continued from page 1)

However, Mr Fischer warned Queensland's mining market was at risk now that the 'labour intensive' construction phase across the sector had winded down.

"Queensland employers remain cautious in their hiring intentions heading into the New Year – taking a 'wait and see' or 'make do with what we have' approach to hiring," he said.

"The reason for this is three-fold – across the state a number of major construction projects have wrapped up such as BHP's Caval Ridge mine; we are seeing falling commodity prices; and we have had weaker than expected retail growth, which has all led to a more subdued outlook.

"The resources sector will remain a key driver of future growth, but the Queensland economy needs to manage the transition from construction to production in this sector."

Australian Mines and Metals Association (AMMA) director of industry services Tara Diamond said overall the 2016 year had been a tough one for the resources job market with a number of companies forced to make redundancies and adjust to the challenging environment.

"However, it is encouraging to see pockets of recovery in the jobs market as demonstrated in DFP Recruitment's latest mining, oil and gas jobs index," Ms Diamond said.

"Most of the areas seeing some positive movement reflect the broader transitions we are seeing in our national resource industry.

"It is encouraging to see coal and some minerals vacancies being significantly up over the past six months, due to a slow but steady recovery for prices in those commodities and the flow on positive impacts this has for investment and hiring decisions."

"[THIS] DEMONSTRATES THAT MINING AND RESOURCE EMPLOYERS ARE SHOWING CONFIDENCE IN THIS EARLY STAGE OF THE RECOVERY PHASE."



Job seekers in the resources industry are looking for further confidence.

Image: Downer Group.



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The government co-funding initiative has been running since 2009.

WA continues co-funded drilling initiative

CAMERON DRUMMOND

42 PROJECTS across WA will share up to \$4.75 million under State Government's Exploration Incentives Scheme (EIS) co-funding drilling initiative.

The \$130 million initiative, initially supported by Royalties for Regions, is being funded from April 2009 to June 2017.

The program refunds up to 50 per cent of direct drilling costs with caps of \$150,000 for a multi-hole project, \$200,000 for a single deep hole, and \$30,000 for a prospector application.

Refunds are made after completion of drilling and the submission of reports, which are released publicly by the Department of Mines and Petroleum after a six-month confidentiality period.

State mines and petroleum minister Sean L'Estrange said the drilling program, which was heading into its ninth year, provided companies with added incentive to drill in underexplored regions.

"Encouraging exploration is the key to the continuity of WA's vital resources industry, which will underpin the State's economy for decades to come," Mr L'Estrange said.

"This very successful program has already resulted in a number of major discoveries. Among the success stories is the Nova discovery east of Northam, supported by EIS geophysics data and co-funding in 2011-12, with production having commenced in November this year."

Co-funding recipients for this round include gold prospects from Fortescue Metals Group, Antipa Minerals and Chalice Gold Mines.

Other EIS successful discoveries include the Camelwood nickel deposit 500km north of Kalgoorlie, Yeneena copper deposit in the Paterson Province, Millenium zinc in the East Pilbara, and the Dusk Til Dawn gold discoveries north-east of Wiluna.

An economic impact study released early in 2015 showed that every \$1m spent by the EIS generated \$10.3m of exploration activity and a longer term benefit to WA, in terms of higher Gross State Product, of \$23.7m.

The Association of Mining and Exploration Companies (AMEC) chief executive Simon Bennison said the program was highly regarded by industry.

"The EIS programme is an example of a government program that translates into more jobs on the ground," Mr Bennison said.

"Sourcing capital is challenging in the current market conditions where investors are risk adverse and not investing in exploration.

"Continuation of the program is essential to enable these companies to continue exploring and making new mineral discoveries such as the Nova nickel at Fraser Ranger and Gruyere, east of Laverton."

Doray's Allan Kelly resigns



WA Mines and Petroleum minister Sean L'Estrange with former Doray managing director Allan Kelly.

CAMERON DRUMMOND

DORAY minerals founder and managing director Allan Kelly resigned ahead of the company's annual general meeting on 28 November.

Doray announced that Mr Kelly resigned due to personal reasons, with non-executive director Leigh Junk assuming the role until a formal replacement was found.

Just one month earlier Mr Kelly was joined by Mines and Petroleum minister Sean L'Estrange at the official opening of Doray's Deflector gold mine 160km east of Geraldton; the second high-grade gold project the company had commissioned in four years.

Mr Kelly managed the company for seven and a half years of successes, including its listing to the ASX in 2010 when it was recognised as the most

successful Initial Public Offering (IPO) of that year in terms of share price increase.

Doray non-executive chairman Peter Lester said that in just over seven years Mr Kelly has taken the company from a concept as a greenfields explorer to an ASX300 gold producer.

"Allan built a company with a strong foundation for future growth and has left Doray in good hands," Mr Lester said.

Rio awards big Amrun contracts

REUBEN ADAMS

DEVELOPMENT at Rio Tinto's \$2.6 billion Amrun bauxite project in North Queensland is ramping up following the award of a number of key contracts in December.

WA-based marine services provider Bhagwan Marine was awarded a contract to supply marine vessels and crew to support Amrun construction.

Bhagwan's contract scope included the supply of personnel, vessels, plant and equipment, which company managing director Loui Kannikoski said "couldn't have come at a better time".

"We will be supplying a variety of tugs, barges, multi-cats and crew transfer vessels to Amrun which is a huge win for us not only in terms of fleet utilisation, but also in providing two years of ongoing work security to some of our amazing crews," Mr Kannikoski said.

"Creating new work opportunities for some of the local community is also very satisfying for us."

Bhagwan stated that "a significant percentage" of the contractor's workforce would consist of Indigenous employees from the local community and other regional areas.

Indigenous Coxswain traineeships would be rolled out, whereby trainees from local communities completed a two year trainee program consisting of four weeks pre season training, 20 months on the job training, and four weeks post sea training.

Civmec was also awarded two significant contracts totalling \$160



WA-based marine services provider Bhagwan Marine was awarded a contract to supply marine vessels and crew to support Amrun construction.

million as part of the development of the Amrun processing facility.

The larger of the contracts included construction of the processing facility – including a bauxite beneficiation plant and associated water, electrical and lighting systems – and 11,800 tonnes of Australia steel and precast concrete.

The fabrication, precast manufacture and modular assembly would take place at both Civmec's east coast facility at Newcastle, NSW and west coast facility

at Henderson, WA.

The second contract, awarded by Sandvik, included the part supply, fabrication, surface treatment, mechanical and electrical install and the modularisation of a stacker, reclaim and shiploader for bauxite material handling.

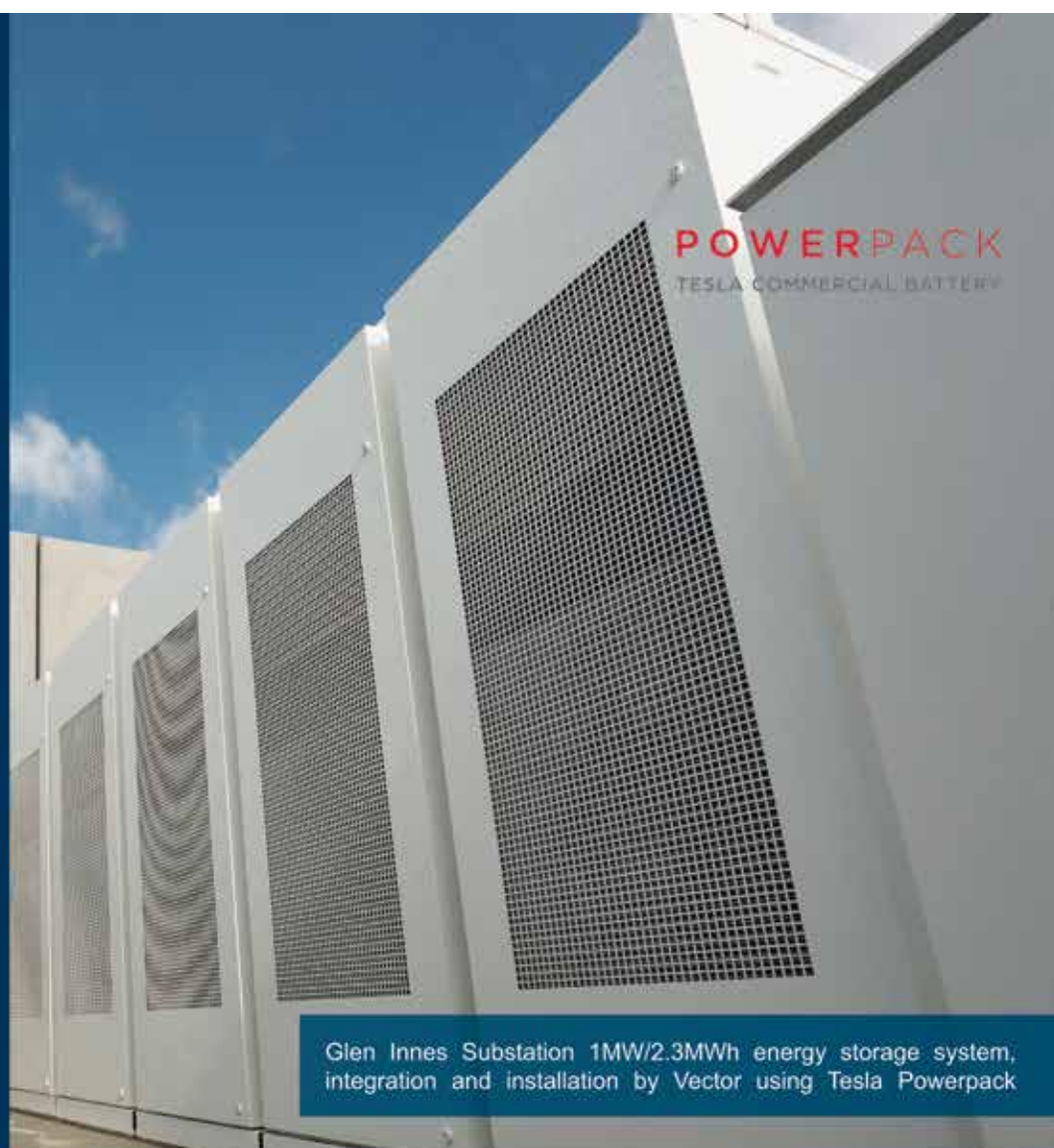
This contract involved the fabrication of 2200 tonnes of steel, and the works would be completed at Civmec's Henderson facility.



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Research to boost gold discoveries

ELIZABETH FABRI

SOUTHERN Gold has joined forces with CSIRO and the Department of Industry, Innovation and Science to produce a 3D model of the Cannon gold mine orebody that will increase the company's chances of locating future deposits.

The collaborative research project aimed to define a wider alteration halo that could be used to locate similar mineralisation in the Bulong region, and would be the first time a complete Yilgarn gold mineralised system would be modelled in this way.

Each party would contribute \$50,000 each, which would cover the costs of data analysis, hyperspectral scanning of 5000m drill chips, and the collection of portable X-Ray Fluorescent geochemistry on the drill chips.

Southern Gold managing director Simon Mitchell said by establishing a wider halo, the company could provide a much larger footprint around the Cannon-style mineralisation.

"An important part of our corporate strategy is to strive for technical excellence," Mr Mitchell said.

"Southern Gold looks to be an innovator when it comes to exploring for and identifying new deposits, particularly in mature exploration districts.



Southern Gold RAB drilling at the Bulong operation.

"This collaboration with the CSIRO and Commonwealth Government is demonstrative of Southern Gold's innovative, cutting edge and science-based approach to deliver new

pathways to gold discoveries.

"In time, I believe this sort of initiative will differentiate us as a unique exploration house."

Southern Gold was also engaged in a

separate five month research program to the east of its Bulong tenements that would scan 1920m of diamond core and fly 184sqkm of airborne hyperspectral data to form a large regional data set.



The partnership aimed to advance technology and its applications.

BHP turns to tech collaborations

ELIZABETH FABRI

BHP Billiton will investigate ways technology can be used to advance mining and mineral processing through a new collaborative research partnership with engineering company Hatch.

The project would see the companies look into the benefits of a wide range of innovations, with the aim of encouraging the development and deployment of future technologies.

"Our two companies are working together to accelerate the realization of benefits from potential innovations," Hatch performance innovation director Damien Harding said.

"BHP Billiton will have access to Hatch's proven technology commercialisation experience and deep mining-domain expertise in business process design, operational performance, engineering, and digital systems.

"Our essential differentiator goes beyond having the depth and breadth of solutions to innovate.

"It's also the knowledge and expertise to integrate all the elements we need to rapidly develop and implement holistic solutions that will have a significant impact on the mining industry."

Roy Hill opens learning centre



Kent Street High School students with Gina Rinehart.

CAMERON DRUMMOND

GINA Rinehart's Roy Hill iron ore business has opened a new interactive learning centre at its corporate headquarters in Perth, WA.

Dubbed the 'ROC-ED', the centre aimed to provide an innovative education experience for students to learn about the mining, and act as a foundation for the development of career prospects.

The half-day excursion program gave students and teachers access to the real-time

operation of Roy Hill's remote operations centre and infrastructure.

Hancock Prospecting and Roy Hill executive chairperson Gina Rinehart said she opened the centre so that students could consider the wide range of career options open to them.

"I hope to interest students to take up the study of engineering, geology, mathematics, science and technology, which are key to Australia's future development," Ms Rinehart said.

Students will participate in learning

experiences as an introduction to key aspects of the mining industry, including automation, robotics, technology and innovation."

Roy Hill Holdings chief executive Barry Fitzgerald said the decision to open the ROC-ED learning centre enabled students to learn more about Roy Hill's operations in the context of their broader school education.

"They will also explore what it takes to build a career in mining and the importance of the mining industry to the national economy," Mr Fitzgerald said.



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IN BRIEF

X-ray tech
shines light on
gold

GOLD

THE CSIRO, together with assay tech company Chrysos, have developed a highly sensitive detector capable of delivering accurate metallurgical results in minutes without generating toxic waste products.

The PhotonAssay X-ray gold detector uses high powered X-rays to bombard rock samples and activate atoms of gold and other metals, picking up unique signatures from the elements to determine their concentrations.

Although the basic principles of the method have been known for decades, the complex nature of the technology meant the technique had only limited commercial application to date.

"We have focussed on improving the accuracy, sensitivity and simplicity of the technology to make it useful for low-grade Australian operations," CSIRO chief technology officer Dr James Tickner said.

Sileach testing
progresses

LITHIUM

LITHIUM Australia has recommenced pilot plant testing on Pilbara Minerals spodumene concentrate as part of its project to commercialise the Sileach process.

On 16 December the company undertook a 24-hour commissioning run of the Sileach circuit at ANSTO Minerals, and would carry out further piloting operations in January.

"Sileach is the only hydrometallurgical process capable of recovering lithium from spodumene," Lithium Australia managing director Adrian Griffin said.

"The ability to achieve that without roasting is a big step forward for Lithium Australia, and more broadly, the lithium industry."

Mining3
launches spinoff
company

COAL

NEWLY formed research organisation Mining3 has launched a spinoff tech company that will focus on coal seam gas production and degassing coal mines in Australia.

V2H International (V2HI) recently completed a capital raising to fund initial commercial operations.

"The development of high-pressure water jet drilling has been a focus area of Mining3 (previously CRCMining) for many years, and we have world-leading technology and expertise in this area," Mining3 chief operating officer Kevin Greenwood said.

"We are excited about the benefits to industry, which include increased safety, productivity and sustainability."

WA tech strategy goes global



Autonomous trucks at Rio Tinto's West Angelas mine.

Image: Christian Sprogoe Photography.

ELIZABETH FABRI

CANADIAN-based Global Mining Standards and Guidelines Group is taking a leaf out of Australia's book by developing a new international guideline for autonomous mining, based on documentation released by the WA Department of Mines and Petroleum

(DMP).

Published in 2015, the DMP's *Safe mobile autonomous mining in Western Australia* was a world-first code of practice focused on safe autonomous mining technologies such as loaders, trucks, drills and dozers.

Senior Inspector of Mines Peter O'Loughlin would be appointed on the committee for the new guidelines following

his coordination of the WA code of practice.

"This reflects Western Australia's global leadership in the field of autonomous mining equipment and its safe operation," Mines Safety Director and State Mining Engineer Andrew Chaplyn said.

"It is also indicative of the collaborative approach the department used in developing the code."

Exploring for the Future program kicks off

ELIZABETH FABRI

A FOUR year, \$100 million exploration program tasked with discovering Australia's next generation of mines has begun.

Led by Geoscience Australia, the Exploring for the Future program received \$100 million in funding from the Federal Government in 2016 to boost mining investment.

Association of Mining and Exploration Companies (AMEC) chief executive Simon Bennison said the program was a 'great investment' that would have significant flow on effects to the industry.

"Investing \$100m in Geoscience Australia to produce pre-competitive data for the Exploring for the Future program will have an enormous multiplier effect," Mr Bennison said.

"One of the first steps has been the \$3.1m investment into mapping electrical conductivity in the Northern Territory."

"Australia will reap dividends from this investment in the future - in jobs, mines and government revenue streams."

Geoscience Australia's pre-competitive data produced through its UNCOVER program, State and Territory Co-Funded Drilling Schemes and the Exploration Development Incentive (EDI) were also integral to future proofing the sector.

"UNCOVER is supporting scientific

research to improve exploration success," Mr Bennison said.

"The investment made in co-funded drilling schemes reduces the cost of drilling, and makes it easier for companies exploring remote Australia to make the decision to drill and discover the mines of tomorrow."

"The cyclical nature of the industry means that investing in mineral exploration now is vital to ensuring the discoveries that will become the mines of tomorrow are made, providing the jobs and Government revenue streams for the future."



Image: Geoscience Australia.



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IN BRIEF

Thiess renews
Botswana
contract

AFRICA

GLOBAL mining service provider Thiess has secured a \$370 million contract to continue works at Jwaneng diamond mine in Botswana for the next two years.

With a strong track record at Jwaneng through its 60 per cent interest in the Majwe Mining Joint Venture, Thiess has performed mining operations at the mine since 2011.

“We’re proud to continue being part of the Jwaneng expansion operations, bringing a continued focus on mine engineering and asset management, and developing the skills and experience of our people in Botswana,” Thiess managing director Michael Wright said.

Diamond output
to decline after
2019

GLOBAL

THE global diamond industry could be looking at a demand-supply gap of between 5 per cent and 6 per cent after 2019, despite production rising from 127 million carats (Mct) in 2015 to an estimated 134.5 Mct by 2020.

A report from research and consulting firm GlobalData said initial growth would be supported by expansions at operating mines, including Lukoil Oil Company’s Vladimir Grib project in Russia, the Diavik and Ekati diamond mines in Canada, and Rio Tinto’s Argyle mine in Australia.

However, global output is expected to decline after 2019 as a result of reserve depletions in the Argyle, Diavik and Ekati mines, which accounted for 18 per cent of global production as of 2016.

Vale opens its
largest iron ore
mine

BRAZIL

MINING giant Vale officially opened its largest ever iron ore mine in the Amazon rainforest of Brazil, a project which took 15 years to come into fruition.

The S11D mine will contribute 74mtpa when it reaches peak output in four years, contributing to Vale’s estimated annual production of between 400mtpa and 450mtpa by that time.

\$US14 billion was spent completing the project, which included the mine, plant and a 101km-long railroad connection.

BHP flags Samarco restart



The aftermath of the Samarco tailings dam disaster.

Image: Agência Brasil.

CAMERON DRUMMOND

THE Samarco iron ore mine in Brazil could be restarted in 2017, but only if the project’s \$US3.8bn debt is restructured and the necessary government approvals are secured.

Mine operations were suspended in November 2015 after a tailings dam breach caused flash flooding which killed at least 19 people and caused a widespread economic and environmental damage to the region.

“A restart of operations is technically feasible in 2017, however, restart will occur only if it is safe to do so and the necessary approvals are received from Brazilian authorities,” BHP said in a statement.

It also stated that a restructure of Samarco’s \$US3.8bn debt to make it economically viable would be required to allow the mine to move forward.

A JV between BHP and Brazil’s Vale, Samarco has had its operations and cash flow suspended since the accident and has remained

in financial uncertainty after agreeing to a \$US2.3 billion cleanup and rehabilitation cost in March 2016.

The complete financial cost remains uncertain, after a Brazilian court in July agreed to reinstate a rival civil claim for \$US6.2 billion.

Meanwhile, an injunction to pay a deposit of \$US400m to cover community and environmental rehabilitation was confirmed by a federal court, with payment due 8 January.

Iluka makes changes to global portfolio



Image: Sierra Rutile.

ELIZABETH FABRI

ILUKA Resources’ long awaited Sierra Rutile acquisition was completed just days after the mineral sands company ended its joint venture contract with Vale in Brazil.

After a two year investigation, Iluka and Vale announced on 1 December that they would not develop the Tapira deposit in Minas Gerais State, Brazil.

“Due to the complex geological nature of the deposit, and contained mineral assemblage, a method to produce a market acceptable titanium dioxide feedstock was not identified using currently known conventional or alternative technological routes,” Iluka said in a statement.

“The total Iluka expenditure on the Tapira project has been approximately \$6 million and has been expensed as part of Iluka’s resources development expenditure.”

A week later, Iluka completed its \$375 million acquisition of London-listed company Sierra Rutile (SRL) once concerns surrounding the tailings dams had been resolved.

The merger was set to double Iluka’s rutile resource base, with SRL’s Sierra Leone operations currently producing 130,000 tonnes per annum of rutile with expansion potential up to 240,000tpa.

“Iluka believes that the combination of the experience and capabilities of SRL personnel with Iluka’s mineral sands

operational and technical experience, gained across multiple ore bodies and processing facilities over many years, will enhance the operational performance of Sierra Rutile,” managing director and chief executive Tom O’Leary said.

“As planned, Iluka intends to continue the evaluation of the development options at Sierra Rutile through the commencement of definitive feasibility studies on each option.

“Subject to this evaluation and market conditions, Iluka plans to commit progressively to expansion opportunities that, in aggregate, could see a significant increase in rutile production and a material improvement in unit cash costs of production.”

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Stronger for longer in 2017

Mid December 2016 saw iron ore reach over the \$US80 mark for the first time since October 2014, news which has been welcomed by miners of the steelmaking material.

CAMERON DRUMMOND

MARKETS analyst S&P Global Platts assessed the 62 per cent Fe Iron Ore Index at a year-to-date high of \$US83.95 per dry metric tonne (dmt) on 13 December – more than double its record low price of \$US38.50/t this time last year.

The price rally – which consistently ignored widespread bearish forecasts in 2016 – had been largely attributed to burgeoning infrastructure investment in China and a slowdown in the country's supply growth.

According to Platts, continued strength in China's steel market had caused iron ore prices to rise.

China imported 91.98mt of iron ore in November 2016; up 12 per cent year-on-year and 13.7 per cent from the previous month, according to data released in December by China's General Administration of Customs.

Analysts such as Citigroup, UBS, JP Morgan and Morgan Stanley, which had expectations of weaker prices toward the end of 2016, have revised their previous forecasts for the commodity in 2017.

JP Morgan's outlook for 2017 was bullish, backing it to \$US60/t for 2017 from its previous outlook of \$US54/t, while Goldman Sachs also upgraded its outlook to \$US55/t.

Investment bank Morgan Stanley believed that iron ore demand, along with base metals would shine during 2017.

"Mr Trump's promise to rebuild US infrastructure is a brand-new upside risk



Image: Mineral Resources

for our commodity outlook," the bank said in a December 12 report.

The release of a 5 year planning document by Chinese authorities in September 2016 calling for the closure of between 100mt and 150mt of steel capacity through to 2020 has yet to have any effect on iron ore demand.

However, at a recent investor conference in November 2016, Rio Tinto

chief executive Jean-Sebastien Jacques said the company had "quietly abandoned" its long held view that China was on its way to forging 1 billion tonnes of steel by 2030, compared to a current output of 800mt, *Reuters* reported.

He said that uncertainty over the restructuring of China's state-owned enterprises made it difficult to predict how things would pan out for the iron ore

sector.

"No one can work with only one scenario ... we work with multiple scenarios and our central case is not 1 billion tonnes," Mr Jacques told analysts at the briefing.

He also said that Rio would consider cutting iron ore mining if it would boost free cash flow.

"If it means reducing volume, we'll do it," he said.

FMG exploits price rebound



FMG's Solomon Hub project in WA has an annual production capacity of 70mt.

Image: FMG.

ELIZABETH FABRI

FORTESCUE Metals Group (FMG) has been recognised as the lowest cost seaborne supplier of iron ore into China, ahead of Rio Tinto and BHP Billiton.

Based on data released by Metalystics Resource Sector Economics in December, the achievement coincided with a \$US1 billion debt repayment as part of FMG's previously announced debt reduction

strategy.

"We are very pleased that we have been formally recognised as the lowest cost seaborne supplier of iron ore into China," FMG chief executive Nev Power said.

"This is testament to the hard work and commitment of the Fortescue team who remain absolutely focused on being the safest, lowest cost and most profitable producer of iron ore.

Mr Power said the debt payment made

on 23 December would further lower its cost position, and result in annual interest savings of about \$US38 million.

"Fortescue's nearest debt maturity is in June 2019 and is now less than \$US 2.0 billion with gross gearing falling below our targeted 40 per cent level once this payment is made," he said.

"At current iron ore prices we are generating strong cash flows and we will continue to repay our debt and strengthen our balance sheet."

Iron ore still number 1 in WA

REUBEN ADAMS

IRON ore remained WA's most valuable commodity sector in FY16, providing nearly \$3.5 billion in royalties to the WA State government – almost 75 per cent of all royalties and associated payments.

The iron ore sector was valued at \$48.4 billion as the volume of iron ore sales reached a record 757 million tonnes in FY16, according to the Department of Mines and Petroleum (DMP).

At \$10 billion in sales for the financial year – or 14.5 per cent of total mineral sales – the State's gold sector was a distant second, despite accounting for about 70 per cent of Australia's total gold production.

Alumina and nickel were WA's third and fourth most valuable minerals for the period, reaching \$4.9 billion and \$2.2 billion, respectively.

The State has the largest proportion of the nation's economic nickel resources and is currently the sole producer of nickel in Australia.

In FY16, the sales value of WA's mineral sands sector was \$539 million.

SPECIAL FEATURES

AUSTRALIAN CONTRACTORS IN AFRICA



**"AUSTRALIAN COMPANIES
HAD INVESTED MORE
THAN \$30 BILLION IN
EXTRACTIVE PROJECTS
ACROSS AFRICA."**

Resolute Mining announced plans to construct a \$US95 million underground gold mine at Syama in June.

Image: Hugh Brown.

Resource-rich Africa lures investors

Home to some of the world's largest untouched resources, Africa is treasure trove for foreign investment with Australia leading the chase as the region's largest contributor. As more projects enter production, opportunities for ASX-listed miners and contractors are only expected to grow.

ELIZABETH FABRI

AFRICA's resource wealth is no secret; the continent produces more than 60 metal and mineral products, from high-grade gold to diamonds, platinum, bauxite, manganese, iron ore and copper.

However, for many years concerns around regional stability prevented overseas companies from taking that much-needed 'leap of faith'.

In the early 1990s, Africa still only received five per cent of global exploration and mining development expenditure, according to KPMG's *Mining in Africa Towards 2020* report.

"A study by the World Bank on the shortcomings of African territories in the eyes of miners revealed a need for infrastructure, stable legal systems, a predictable fiscal regime, profit repatriation guarantees, and access to foreign exchange," the report stated.

"The remarkable changes that took place in Africa from 2000 to 2011 resulted in the continent receiving 15 per cent of global exploration expenditure and mining investment during 2012."

In the last decade the surge in investment, predominately driven by China's demand for commodities, brought more projects into production.

Deloitte estimated 30 new large-scale projects valued at \$US18 billion would come online before 2018; with a large proportion of expenditure traced back to Australian shores.

In a key-note speech at the 2016 *Africa Down Under* mining conference, assistant minister for Trade, Tourism and Investment Keith Pitt said the government estimated Australian companies had poured more than \$30



Investing in African Mining Indaba is the world's largest mining investment conference.

billion into extractive projects across Africa.

"There are over 200 Australian companies, many of these Western Australian, with about 700 projects in 35 countries," Mr Pitt said.

"Much of this is in exploration activity – especially in gold.

"As such, the future is bright, especially as we come out of a period of particularly low commodity prices."

Mr Pitt said Africa was one of the largest investment markets for Australian extractives companies.

"Aussie firms are at the cutting edge of international best practice," he said.

"They have demonstrated innovation

and resilience in engaging in challenging environments.

"And they are backed here in Australia by robust legal and financial regimes."

Investment opportunities

A number of regions have benefited from Australia's presence in Africa, particularly Western Kenya, Namibia, and Central and West Africa.

"The area is seeing a significant increase in railway construction in order to transport ore to ports and this has led to the opening of mines in Guinea, Liberia and Sierra Leone," KPMG stated.

"Around 85 per cent of global phosphate

reserves are located in North Africa."

Botswana was a hive of activity for diamonds and coal, with an estimated 200 billion tonnes of coal reserves, while Ghana and South Africa were the largest gold producers.

"Companies including Perseus Mining and Endeavour Mining Corporation invested US\$20bn in Ghanaian gold mines during 2011-12," KPMG stated.

Mozambique's mining sector was also strong, with an increase in economic activity predicted following the rise in global coal production.

While mining giants had interests in many of these assets, it was the juniors instead that earned their stripes as Africa's majority investment group.

In a recent report, the Australian-Africa Minerals & Energy Group (AAMEG) found that out of 590 Australian projects in Africa, 449 were owned or partially owned by ASX-listed companies with a market cap up to \$100 million.

Northcott Capital managing director Nick Martin said the sudden spike in investment came down to three crucial factors — having a clear and concise understanding of what financiers wanted; ensuring the building blocks were exact; and being responsive to market changes.

Mr Martin said financing projects in Africa continued to be difficult but the market was improving.

"Commodity prices are subdued, there exists a distressed asset overhang, investor sentiment is 'selective' at best and many commercial banks are 'risk adverse'," Mr Martin said.

"That said — good projects will still obtain finance; the money is there — but it needs convincing to go to Africa.

(continued on page 18)

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**"GOOD PROJECTS
WILL STILL OBTAIN
FINANCE; THE MONEY
IS THERE – BUT IT
NEEDS CONVINCING
TO GO TO AFRICA."**

(continued from page 16)

Perseus Mining's Edikan mine produced first gold in 2011, and continues to be a high performer for the region.

Image: Perseus Mining.

"The market is changing and my advice to companies seeking funding is start the process early....as early as possible."

Companies to watch

2016 was flooded with announcements from Australian miners acquiring established African projects, forging joint ventures, and returning high-grade results from exploration programs.

But miners haven't been the only ones in on the action, with Australian service contractors also appointed to carry out tasks.

In April, Australian contractor PYBAR Mining Services announced it had entered a three year agreement with drilling services company Capital Drilling Limited to complete underground hard rock mining services in Africa.

"Our focus remains on the Australian market, however with a large number of potential underground projects in Africa,

there is an opportunity to transfer our capabilities to a market that can benefit from our expertise," PYBAR chief executive Paul Rouse said.

"Partnering with an established player such as Capital Drilling will facilitate any entry into the African market."

Progress at Perth-based Kibaran Resources' \$US80 million Epanko project in Tanzania was also picking up pace, with a feasibility study on track.

Throughout this phase, the graphite hopeful had engaged the services of Perth-based companies GR Engineering, Intermine Engineering Consultants, and Knight Piesold.

Perseus Mining, best known for its Edikan Gold mine in Ghana, was gearing towards first gold production at its Sissingué Gold Mine in Côte d'Ivoire in late 2017, and completing definitive feasibility works in mid-2017 at its Yaouré Project, also in Côte d'Ivoire.

Resolute Mining also had a strong foothold

in the region, committing the majority of its \$19 million exploration spend to African targets in the next 12 months.

At the October *Africa Down Under* conference Resolute managing director John Welborn said the company had uncovered multiple high-quality projects close to its existing flagship project Syama in Mali.

After 20 years in Africa, he said Resolute remained hopeful of opportunities in the region, with feasibility works now completed at its Bibiani Gold Project in Ghana, and exploration prospects along the Syama Shear and greenstone belts in Mali and Cote d'Ivoire.

"Resolute is currently exploring more than 135,000sqkm of prospective tenure across three countries in Africa," Mr Welborn said.

"Resolute remains committed to partnering with governments and other stakeholders to develop projects that benefit everyone, specifically those who live and work in the jurisdictions in which we operate."

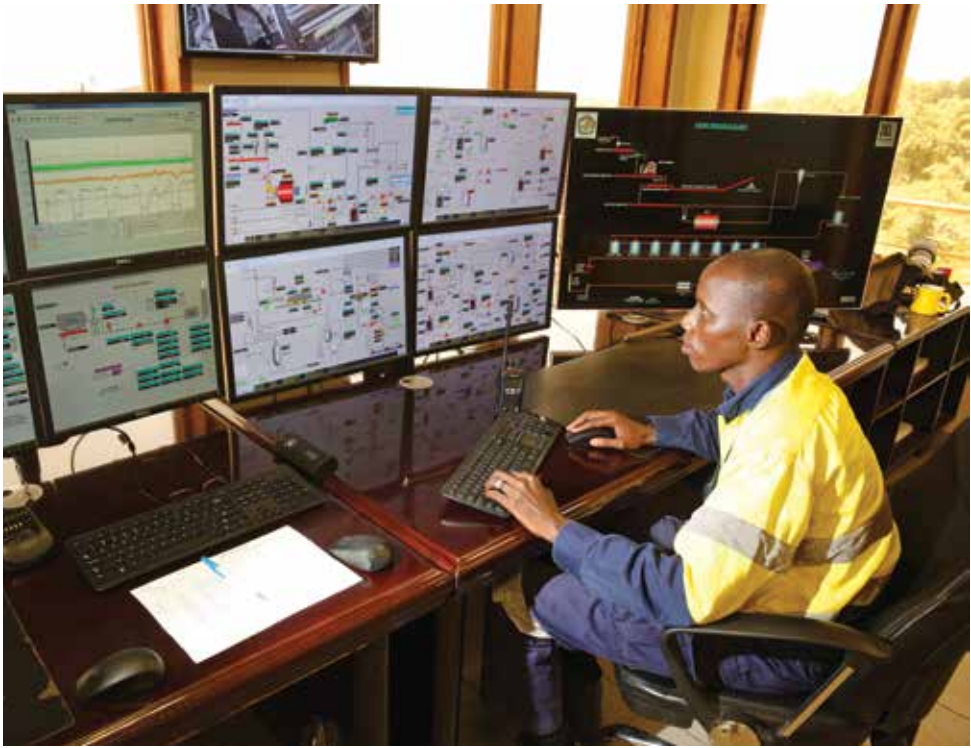
Mining Indaba

Also sharing a 20 year history in the region, was the annual *Investing in African Mining Indaba* conference, which brought together investors, miners, governments and stakeholders from around the world.

Held from 6-9 February in Cape Town, South Africa, the 2017 event was set to attract 2000 international companies across 100 countries and territories.

The four-day conference aimed to advance mining in Africa by highlighting the benefits of investing in the region through corporate presentations and information sessions, and facilitating networking opportunities.

This year's program included key note speeches from about 150 industry leaders, from Resolute Mining's Mr Welborn, to African resources ministers, Harmony Gold chief executive Peter Steenkamp, Rio Tinto energy and minerals chief executive Bold Baatar, and Deloitte Energy and Resources leader Andrew Lane.



Long term vision

Africa is in the midst of a 'massive historical shift', with its population expected to double to 2.4 billion by 2050, according to the Australian Strategic Policy Institute (ASPI) latest report *Aus-Africa Dialogue 2015*.

"By 2030, most Africans will live in cities, rising to 56 per cent by 2050," it stated.

"Africa continues to grow economically, but the International Monetary Fund has cut its growth forecasts for 2016 to 3 per cent as much of the continent reels from the downturn in commodity prices and the related slowdown in Chinese demand.

"If Africa is still 'rising', it will do so in the near term at a slower pace than in the heady days of the late 2000s."

The institute said mining in Africa had a long way to go, and more research, exploration and cooperation between the government and industry was required to realise its potential.

"The minerals sector and governments urgently need to rehabilitate a relationship that's broken down in recent years, in order to reduce the costs of mining operations and improve trust between all stakeholders," it stated.

"Mining companies need to understand governments and be more transparent with them about profits and returns; this can and should be a win-win for the mining companies and the governments."

ASPI senior analyst Lisa Sharland said the development of a whole-of-government strategy would ensure the government and private sector were well positioned to identify opportunities for broader Australian-African engagement.

"The remote location of African mines, many of them joint ventures with Australian partners and investors, means mine owners often perform a quasi-government role," Ms Sharland said.

"Admittedly, some of the higher risk African mining ventures can present difficulties for investment and there are ongoing challenges with taxation and revenue arrangements.

"A workshop with African mining stakeholders as well as regional bodies and institutions such as the African Development Bank, the Common Market for Easter and Southern Africa (COMESA) and the African Union, would also be beneficial."

Ongoing partnerships such as this were deemed necessary for the sector's growth, and had already been embraced by various groups.

In April this year, Perth-based Curtin University's Faculty of Science and Engineering signed a Memorandum of Understanding agreement with the École Nationale d'Ingénieurs Abderhamane Baba Touré in Bamko, Mali to open the doors between both countries for academic links in mining engineering.

The WA government was involved in a similar program in February and November, sharing its mining knowledge with Ethiopia and Kenya in a series of workshops at Addis Ababa and Nairobi.

"I am pleased the department is able to offer these services as a part of the MoU and encourage sustainable development in COMESA nations," Mines and Petroleum minister Bill Marmion said.

Industry peak body AAMEG had also sat down with the Department of Foreign Affairs and Trade (DFAT) and the ASIO Business Liaison Unit (BLU) in June, to discuss how Australian companies in Africa could mitigate security issues.

"AAMEG provides an important role facilitating and leading the resources industry to work together and respond to this issue," AAMEG chief executive Trish O'Reilly said.

"Operating in Africa offers great rewards, but it often comes with great risk.

"Security is extremely important and an area in which we, as an industry, need to be far more proactive."

Continued success at Kwale

BASE Resources' successful development of the Kwale mineral sands project in southern Kenya, and growing track record of operational, safety and community development achievements, has established a solid foundation from which to grow the company.

With production volumes exceeding design targets and an enviable position in the market secured, Base Resources is well placed to capitalise on a mineral sands market showing renewed investor sentiment.

In only its second full year of operating, Base Resources production for the 2016 year soared to the top end of guidance, recording 85,654 tonnes of rutile, 455,870 tonnes of ilmenite, and 31,389 tonnes of zircon.

Net cash generated from operating activities came in at \$78.6 million, while net debt was reduced by an impressive \$41.0 million.

"This is testament to the quality of the resource, our plant and equipment and, most importantly, to the experience, quality and dedication of our operations team," Base Resources chairman Keith Spence said.

With the Kwale Operations at steady state, Base Resources is turning its attention to optimising the back end of Kwale and extending mine life through exploration.

The Kwale Phase 2 project seeks to deliver an optimised mining methodology, increased mining rates in lower grade zones and increased concentrate production.

Following the completion of a Pre-Feasibility Study in July 2016, and based on the potential value the Kwale Phase 2 project could add to the Kwale Operations, a Definitive Feasibility Study was underway, scheduled for completion in the June quarter of 2017.

A successful airborne geophysics program, conducted in 2015, covering the south coast region of Kenya from Mombasa to the Tanzanian border, identified a series of exploration targets that were subsequently confirmed through ground reconnaissance.



Base Resources looks beyond its Kwale mineral sand operations in Kenya, East Africa.

To capitalise on the targets identified, the company has recently significantly expanded its exploration land area surrounding the Kwale Operations and up to an 18,000 metre aircore drill program was expected to be completed over the coming year.

The company has also secured exploration tenure over a large area of land in northern Tanzania, about 50km south of the Kenyan border and 100km from Kwale Operations, within its economic radius.

Looking beyond Kwale, Base Resources' demonstrated development capability provides a sound platform to drive further shareholder value from acquisition opportunities, something it has demonstrated willingness for in the past.

The company continues to assess and progress opportunities in a disciplined manner and appears well positioned for growth.

Australian underground mining expertise in Africa

WITH a large number of African projects seeking to move underground and limited local skill sets in the highly specialised area of mechanised underground mining, an opportunity has emerged for specialist underground mining contractor PYBAR Mining Services to transfer its Australian underground mining techniques and best practice safety systems.

PYBAR has partnered with Mauritius-based drilling services company Capital Drilling Limited, which has 15 years' experience in Africa, to co-market underground hard rock mining services in the region.

"The tabular orebodies in the Achaean age greenstone belt operations in Central and Western Africa are very similar to those found in Western Australia's greenstone belts," PYBAR chief operating officer Brendan Rouse said.

"As these open pit operations go deeper, the increasing strip ratio can make it more economic to take mines underground."

Adopting the Australian mechanised mining approach via the services of an experienced contractor is a logical solution for many of these types of projects – and an opportunity for asset owners to initiate important skills transfer programs for the local workforce.

"However, new markets present a whole new set of challenges when it comes to managing political issues, legislative requirements, cultural diversity and logistics," Mr Rouse said.

"Partnering with an established local contractor such as Capital Drilling, which has a complementary business model and



PYBAR's operations at the Vivien gold mine on one of WA's greenstone belts.

shares our values, can help overcome these and facilitate a smooth entry for PYBAR.

"Our combined service offering delivers on fundamental project requirements which include the ability to adopt or implement project-specific solutions to meet the needs of the client, project, government and local community and, naturally, a demonstrable track record of delivering on performance targets."

Contractors in Africa must be able to seamlessly transition projects from surface works to the mine development phase by sustaining and nurturing local social welfare programs and government

departmental relationships, adopting the same supply chains, and retaining existing project personnel.

"Given the variable local conditions and need for cost efficiency, our unique value proposition lies in our agility, flexibility, swift decision making, proactive approach to supporting the development of the local economy and application of technical innovation," Mr Rouse said.

"There is a clear competitive edge to be gained, and for significant efficiency, productivity and safety improvements to be realised if African miners select a contractor with the right credentials."



Positioned for Growth

Base Resources' (ASX & AIM:BSE) successful development of the Kwale Mineral Sands Project in southern Kenya and growing track record of operational, safety and community development achievements, provides a solid foundation to grow a contemporary mid-tier resources company.

With production volumes exceeding design targets and an enviable position in the market secured, Base Resources is well positioned to capitalise on a market showing positive signs and renewed investor interest in the sector.

The recent granting of exploration tenure and the imminent commencement of drilling on identified targets presents exciting potential to extend the mine life of the Kwale Operations.

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**BASE
RESOURCES**

"WE HAVE ONLY SEEN CONTINUED GROWTH OUT OF PORT HEDLAND, AND FOR FY17 WE EXPECT TO BE DOING SOMEWHERE NORTH OF 500MT OF THROUGHPUT."

Aerial image of the Port of Dampier.

All Images: Pilbara Ports Authority.

Record throughput

The Pilbara Ports Authority has achieved record throughput across its operations for the second time in as many years, as it looks to begin the replacement and upgrade of vital port infrastructure in the current financial year.

CAMERON DRUMMOND

PILBARA Ports Authority, the world's largest bulk export port authority, is set to undertake substantial enhancements to its port operations at the ports of Dampier and Port Hedland, which are located along the coast of the mineral-dense Pilbara region of Western Australia. These upgrades are set to enhance efficiency, increase safety and capacity and allow for more product to be exported.

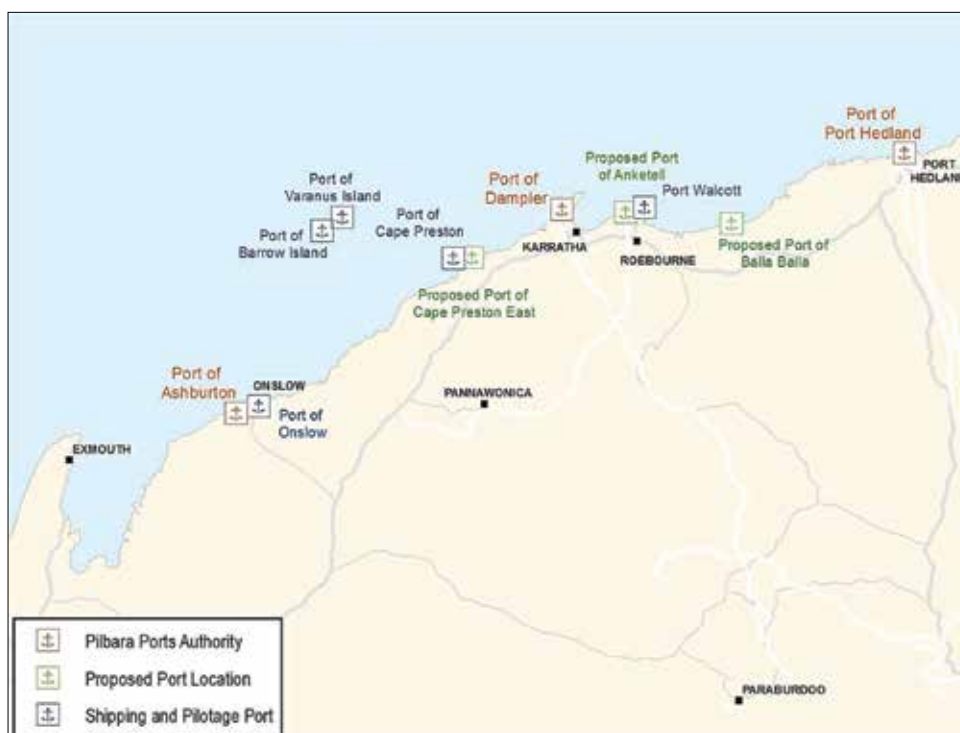
The PPA is responsible for about 70 per cent of Australia's iron ore exports and 50 per cent of the world's seaborne iron ore exports, as well as roughly 8 per cent of the world's LNG exports.

China and Japan remain the PPA's largest commodity export markets, having shipped 82 per cent of iron ore to China and 75 per cent of LNG to Japan in the 2016 financial year. Total trade for FY16 was a record 633.5mt, up 2.16 per cent from 619.8mt in FY15, with iron ore accounting for 94.1 per cent of exports. Iron ore also accounted for 93 per cent of the tonnage shipped through terminals at PPA, with LNG/LPG (4 per cent), Salt (1 per cent) and other commodities making up the remaining 2 per cent.

Record breaking

The 2016 financial year saw throughput at PPA ports break multiple records, returning the WA Government a \$100.5m dividend.

In FY16, PPA posted a record throughput of 633.5 million tonnes across all ports, with Port Hedland accounting for the bulk of that figure with its own record throughput of 460.4mtpa.



A map of the Pilbara region's ports.

It hit an all-time monthly throughput record in August of 42.9mt, as well as a new 24 hour record during the month of June, when it shipped 2,174,533t on 12 vessels (up from the previous record of 2,065,269t on 11 vessels in FY15).

Australian iron ore exports from Port Hedland remained solid in October, with a total of 41.6mt of ore shipped, 14 per cent higher than the corresponding period last year.

In cumulative terms, iron ore exports soared to 469mt over the past year; the largest total on record and close to 6 per cent up on

the levels shipped in the year to October 2015.

In terms of value, the two major commodities through PPA ports totalled \$17.8 billion and \$49.8 billion for oil and gas and iron ore, respectively.

Iron ore produced by Fortescue Metals, BHP Billiton and Gina Rinehart's majority-owned Roy Hill mine is shipped out of the Port of Port Hedland, the world's largest bulk export port.

Three significant projects are underway at the port, which has experienced an average annual growth rate of 15 per cent over the past five years; - the construction of a new

integrated marine operations centre, the Channel Risk Optimisation Project (CROP) and the replacement of channel markers.

PPA chief executive officer Roger Johnston said the authority has only seen growth out of Port Hedland year-on-year since he arrived five years ago, when throughput for the 2012 financial year was 246.6mt.

"We have seen continued growth out of Port Hedland, and for FY17 we will be doing somewhere north of 500mt throughput," Mr Johnston said.

Mr Johnston said that all the projects were necessary upgrades and had been very well received by industry.

"These three key strategic projects will set the port up to be able to manage expected volumes for the next 25 years," Mr Johnston said.

Upgrades


Marine Centre

A new Integrated Marine Operations Centre (IMOC) will be constructed at Port Hedland to facilitate safe and efficient movement of vessels through the harbour.

It is one of three projects funded by the Port Improvement Rate, a temporary levy charged on vessels entering and exiting the harbour, which funds capital improvements necessary to sustain the long-term operation and development of the Port of Port Hedland.

Pindan Contracting was recently announced as the successful tender to design and construct the IMOC, with onsite works expected to begin in early 2017.

(continued on page 24)




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Pilbara Port Authority 2016 Nav Aid Refurbishment Program

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ESTABLISHED in 1995, RM Surveys has continued to evolve as a trusted industry leader in the provision of specialised survey services.

While maintaining its focus on WA, the company has also worked on national and international projects.

The recent acquisition of North West based survey firm MAKJaP has expanded RM Surveys' client base to include the Pilbara Ports Authority and other key stakeholders in the Pilbara and Kimberley regions of WA.

RM Surveys has proven its offering of reliable and accurate survey information for numerous planning and development in the region.

Recent works including 3D laser scan surveys for the Port Hedland Bulk Handling Facility; boundary and lease surveys within the Port Facility for numerous mining companies; and bathymetric surveys of King Sound, Derby.


These works supplement its Perth-based operations which include numerous high profile construction and engineering projects, including the New Perth Stadium and The Towers at Elizabeth Quay; as well as specialist survey services including dimensional control surveys for materials handling infrastructure such as car dumpers, stackers and reclaimers for the mining industry.

RM Surveys plans to build on its North West operations by providing the same level of dedication and commitment to customer service to new and existing clients. It looks forward to opportunities for involvement with future works in the region, including the Integrated Marine Operations Centre, proposed Port Hedland Marina, and Derby Airport redevelopment.


Through RM Surveys' proven capacity in assisting clients, providing reliable survey information and a focus on continual health, safety, quality and environmental improvement, the company prides itself on its strong relationships with its clients as reliable partners in precision.

We've taken things to the next level. From North to South.

With our recent acquisition of North West survey company MAKJaP, RM Surveys are perfectly placed to be your Partners in Precision, no matter where your project is.





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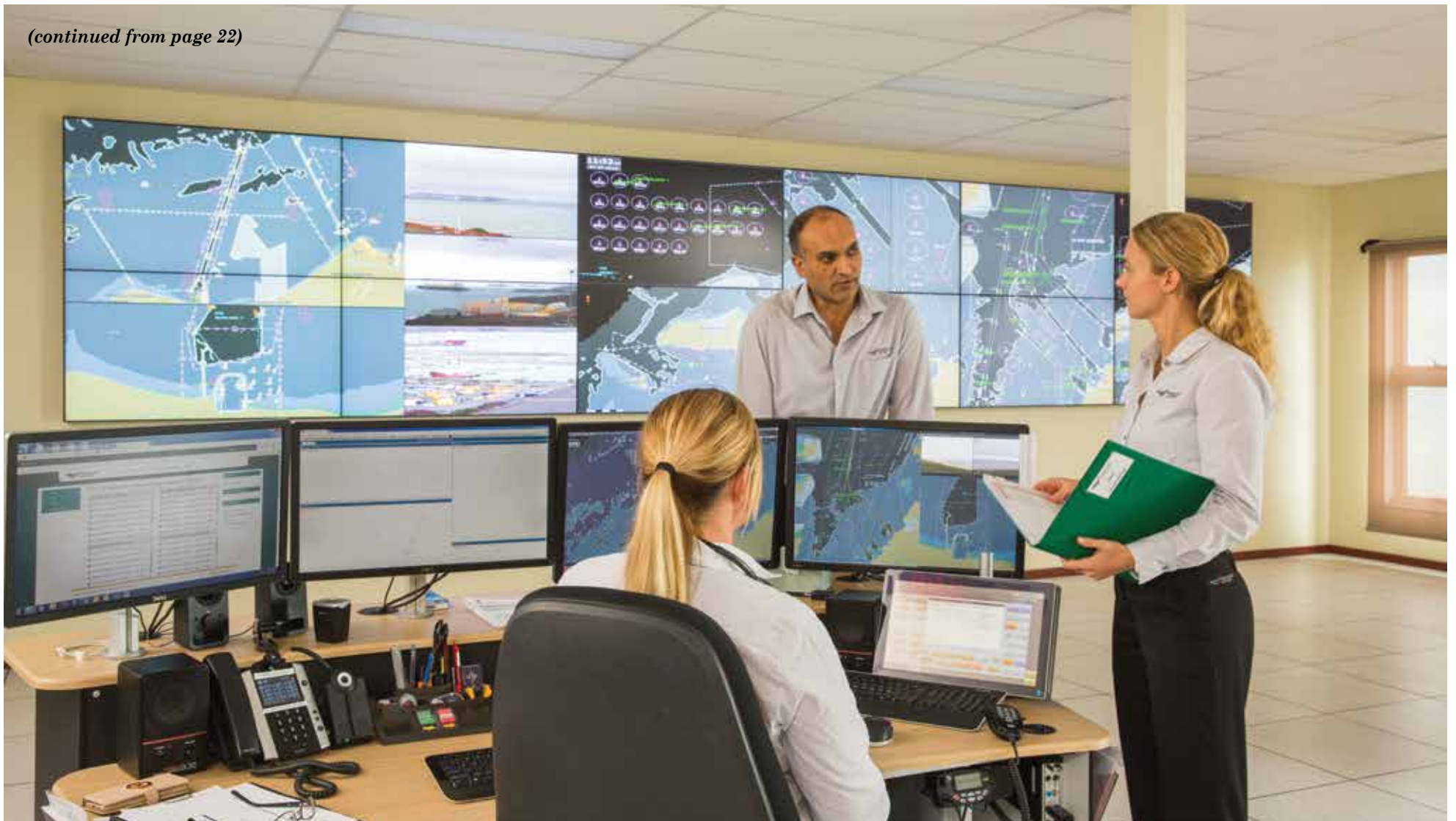


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Port of Dampier Vessel Traffic Services Centre.

The IMOC will be adjacent to the existing port administration building and replace the existing and outdated shipping control tower. The new facility will control the marine operations of the port, including vessel movements in the inner harbour, shipping channel and off shore anchorage.

It will also house Vessel Traffic Services (VTS) systems and equipment for the harbour master function, dredging management, port security, marine pilot briefing facilities and provide for improved incident control capability.

"The new tower will allow for us to have multiple desk operators in it and initially provides space for up to four people with room for growth," Mr Johnston said.

"The second floor will also be set up as a separate incident control centre so as not to interrupt the day-to-day management of the port."

CROP

After receiving State Government approval in May, the PPA is set to deliver a \$120m Channel Risk and Optimisation Project (CROP), which would reduce the risk of an obstruction in the Port of Port Hedland shipping channel and allow users to further optimise tonnages on their vessels. The two-year project involves the creation of a new emergency passing lane, extension of a deep water refuge zone, and use of existing deeper depths along the tidally constrained 42km channel.

The aim is to optimise the use of the channel for the benefit of port users, with an extension to sailing windows, creating larger separations between departing vessels in a convoy, or potentially allowing an additional vessel to depart on the tidal window.

"The CROP will deepen the refuge zone so it can cater for the larger-sized vessels even during low tide," Mr Johnston said.

"It will also create a passing lane so fast moving ships can overtake the slow vessels, again with sufficient depths, which will help drive efficiency."

PPA said it would finalise planning and seek environmental approvals, with Expressions of Interest (EOI) expected to be invited from industry in 2017.



Bulk carriers and an LNG tanker at the Port of Dampier.

Dredging and associated industries were invited to an information briefing held on 25 August to learn more about the project requirements and timeframes for delivery.

A tender for Stage 1 of the dredging component of the project is expected to be advertised during the first half of 2017.

The CROP will be delivered concurrently with annual maintenance dredging at Port Hedland to achieve savings in dredging mobilisation and execution costs and is expected to be completed by the end of 2018.

Channel Marker Replacement

The PPA also plans to replace 35 offshore and three landside channel markers that are used by vessels as navigational aids. The replacements would guarantee the structural integrity and reliability of the markers for at least the next 25 years and ensure operations and vessel traffic were not interrupted.

"We are going to replace very old and ailing infrastructure to make sure we have consistent quality that will last for the next 25-50 years," Mr Johnston said.

The initial phase of the project was completed in 2014 with the replacement of offshore channel marker topsides, with second phase works to include the

replacement of offshore navigation aid piles and replacement of land based navigational aids.

Tenders for the channel marker replacements are anticipated to be advertised in early 2017.

IN 2015, THE VALUE OF OIL AND GAS AND IRON ORE EXPORTS THROUGH PPA PORTS WERE \$17.8 BILLION AND \$49.8 BILLION RESPECTIVELY.

West Pilbara ports

Located in the west Pilbara region, the Port of Dampier is the world's second largest bulk export port with an average throughput of 175mt of cargo each year.

As with Port Hedland, Dampier ships mostly iron ore from Pilbara mines, making up 82.65 per cent of PPA exports in FY16. Its other two main commodities are LNG (12.5 per cent) and salt (2 per cent).

LNG arrives from offshore gas fields via subsea pipelines to Woodside Energy's

Withnell Bay terminal at Dampier, and then piped down to southern WA for domestic use or export, primarily to Japan. Salt is shipped through the port to overseas markets from Rio Tinto's Dampier Salt operation.

West of Dampier and near the seaside town of Onslow is the Port of Ashburton, a multi-user port being built by Chevron to manage its LNG exports.

It was expected that second and third users may also utilise common use infrastructure that has the capacity to export up to 50mt of LNG, other hydrocarbons, heavy industry and general cargo; as well as contain supply base capability to service nearby offshore operations.

PPA has been managing the traffic out of Ashburton since July 2016, with the whole port expected to be handed over to the authority in mid-2017 when Chevron pumps first gas from its Wheatstone LNG project at Ashburton North.

Greenfields

There are three greenfields ports flagged for future development along the northern coast of the Pilbara. The Port of Cape Preston East, about 70km south west of Karratha, will be developed as a multi-user port to facilitate iron ore exports and other bulk minerals.

Iron ore miner BC Iron has flagged the development of the port for its Buckland iron ore project which would utilise the facility for throughput of up to 20mtpa.

Development applications are being progressed to construct and operate onshore and marine facilities for an initial term of 20 years.

30km east of Karratha is the proposed deep water multi-user Port of Anketell, planned as an iron ore export facility and industrial area with an ultimate throughput capacity of more than 350mtpa.

It would also have the provision for the export of other bulk commodities and import of fuel and general cargo.

100km east of Dampier is the proposed site of the Port of Balla Balla, which has been planned as another multi-user port for iron ore and other bulk material exports.

The facility would comprise of 71,400 hectares (ha) of port waters, a 19,700ha seabed and 5300ha for the port precinct.



The majority of Hunter Valley coal producers utilise the Port Waratah Coal Services terminals.

All images: PWCS.

Celebrating 40 years

The coal mining business in NSW is booming. With renewed demand and a spike in prices, an expansion of Newcastle’s hallmark Port Waratah Coal Services couldn’t come sooner.

ELIZABETH FABRI

PORT Waratah Coal Services (PWCS) has been a crucial player in the NSW coal industry for decades.

Acting as the final link in the supply chain before coal is shipped off for export, in 2016 the company reached a significant milestone; its 40 year anniversary.

Celebrated in October, the anniversary prompted existing and former employees, industry peers and local residents to reflect on PWCS’s history and its journey ahead as global coal demand rose.

Since 1976, the company received, stockpiled, blended and loaded coal for export through the Port of Newcastle, with an initial throughput capacity of 16mtpa via its first terminal, Carrington.

Established at a time when the Basin Coal Loader was still operational, Carrington expanded to its present capacity of 25mtpa in 1982, when Kooragang Coal Loader (KCL) first began operation.

In 1990, PWCS bought out Kooragang to bolster the company’s combined loading capacity to 46mtpa, and by 1996, after a step-by-step construction on a second berth, PWCS’ nominal capacity hit 66mtpa.

In 2013, following further expansions projects, PWCS’s combined capacity peaked to its current level of 145mtpa.



The new Carrington Coal Terminal shiploaders.

Today, both Kooragang and Carrington received coal from some of the world’s largest miners, including Rio Tinto, BHP Billiton, Anglo American, Glencore and Peabody.

Looking back on the company’s history, PWCS chief executive Hennie du Plooy said

the change of scenery across Newcastle was apparent.

“Who would have thought in 1976 that today, glittering large cruise ships would be docking not too far downstream from operating industrial terminals,” Mr du Plooy said.

“In our business we have navigated many changes over this time: expansion of both the Carrington and Kooragang Terminals was an ever-present activity from the early days to 2013 and included pioneering investment in larger equipment and automation.

“Delivering services to our customers, while also progressively updating facilities and systems to meet the ever higher expectations of our host communities has been an ongoing challenge and remains one which we relish today.”

Shiploader replacements

PWCS’s 40 year anniversary also coincided with the commissioning of two new shiploaders at Carrington.

After loading more than 300mt of coal over the last four decades, Carrington’s three existing shiploaders had reached the end of their lifespan and needed to be replaced.

“The existing shiploaders date from when the terminal was originally built forty years ago,” Mr du Plooy said earlier in the year.

“They have been maintained, updated and improved over time but it has now become more cost effective to replace them with new machines.”

(continued on page 25)

Increased berth productivity

AS Australia's leading provider of safe, reliable and round-the-clock towage services, Svitzer plays a vital role in the functioning of the nation's port infrastructure and wider national economy.

With a modern fleet of more than 70 tugs manned by highly trained professional crews, Svitzer is ready to keep customers' vessels moving without delay, irrespective of the time or day.

Nationwide, Svitzer operates in 35 ports and terminals.

The company is also equipped with the expertise and capabilities to respond quickly to maritime incidents that have the potential to devastate the natural environment or disrupt port operations.

While the company services multiple sectors, the Australian resources industry is one of Svitzer's most important customers.

"Two out of the five tug jobs we do involve servicing ships loaded with coal, iron ore and other resources destined for international markets," Svitzer Harbour Towage East region general manager James Mather said.

"In particular, we are the sole towage provider in two of the world's largest coal export terminals, Abbot Point in Queensland and of course, the Port of Newcastle.

"This year alone our Newcastle fleet of nine tugs and five lines boats will assist some 1200 ships berth safely and then tow them back out to sea fully loaded."

Almost 60 per cent of Port of Newcastle's vessel calls are serviced by PWCS.

"What makes Newcastle different from most other ports is that it's one of the few where our tugs have to perform a highly skilled manoeuvre known as headline towage



Svitzer has provided safety and support at sea since 1833.

in order to navigate the sharp twists and turns of the access channel," Mr Mather said.

"Specifically, one tug needs to connect

itself close to and in front of the vessel being towed."

Together with terminal operators like

PWCS, Svitzer is cementing Australia's reputation as one of the world's most reliable suppliers of mineral and energy commodities.



Operating in 35 ports and terminals with a modern fleet of more than 70 tugs manned by highly skilled professional crews, Svitzer is helping to facilitate the safe, efficient movement of trade into and out of Australia. We are also always on standby to respond quickly to accidents that have the potential to disrupt port operations or devastate the natural environment.

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(continued from page 23)

"TODAY, BOTH KOORAGANG AND CARRINGTON RECEIVE COAL FROM SOME OF THE WORLD'S LARGEST MINERS, INCLUDING RIO TINTO, BHP BILLITON, ANGLO AMERICAN, GLENCORE AND PEABODY."

The Kooragang coal export terminal has a capacity of 120 million tonnes per annum.

Manufactured in China, the \$60 million shiploaders arrived safely at the Newcastle Harbour on 24 July and were commissioned at the end of 2016.

While similar in design to the original loaders, the two machines incorporated pioneering provisions which integrated operational and safety learnings, and eliminated impact to the environment.

"The fully enclosed booms and soft flow chutes which can retract for maintenance are again setting standards which keep Port Waratah at the forefront of our industry," Mr du Plooy said.

"IN OUR BUSINESS WE HAVE NAVIGATED MANY CHANGES OVER THIS TIME: EXPANSION OF BOTH THE CARRINGTON AND KOORAGANG TERMINALS WAS AN EVER-PRESENT ACTIVITY FROM THE EARLY DAYS TO 2013."

Terminal 4 progress

The Terminal 4 expansion plan has been in the pipeline for some time, but sluggish coal prices over the last few years and lack of government support had put progress on hold.

In December 2015, the proposed Terminal 4 facility was approved by the Commonwealth Government, propelling a sense confidence into the Hunter Valley coal region.

"The Commonwealth Government approval follows the earlier approval of the Terminal 4 facility, in October 2015, by the New South Wales Planning Assessment



Five vessels at berth at the Kooragang terminal.

Commission," PWCS chair Penny Winn said at the time.

"Whilst the current environment is significantly different from that in which our original application for Terminal 4 was lodged in 2010 and the need for extra coal export capacity is currently not immediate, the planning certainty afforded by the approval of Terminal 4 will allow Port Waratah and the Hunter Valley export coal industry to deliver further capacity when required."

Positive news continued in the second half of 2016 as coal prices and demand continued to rise; one of PWCS's provisions for its Terminal 4 development to proceed.

While PWCS had not yet given the green light for construction, once developed Terminal 4 would have a throughput capacity of 70mtpa, which it would achieve through a number of instalments based on demand.

Recent figures

Export figures remained fairly stable throughout the 2016 calendar year, with Japan the clear frontrunner as the largest export destination for coal shipments.

In October, Japan accounted for 50.36 per cent of total shipments, while Taiwan came in second with 14.30 per cent.

China came a close third with a reported 14.29 per cent, followed by South Korea which accounted for 10.67 per cent.

In the same month, Carrington and Kooragang collectively received 9.2mt by rail and road, updating its year to date receival figure to 90.59mt.

The Carrington and Kooragang sites loaded a total of 8.6mt for October, raising the year to date level to 89.75mt.

In November, The Hunter Valley Coal Chain reported a nine-week high on the number of ships queuing to load coal from the

terminals, with a record 27 ships in the week ending 13 November.

By 27 November, month-to-date shiploading at PWCS sat at 8.428mt which translated to an annualised rate of 114.2mt.

Community support

On top of supporting local jobs and suppliers, PWCS contributed \$750,000 each year to the communities bordering its operations.

In August 2015, the company received the 2015 Hunter Business Chamber award for 'Contribution to the Region', recognising the positive impact made by Port Waratah through its wide range of activities.

In 2016, the company supported a mix of campaigns, including teaming up with locals to clean up Throsby Creek, and contributing to the local Men's Shed, lifesaving club, and schools.

Furthermore, the company engaged with community stakeholders through its 'Storylines' project, featuring stories and statistics from 30 community partners.

"We have aimed to showcase the breadth and depth of work done by a diverse range of people and organisations," Mr du Plooy said.

"Storylines demonstrates the difference community-based projects can make to individuals, families and communities.

"Our key objective is to demonstrate the benefits that flow to the community from having a large operating business that shows positive behaviour."

PWCS's environmental program also looked out for the needs of locals, directing its focus to air quality, noise, water, energy and ecology.

In April 2016, the company undertook its third biannual community attitude survey which surveyed 500 people across the region to better understand issues residents encountered.

Results indicated 54.8 per cent of respondents did not have any concerns with PWCS's activities, a 29.8 per cent increase from 2013.



All Images: BC Iron.

Desert shift

After falling iron ore prices hit BC Iron's balance sheet through 2014-15, the company exited its Nullagine operation in 2016 in search of new opportunities, most notably to progress its Buckland iron ore project in the West Pilbara.

CAMERON DRUMMOND

A disastrous plunge in iron ore prices to \$US38 per tonne by the end of 2015 forced WA miner BC Iron (BCI) to mothball its Nullagine Joint Venture (NJV) and sell off its share of the project to JV partner Fortescue Metals Group (FMG).

2016 has been a transition period for BCI, as it moved from operations at Nullagine to reducing operational costs, restructuring debt, reshuffling management and focusing on the development of its Buckland iron ore project in the West Pilbara.

Nullagine

The NJV was established in 2009 as a 50-50 partnership between FMG and BCI, with BCI becoming the first mining junior to utilise both third party rail and port infrastructure owned by a major company in the Pilbara in early 2011.

Nullagine was highly successful for the company, which led BCI to acquire a further 25 per cent stake in the project from FMG for \$190 million in late 2012, launching the company into the ASX300.

The NJV produced well during 2013 and 2014, with BCI earning increased profits from as iron ore prices



The Iron Valley project produced record pre-tax earnings in the September quarter.

soared, delivering strong dividends to shareholders.

The company's third consecutive full-year fully franked dividend in 2014 was 32c per share at a payout ratio of 54 per cent on net profit after tax.

The mining junior had since struggled, posting \$240m in losses as the iron ore

price fell from a high of \$US155 per tonne in early 2013, to below \$US40/t late into 2015, prompting BCI to suspend operations at the mine.

Former BCI managing director Morgan Ball said the decision regrettably impacted on its employees.

"Unfortunately, we've seen the price go

into the high 30s, the board has formed the view there's a reasonable chance it could stay around there for a while and we aren't prepared to gamble with shareholders funds," Mr Ball said.

"It's pretty tough. We're in a cyclical industry, in the bottom of every cycle, everyone says this is the toughest one they can remember and we're all saying that again."

WHEN BCI ACQUIRED IOH IN AUGUST 2014 FOR \$256M, IT INCLUDED THE IRON VALLEY IRON ORE PROJECT IN THE CENTRAL PILBARA.

Changes

Mr Ball was replaced as managing director by former Iron Ore Holdings' (IOH) boss Alwyn Vorster in May last year after the board considered the future direction of the company.

BCI chairman Tony Kiernan said Mr Vorster was uniquely placed to head the company's focus on its West Pilbara assets.

(continued on page 29)

Accessing all areas

WA-BASED Castle Drilling Company has found a niche in Reverse Circulation (RC) drilling through difficult terrain.

In operation since February 2008, the company is committed to delivering high-quality samples to enable clients to accurately estimate quality and quantity of ore reserves.

Where larger drills require significant earthworks for access and pads, Castle Drilling's three RC capable Atlas Copco ROC L8 drills are able to easily gain access and drill a wide variety of angles and dips with minimal clearing.

"Our operations have included Reverse Circulation Grade Control (RCGC); RC exploration; blast hole drilling; and civil operations comprising conventional DTH hammer, roller bit (tri-cone) and fixed cutter (PCD) drilling," Castle Drilling managing director Matt Skeet said.

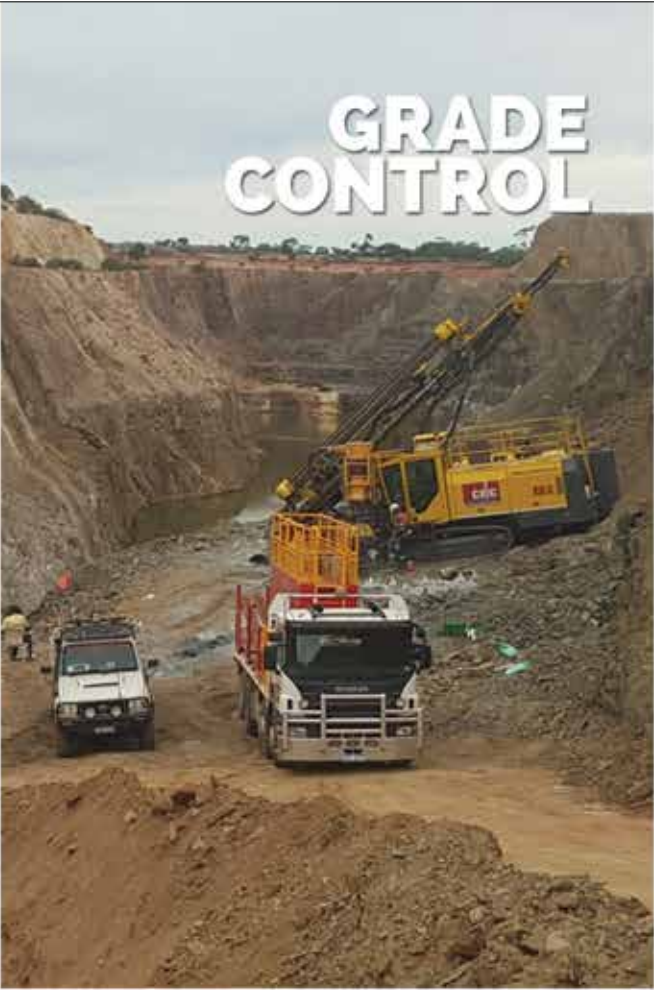
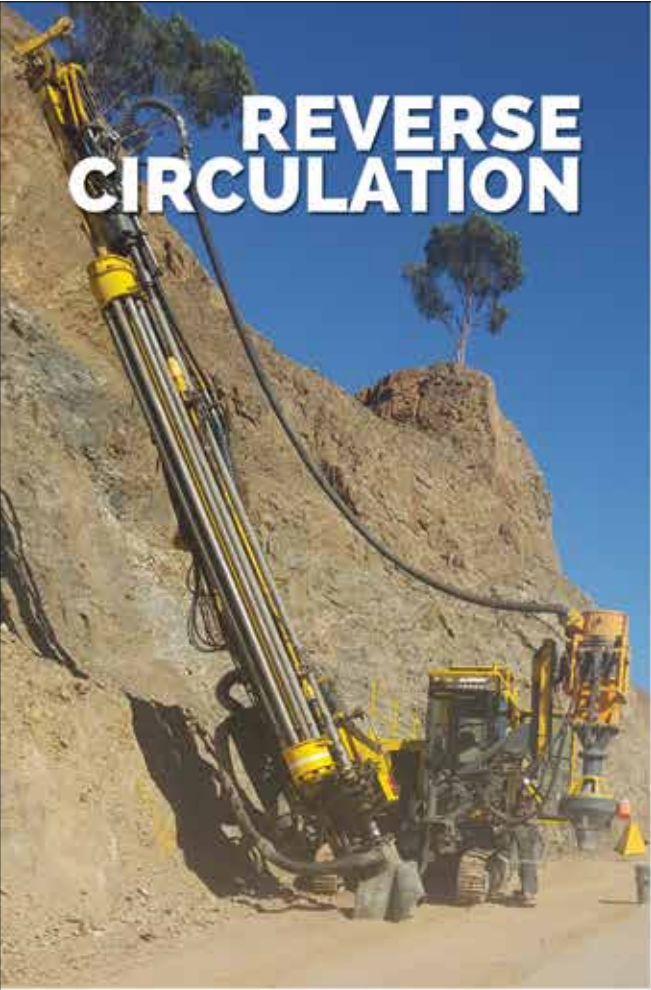
"Doing so safely and productively has seen the company retain long term clients and forge excellent relationships within the industry.

"Our competent, valued staff are highly trained and enjoy their jobs and understand what is expected of them, which has been integral to our success and commitment to client satisfaction."

In the short term the company is servicing several clients in the East Pilbara region, and is constantly seeking other suitable contracts across Australia for the medium and longer term.



Castle Drilling gains access to difficult areas with minimal environmental impact.



Specialising in difficult terrain drilling – focused on delivering quality RC sample, safely

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castledrill.com



BC Iron sold off its Nullagine project last year, but will still receive royalties from any future operation of the mine.

As BCI struggled with care and maintenance costs at Nullagine, FMG came knocking in October this year and bought out the company's 75 per cent stake for a token \$1.

Mr Vorster said the company would have continued exposure to future Nullagine operations via an ongoing royalty payment on all future ore mined.

"Importantly, the sale will also reduce exposure for BCI by eliminating its rehabilitation liability, as well as monthly costs of \$150,000 to \$200,000 associated with holding the NJV interest," Mr Vorster said.

"Management will also be in a position to direct additional time and resources towards maximising the value of our Buckland project, and potentially securing attractive new project opportunities."

Iron Valley

When BCI acquired IOH in August 2014 for \$256m, it included the Iron Valley iron ore project in the Central Pilbara.

The Iron Valley mine has ore reserves

of 123.2 million tonnes (mt) at 58.8 per cent Fe and is 100 per cent operated by Mineral Resources (MIN) under an ore purchase agreement that generates low-risk royalty earnings for BCI.

MIN shipped 6.5m wet metric tonnes (wmt) of Iron Valley product during FY16 which generated revenue for BCI of \$39.9m and earnings before interest, tax, depreciation and amortisation (EBITDA) of \$10.2m.

For the September quarter, Iron Valley posted a second consecutive quarterly record EBITDA of \$4.7m from 2.1 million wmt.

BCI said the positive results stemmed from strong performance by MIN and resilient iron ore prices.

MIN had also implemented plant modifications at the project during the quarter and dewatering infrastructure installation had proceeded as planned in preparation for below water table mining.

Mr Kiernan said the company was on track to receive an EBITDA contribution of between \$6m and \$16m from the Iron Valley in FY17, and was likely to track

toward the upper part of that range on the back of stronger iron ore prices.

Buckland

Buckland is a mine-to-port iron ore project in the West Pilbara region, comprising a proposed 10 million tonnes per annum (mtpa) to 20mtpa mine at Bungaroo South, a private haul road, and transshipment port at Cape Preston East.

As at 30 June the project had ore reserves of 134.3mt at 57.6 per cent Fe, a completed feasibility study, and all primary tenure and approvals secured for mine, road and port.

\$3m out of a \$25m capital raising was flagged to be used toward the Buckland project.

BCI said it was on schedule to begin construction in the second quarter of 2017 and would continue to pursue a number of development strategies for Buckland to increase the utilisation of the Cape Preston East port and achieve a more competitive cost structure.

Financials

Despite revenue of \$151m for FY16, BC Iron posted a net loss after tax of \$80m with an underlying loss of \$9m, spurring the company to enact cost reduction measures across its operations.

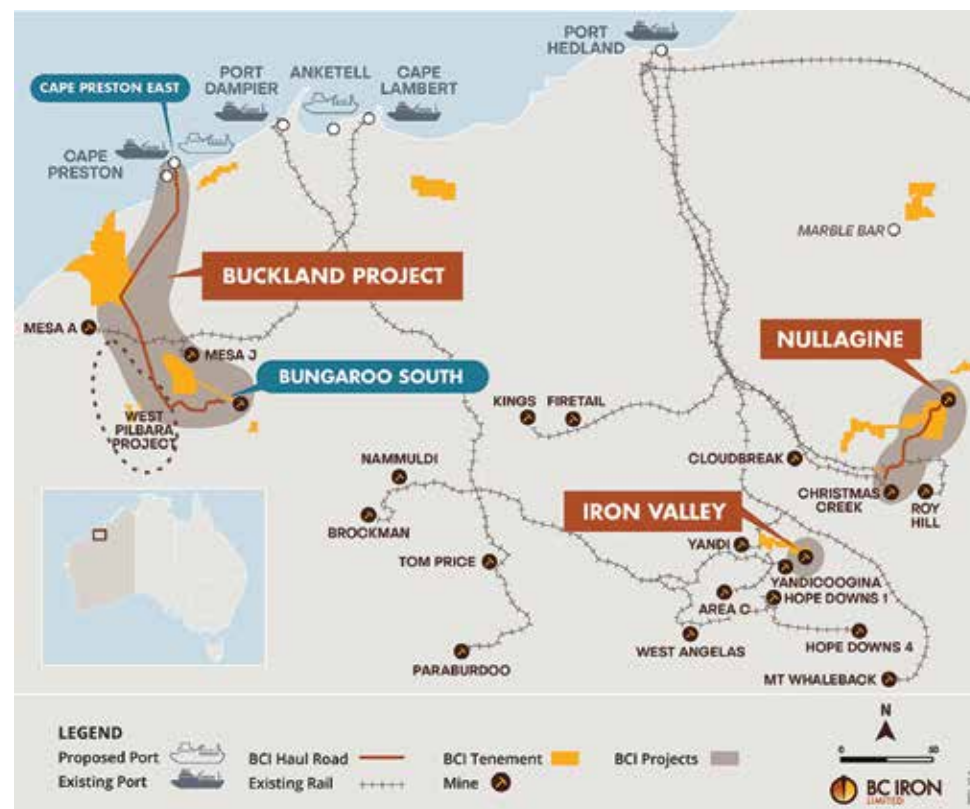
During the September 2016 quarter cash flows were neutral, with cash on hand remaining at \$9.5m, resulting from positive earnings from Iron Valley offsetting operating costs and government royalty repayments.

Net cash improved as the company's royalty repayments were reduced to \$5.24m, the sum of which was to be repaid over the next four quarters in equal instalments.

BCI expected its cash balance by the end of 2016 to be significantly higher due to a completed capital raising of \$25.5m, \$3m of which was to be put toward the development of its Buckland project, with the remainder to be used for potentially securing a new non-iron ore project and strengthening the company's balance sheet.



The company expected to have better cash balances during 2017.



A number of development strategies are on the cards for the Buckland project, including the utilisation of the Cape Preston East port.



Rio will process the Marra Mamba ore it extracts from the Silvergrass mine and add it to the company's premium saleable product.

Premium blend

The development of the Silvergrass iron ore project will be instrumental in maintaining Rio Tinto's Pilbara blend.

CAMERON DRUMMOND

AN additional 10 million tonnes per annum (mtpa) iron ore capacity is set to be added to Rio Tinto's portfolio after the development of its Silvergrass mine in the WA Pilbara is completed.

Silvergrass is a satellite deposit adjacent to Rio Tinto's Nammuldi iron ore mine and is part of the Greater Nammuldi precinct, about 70 kilometres north west of Tom Price.

Ore from the Silvergrass mining operations is high-quality, low-phosphorus Marra Mamba ore that is treated at the Greater Nammuldi processing plant and blended into Rio Tinto's premium Pilbara saleable product.

In August 2016, Rio committed \$US338 million to finish the development of the brownfields project.

Silvergrass was originally going to cost Rio Tinto upwards of \$US1 billion; however the decision was made to split the project into three stages under the Nammuldi Incremental Tonnes (NIT) project.

The first two stages, NIT1 and NIT2 were for the construction of haulage roads and related infrastructure, with NRW Holdings completing the stages through the award of a \$140m contract in July 2015.

NIT1, (with a 5mtpa capacity) commenced production in Q4 of 2015 and the second phase, NIT2, added another 5mtpa capacity and came into production in Q4 2016.

The final phase of the project – the development of the Silvergrass mine – gained WA Government approval in September 2016.



The Greater Nammuldi project, including the Silvergrass mine is split into a three-phase project.

"This project will create about 500 jobs during construction and an additional 25 operational positions once the expanded mine is fully operational," State Development minister Bill Marmion said.

"Expanding production from Silvergrass will allow Rio Tinto to sustain the quality of its Pilbara blend product and maintain current production levels.

"[The project] provides a significant boost to the Western Australian resources sector and shows our State continues to be an attractive place for large-scale investment."

With approvals in place, Rio wasted no

time to progress mine development; later that month WA mining services company RCR Tomlinson (RCR) was awarded a \$120m contract to build processing infrastructure.

RCR will provide the engineering, procurement and construction of a primary crusher, an overland conveyor system, and 33kW power line at the Silvergrass East mine.

The road haulage used in the NIT projects would be replaced by a 9km conveyor to connect the Silvergrass mining area to the existing processing facilities at Nammuldi.

The NIT is expected to take annual mine capacity from 10mt to 20mt by Q4 2017, gearing into full production in 2018; by that time, Rio's total Pilbara iron ore production is anticipated to be about 350mtpa.

"OUR BALANCE SHEET STRENGTH AND TIER 1 ASSETS PROVIDE A STABLE FOUNDATION IN THESE UNCERTAIN AND VOLATILE MARKETS, WHICH IS FUNDAMENTAL IN A CYCLICAL AND CAPITAL-INTENSIVE INDUSTRY."

Rio expected the expansion of the Silvergrass mine would offer attractive returns, with a projected internal rate of return in excess of 100 per cent of investment, with a payback time of less than three years.

"We are committed to disciplined capital allocation and the approval of the final phase of the Silvergrass development, which is one of the most value-accretive projects across the mining industry, delivering high-quality, low-cost growth that will underpin future returns to shareholders," Rio Tinto chief executive Jean-Sebastien Jacques said.

(continued on page 33)

Experience to tackle challenges

DELIVERING a successful drilling project comes down to two key factors: experience and willingness to understand a project's needs.

A driller's knowledge and experience are important in ensuring the most appropriate drilling method is used; and they need to have the flexibility to be able to adapt when conditions change.

Bunbury Drilling Company (BDC) has more than 60 years experience drilling in a number of industries, including mining.

For more than a decade BDC has been able to deliver every project it has been involved in safely, on time, and within budget.

BDC has worked continuously in the Pilbara since 2011, including on Rio Tinto's Silvergrass mine across the last few years.

BDC's Silvergrass projects have included 12 inch production bores and related monitoring bores, all completed to depth and specification.

The company's extensive experience enables it to take on the challenges of various projects across WA.

BDC general manager Dale McLeod said BDC works closely with clients on every project undertaken to develop the best-suited and lowest-risk drilling methodology.

"We have found that starting with the correct focus sets any project up for success, and having the experience to work through or around unexpected challenges keeps it on track," Mr McLeod said.

"By maintaining open and effective communications, BDC gives clients the confidence the project's needs are understood and will be met.

"It also ensures our team is able to deliver every project safely, to depth, on time and within budget."

Mr McLeod said that keeping on top of the changing requirements of individual



BDC has worked tirelessly to provide best-practice services to Rio Tinto's Silvergrass mine.

boreholes while staying within the project scope remained a BDC specialty.

"The Silvergrass project area has presented us with some diverse drilling conditions and during each phase of the project over the past few years we have encountered some

unexpected geological sequences which have been dealt with effectively," he said.

"Each discrete scope has been very successful and delivered the desired outcomes to stakeholders.

"Our operations team have the knowledge

and skills to make the right decisions in the field, utilising the best practices that set the benchmark in the industry.

"Our 60 years of experience has given us the knowledge and skills to deliver projects safely – experience really does count."



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Ore from Silvergrass will be transported by a 9km conveyor for processing.

(continued from page 31)

“The additional low-phosphorus tonnes that Silvergrass delivers will sustain the long-term viability of our Pilbara blend, ensuring continued premium pricing, whilst also lowering our operating costs through infrastructure improvements.”

**SILVERGRASS WAS
ORIGINALLY GOING TO
COST RIO TINTO UPWARDS
OF \$US1 BILLION; HOWEVER
THE DECISION WAS MADE
TO SPLIT THE PROJECT INTO
THREE STAGES UNDER THE
NAMMULDI INCREMENTAL
TONNES (NIT) PROJECT.**

Results

Pilbara Production

Rio shipped 80.9mt of iron ore for Q3 2016 across its 15 Pilbara operations, down 5 per cent from the corresponding 2015 period due to port and rail maintenance during the quarter.

However production did increase for the quarter year-on-year, up 2 per cent to 83.2mt with a nine month total of 239.9mt, up 7 per cent compared to 2015 figures.

Mr Jacques said the company had delivered a strong quarterly production, underpinned by improving operational performance across its Tier 1 portfolio.

“Output from our iron ore and bauxite assets reflects the drive for productivity and operational excellence [and] with a continued focus on value, we will seek further productivity improvements across the business,” Mr Jacques said.

Financials

At the 6 months to June 2016, Rio generated net cash from operating activities of \$US3.2 billion with underlying earnings of \$1.6bn – 47 per cent lower than a year ago, against a backdrop of continued volatility and lower commodity prices.

Cash cost improvements, lower energy costs and positive currency and other movements totalling \$US0.5 billion partly offset the \$US1.9bn (post-tax) impact of lower prices.

“We focus on delivering value to shareholders; this focus is unrelenting, with further cost reductions achieved in the half and EBITDA margins of 33 per cent [as well as] strong operating cash flows, tight control over capital expenditure and progress on divestments, the balance sheet remains robust,” Mr Jacques said.

“Our balance sheet strength and Tier 1 assets provide a stable foundation in these uncertain and volatile markets, which is fundamental in a cyclical and capital-intensive industry.

“We will generate cash at every opportunity, which we will then allocate in a disciplined way to deliver returns to shareholders, while also investing in compelling growth.”

Capital expenditure was expected to be around \$US5bn in 2017 and increase to \$US5.5bn in 2018.



Rio Tinto anticipated its capex would amount to \$5bn this year.



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"WE'RE IN A FEASIBILITY STUDY ON STEEPENING OUR PIT WALLS, THE PRIZE FOR WHICH MAY BE IN THE ORDER OF 200,000OZ TO 300,000OZ."

The KCGM Super Pit.

All Images: Newmont Mining.

Life extension

THE KCGM Super Pit has delivered nearly 20 million ounces of gold in its 28 year history. By 2015, KCGM was producing about 800,000oz of gold per year, roughly eight per cent of Australia's gold output, the operation continues to explore potential underground resources to extend the life of both its open pit and underground operations.

CAMERON DRUMMOND

OWNED and operated by global gold mining heavyweights Barrick Gold and Newmont Mining, the Kalgoorlie Super Pit is one of the most recognisable gold operations in the Southern Hemisphere and largely considered Australia's most important gold mine.

The Super Pit has a long grand history for the Goldfields region, an area built on gold mining since the 19th century gold rushes.

In June 1893, Paddy Hannan, Thomas Flanagan and Dan Shea found nearly 100 ounces of gold in the dry red soil of what is now Kalgoorlie-Boulder.

This sparked a gold rush and the discovery of the area known as the Golden Mile, one of the richest gold deposits in the world.

By 1903 there were 49 operating mines, 100 headframes and more than 3000 kilometres of underground workings on the Golden Mile.

Small mining operations remained dotted in the Golden Mile region until the 1980s, when infamous WA businessman Alan Bond began buying up all the individual leases in efforts to create one big company and one giant pit.

Bond's company failed, but 50-50 joint venture partners Normandy Australia



Exploration work at the Hidden Secret orebody is continuing through 2017.

and Homestake Gold of Australia did not; in 1989 the entire area was combined and Kalgoorlie Consolidated Gold Mines was created to manage the assets and operations of Normandy and Homestake.

Existing smaller pits were amalgamated into the Fimiston open pit – originally nicknamed the Big Pit and now known all over the globe as the Super Pit.

It wasn't until 2001 that interest in operating the Super Pit sparked a bidding war, when Normandy attracted interest from South African gold miner AngloGold and US-based Newmont.

Newmont came out on top, securing the takeover at \$2.04 per share which valued Normandy at \$4.56 billion.

Canadian gold heavyweight Barrick also snapped up Homestake for \$US2.2

billion, making it the second largest gold miner in the world at the time.

Today's ownership

Newmont and Barrick operate the mine through their JV, Kalgoorlie Consolidated Gold Mines (KCGM).

April 2015 saw Barrick hand over full operational control of KCGM to Newmont in an effort to streamline the business under one code.

KCGM managing director Ian Butler said the 50-50 ownership structure would remain the same and the adjustment was purely to improve decision making and enhance efficiency.

In late November 2016, Minjar Gold – a subsidiary of Chinese property developer Shandong Tyan Home – bid \$1.35 billion for Barrick's 50 per cent stake in the Super Pit.

The move was welcomed by Barrick Gold as it was markedly higher than the next best previous offer of \$900m, and would help reach its target of paying down \$US2 billion worth of debt during FY17.

However the price of gold fell sharply in the weeks after Donald Trump's shock election win, which translated to investor unrest just as Minjar was looking for financing options; this caused the company to miss its Friday 8 December deadline to secure a bridging loan for the deal.



The Super Pit employs about 550 people.

Recent Activities

The Fimiston open pit is currently 3.5km long, 1.5km wide and more than 600m deep; and will be 700m deep by the end of its projected mine life.

After open pit mining ends, KCGM will begin processing stockpiles of low grade ore until 2029.

With the mining of the Mt Charlotte underground mine due to finish in 2018 and the Fimiston open pit scheduled to end in 2019, KCGM started undertaking a number of surface drilling programs early last year to explore potential underground resources and extend the life of both its open pit and underground operations.

The company identified the Hidden Secret underground ore body in 2014, which has an estimated 665,000t of ore at

3.56 grams per tonne (g/t) of gold equating to 76,000oz.

In May 2015, 11 new positions were created at Mt Charlotte after approval was given for the Hidden Secret project, which extended its mine life into 2018.

"The new drilling project will investigate areas below the old workings, effectively picking up where historical mining left off," Mr Butler said.

Speaking at the WA Goldfields region's What's Down the Track economic forum in October 2015 Mr Butler said KCGM would have six drill rigs on the surface and underground running day and night at the Hidden Secret resource.

"We are increasing our focus on near-mine underground exploration in order to explore the possibility of expanding the Golden Mile's potential for additional,



Mining at the Fimiston open pit is scheduled to end in 2019.

profitable production."

And while KCGM was expected to transition from open pit to underground mining, Mr Butler said further work around the pit would continue that year.

"We've got pre-feasibility happening on additional cutbacks on the Super Pit itself, and we're also in scoping studies around Mt Charlotte," Mr Butler said.

"We're in a feasibility study on steepening our pit walls, the prize for which may be in the order of 200,000oz to 300,000 ounces."

In March 2016, the company ramped up its exploration efforts to extend life of mine with a new surface drilling project above Mt Charlotte, at the northern end of the Glory Hole and within the core yard.

"We are focussing on identifying near-mine underground resources, with

this drilling project investigating areas directly adjacent to the current Mt Charlotte operations," Mr Butler said.

Results

Gold ounces produced increased 7 per cent to 95,000oz during the September quarter compared the same corresponding period in 2015.

All-in sustaining costs (AISC) per ounce decreased 18 per cent from \$US872/oz in the 2015 September quarter down to \$US714/oz in the same period in 2016 due to a targeted reduction of operating costs.

In that same quarter, KCGM produced 95,000oz of gold for an all in sustaining cost (AISC) of \$US714/oz, up from 89,000oz produced at an ASIC of \$US872/oz from the corresponding period in 2015.

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The Andy Well gold project north of Meekatharra, WA.

Changing gears

With two commissioned gold mines and its new Deflector project about to hit full production early this year, Doray’s value is expected to increase as the current financial year hits the halfway point.

CAMERON DRUMMOND

SPEAKING at Doray Minerals’ annual general meeting in November, former managing director Allan Kelly said he believed the company was currently undervalued against most ASX and TSX peers, as both of its WA gold mining operations were currently transitioning through different stages of mine life.

The company share price had fallen from the \$1 mark at the end of the 2016 financial year down to 50 cents by the end of November.

Doray came into existence in 2010 after raising \$4.6 million to explore and develop its then Andy Well prospect, 45km north of Meekatharra, hitting a major gold find in its first drilling program.

It took just three years to ramp up the mine to full production, which produced 76,785oz in its first 10 months of operation to the end of June 2014.

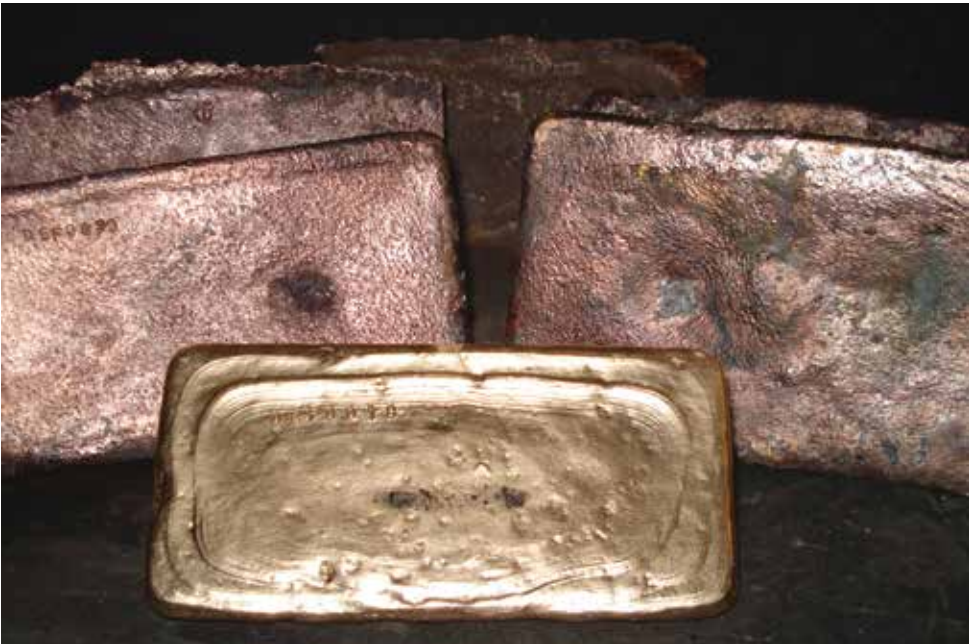
Doray’s second producing mine is the Deflector project, 160km east of Geraldton in WA’s Mid West, which was expected to reach nameplate capacity in early 2017.

Mine updates

Andy Well

84,135oz of gold was produced at the Andy Well project during FY16, delivered at the higher end of guidance of between 78,000oz and 85,000oz at, but marginally lower than FY15 when it produced an annual record of 88,736oz.

The mine recorded all in sustaining costs



First pour at the Deflector gold project.

(AISC) of \$1229/oz, revenue of \$131.1m, and a net profit of \$16.5m for FY16.

Mine production costs rose markedly by the FY17 September quarter to an AISC of \$1432/oz, as mining operations moved further underground with the cessation of open pit mining at the Suzie lode.

The mine’s gold haul was also down, producing 14,943oz, compared to 16,812oz at an AISC of \$1548/oz in the previous quarter.

Gold revenue from Andy Well was also down \$4.12m to \$24.51m, compared to June quarter sales of \$28.63m.

Mr Kelly noted that the mine still

continued to deliver strong operational performance as higher production costs and less revenue were put down to Andy Well’s transition from an open pit to an underground mining operation.

Recent diamond drilling had successfully realised high-grade gold mineralisation adjacent to the active mining areas within its Wilber and Judy lodes.

Mr Kelly said that drilling at Wilber had been particularly successful in further delineating a zone of high grade mineralisation below the current ore reserve, and would positively impact Andy Well in the mid-term.

“We are currently mining through a more variable and narrower part of the Wilber lode orebody, which is having a negative effect on the grade and cost profile at the present,” Mr Kelly said.

“These drilling results have highlighted that, below the current mine design, the tenor and consistency of mineralisation at Wilber appears to increase back towards that which was seen higher in the mine.

“The area directly below the current mine plan has the best potential for immediate extensions to the Wilber lode and we will continue to test this higher grade zone which remains open at depth.”

Deflector

November saw Doray Minerals officially open its Deflector gold mine, which it acquired as a part of its takeover of Mutiny Gold 18 months ago.

The Deflector copper-gold mine’s three separate lodes holds reserves of 1.78 million tonnes (mt) at 5.6g/t for the production of 322,000oz of gold and 16,000t of copper concentrate.

It is expected to produce 61,000oz of gold per year across its initial six-year mine life.

It took Doray just over a year to ramp up to commercial production, marking Deflector as the company’s second producing gold mine.

Total gold bullion produced to the end of the September quarter amounted to 3624oz, with an additional 5204oz in concentrate.

(continued on page 39)

Proud to support Doray Minerals



GR Engineering Services provides high quality project solutions to the Australian resources sector.

ASX-LISTED engineering contractor GR Engineering Services (GRES) provides fixed-price engineering, procurement and construction (EPC) and management services to the international mineral processing industry.

GRES recently completed the delivery of the Deflector project for WA gold miner Doray Minerals, marking it the second project the company had successfully

designed, constructed and commissioned for Doray after previously completing its Andy Well project.

The team at GRES was proud to have been selected by Doray to develop Deflector, showing a proven dedication to the project as it was commissioned and ramped up according to schedule.

Service delivery to the minerals sector is a highly competitive business and

GRES strives to ensure its clients receive high quality, value-for-money project outcomes.

GRES has successfully completed the engineering design and construction for a diverse range of mineral commodities and clients, delivering processing facilities and infrastructure in the gold, base metals, mineral sands, tin, tungsten and iron ore sectors.

The company also maintains a presence in the hydrocarbons industry via its wholly-owned subsidiary Upstream Production Solutions, which is a leading provider of operations, maintenance and well management services to the oil and gas industry in Australia.

Further information regarding GRES engineering solutions can be found at: www.gres.com.au.



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(continued from page 37)



Construction at the Deflector mine site, 160km east of Geraldton.

“Since we completed the takeover of Mutiny Gold, we have funded, permitted and built a new 480,000 tonne per annum processing plant, a new 150-person accommodation village and all other associated mine infrastructure, and commenced open pit mining at Deflector,” Mr Kelly said.

“Not only does Deflector reduce our single-mine risk, it nearly doubles our production, comes with a starting six-year mine life and materially reduces our company-wide AISC’s partly as a result of the by-product credits from the contained copper and silver,” Mr Kelly said.

In mid-November Doray announced that mining of the West and Central lodes of the Deflector pit were about 90 per cent complete as the company progressed from open pit to underground mining.

Mr Kelly said the company was pleased with the progress of the mining and production ramp-up and looked forward to the production of primary sulphide ore early this year.

“As predicted, gold and copper recoveries have increased markedly as we move into the transition ore and we are also seeing some very high-grade sulphide mineralisation being exposed with our first development drives,” Mr Kelly said.

“We are also excited to have commenced our first exploration drilling campaign since acquiring Deflector, targeting historic high-grade gold mineralisation at King Solomon/New Phoenix.”

A total of 200m of ore drive development down the Western and Central lodes had been completed by mid November in preparation for stopping in early 2017.

Gnaweeda

During the September quarter, Doray moved a step closer to the potential development of the Gnaweeda exploration project near Andy Well.

Drilling at Gnaweeda’s Turberry prospect resulted in a maiden resource of 4.6mt at



Doray was the recipient of Mining Prospect’s 2015 Australian Mine of the Year award.

1.8g/t for 266,000oz of gold.

The company said it would continue exploration drilling in the hope Gnaweeda would shape up as a potential operation using already established amenities at Andy Well.

“The maiden resource of 266,000oz at Turnberry is further proof of the exploration potential of Doray’s tenement holdings within trucking distance of Andy Well,” Mr Kelly said.

He added that the company aimed to be a position to make a decision on the project by the end of the financial year.

“We want to get to the point with Gnaweeda where we can justify increasing the size of the mill for a better throughput, giving us a better cost profile and add 30,000oz to 40,000ozpa of gold to our portfolio.”

Mr Kelly said adding Gnaweeda would increase ore throughput at Andy Well from 350,000tpa to around 750,000tpa and improve the overall efficiency of the project.

“Around March to June this year we aim to complete a mini feasibility study for adding a second ball mill, extra tanks and expansion of the tailings dam – at a ballpark cost of between \$8m and \$10m.”

A shock resignation

On 25 November Mr Kelly announced his resignation as managing director from the company due to personal reasons. Non-executive director Leigh Junk would assume the role while the board found a suitable replacement.

On whether the timing of his resignation could have spooked investors, Mr Kelly said that there is never a “good” time to resign.

“There have been comments, but when you’re an ASX listed company you’re either there or you’re not – you can’t say you’re thinking about it – you have to basically do it,” he said.

“I started Doray and I’ve been here a long time, but the company has grown to be bigger than just one or two people – the systems in place, the team and the board are there to keep the company running.”

Mr Kelly was the founding head of Doray Minerals for seven and a half years and managed the company through its listing to the ASX in 2010, when it was recognised as the most successful Initial Public Offering (IPO) of that year in terms of share price increase.

While at the helm Doray won a number of awards, most recently Australian Mining Journal’s *Australian Mine of the Year* in 2015.

Doray Minerals non-executive chairman Peter Lester said that in just over seven years Mr Kelly has taken the company from a concept as a greenfields explorer to an ASX300 gold producer.

“Allan built a company with a strong foundation for future growth and has left Doray in good hands,” Mr Lester said.

Outlook

\$24.9m was raised at the end of October for debt reduction, exploration and the development of additional ore sources at its Andy Well and Deflector mines.

Mr Kelly said the funds received would allow Doray to continue accelerating the Gnaweeda project towards a potential development decision in mid-2017.

“Along with providing us the security of a substantial working capital buffer during the ongoing Deflector ramp-up, this raising also provides a stronger balance sheet from which to negotiate a re-sculpting of our current debt repayment profile,” Mr Kelly said.

The company also said it would reduce debt to the tune of \$35m during FY17 and had flagged \$15.5m for exploration and growth.

“Our growth strategy in terms of exploration is to look for near mine projects of 100,000ozpa of production that could either come from discovery or acquisition, taking us up to a key milestone of 250,000oz of gold per year,” Mr Kelly said.

“We have been looking into projects similar in nature to Andy Well and Deflector, whether they are in Australia or offshore.

“We would like to be getting ourselves set - that once Deflector runs at nameplate capacity and Andy Well has turned a corner, we would like to be in a position to jump onto the right opportunity.”



Back from the brink

Perilya is preparing to rejuvenate Broken Hill's North Mine for the first time in more than 20 years.

CAMERON DRUMMOND

ZINC and lead prices had been amongst the best performing commodities of 2016, with zinc rising 70 per cent to \$US2637 per tonne (t) – a nine year high – leading up to Christmas, while lead jumped 33 per cent from \$US1650/t to \$US2195/t.

Higher zinc demand was driven by bolstered iron ore prices, as zinc is used as a coating on iron and steel to protect against corrosion, as well as the closure of two major mines, Century and Lisheen, which took 600,000tpa of mined ore out of the market.

Base metal miner Perilya has been biding its time over the last few years to further develop its Broken Hill zinc, lead and silver mine; and with 2016's resurgence of commodity markets it believes the time has come.

In May 2002, the company successfully acquired the Broken Hill mine for \$90 million following the insolvency of its previous owner Pasminco.

One of the largest base metal mines in the world, Broken Hill has produced more than 200 million tonnes of ore in its 132 year

mining history, dating back to 1885.

After the Global Financial Crisis bottomed out commodity markets at the end of 2008, Perilya's Broken Hill project went through a resizing which resulted in cost cutting, increased productivity and a 10 year mine life extension.

At that time – with zinc prices having dropped from a 2006 high of \$US4380/t down to \$US1120/t two years later – the Perilya board received a takeover offer from CBH Resources in a scrip-bid, which the company subsequently rejected after a superior offer was proposed.

That offer was from Shenzhen Zhongjin Lingnan Nonfermet (Zongjin Lingnan) – then China's third largest zinc producer – with Perilya accepting \$45.5m for a 50.1 per cent stake in the company.

Operating for more than 50 years, Shenzhen Stock Exchange-listed Zhongjin Lingnan's primary business activities included the mining and processing of lead, zinc and other non-ferrous metals.

On 19 December 2013 the company acquired all remaining shares in Perilya for \$269.3m and de-listed the company from the Australian Stock Exchange.

“ZINC AND LEAD PRICES HAD BEEN AMONGST THE BEST PERFORMING COMMODITIES OF 2016, WITH ZINC RISING 70 PER CENT TO \$US2637 PER TONNE – A NINE YEAR HIGH.”

North Mine

At Broken Hill, the nearby North Mine had been shut since 1993. In 2013 the mine was flagged for redevelopment; however 'a perfect storm' of problems that year stalled Perilya's decision to breathe life into the site.

"Australian dollar zinc and lead prices are now significantly lower than in 2008 at the time Perilya undertook a significant restructure and downsizing of its Broken Hill operations in order to survive the then rapid fall in metal prices and

difficult equity and debt markets," Perilya managing director Paul Arndt said at the time.

Volatile market conditions were not the only problem for Perilya; unanticipated geotechnical issues in older sections of the Broken Hill operations meant reduced access to planned production areas.

The economic environment did not improve enough for the redevelopment of the North Mine, and parent company Zhongjin Lingnan had to inject money to prop the company up after losing \$30m across its Broken Hill operations in 2015-16.

Most of Perilya's work at Broken Hill was remnant mining, and the poor quality of the ore extracted from its Southern Operations mine had been a major factor when the company was forced to axe nearly 100 jobs in early 2016.

"We recognise that the Southern Operations have consistently found it difficult to perform to our expectations, largely because it's a very old mine and we've been asking more and more from that mine," Mr Arndt said, as reported by the ABC.

New life

In March 2016, a preliminary plan to re-open the North Mine received board approval, subsequently gaining approvals by the NSW State Government in July that year.

The company had begun making a profit again at Broken Hill operations as a whole, after letting go about 20 per cent of its workforce.

In a turn of fortunes, those layoffs were flagged to be short-lived as the company looked to finally turn a corner at Broken Hill. It expected up to 150 employees would be required when the North Mine was in full operation.

Perilya said it was hopeful the mine would yield higher grades of ore than was currently being extracted at its southern extensions, scoping high-quality ore more than a kilometre below the surface, as well as remnant ore further up.

“PERILYA HAS BUILT NORTH MINE PRODUCTION INTO A 2017 MINE PLAN AND BY THE START OF THIS YEAR WOULD HAVE ABOUT 10 TO 20 PEOPLE WORKING AT THE OPERATION.”

The redevelopment of the mine would include the development of a decline, conducting an open pit feasibility study into the Flying Doctor deposit and exploration within a 10km radius of the concentrator.

Perilya general manager Bruce Byrne said work was underway to bring the North Mine operation up to current standards before digging could begin again, the ABC reported.



At peak production, the Broken Hill North Mine will employ about 150 personnel.

“There’s a lot of rehab work that needs to be done,” Mr Byrne said.

“Everything has to be brought up to new standards, even the ground support and the bolting that’s been done within the mine.

“The walls of the pit needed to be scaled and then protected from any

material that might fall down there [and] we’ve had specialists and contractors come in, literally on ropes, and they have draped that mesh down and bolted it for protection of the people below.”

Mr Byrne said it Perilya had built North Mine production into a 2017 mine plan and by the start of this year would

have about 10 to 20 people working at the operation.

“We’re going to start off slow, we’ll start off with one development crew, support crews and some maintenance people up there,” he said.

“It’ll take us a couple of years to get that mine operating in full capacity.”

The professional driller



Deepcore drilling provides services throughout Australia and South East Asia.

DEEPCORE Drilling was established in November 2005 after being awarded the diamond drilling contract at Stawell gold mine in Victoria.

Since then, Deepcore has worked hard to achieve sustainable growth through safe productivity, quality practices and customer satisfaction.

Collectively as a management team, the company possesses more than 175

years of experience within the drilling sector.

Deepcore Drilling has the range of capabilities and experience to meet the needs of customers, from short-hole production drilling through to more complex drilling programs that include holes in excess of 2000m with multiple intersections.

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production drilling with mobile plant; underground, directional, dewatering and geotechnical drilling services; and site specific rig development and surface exploration capabilities.

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Aeris achieved its lowest total recordable injury frequency rate to date in FY16 at the Tritton operations.



Aeris is constructing a new \$12 million ventilation shaft at the Tritton mine.

All images: Aeris.

A new direction

Just 12 months ago, Aeris Resources was in a pool of debt, and at the tail end of a three-year restructure which included a name change.

A year later, the dust has well and truly settled as Aeris celebrates record production, a 55 per cent debt reduction, and accelerated greenfields exploration.

ELIZABETH FABRI

IT has been a rocky road for Aeris — formerly Straits Resources — but the tide is turning as extension plans at Tritton and the development of the Murrawombie underground project boost morale.

As Australia's fifth largest independent copper producer by volume, the company operates NSW's flagship Tritton operations and boasts a portfolio of regional exploration tenements across the country.

In 2016 Aeris completed its company restructure, and reported record production for a third consecutive year with 30,425 tonnes of copper metal, exceeding FY16 guidance of 29,500t.

The company also invested in a new underground mining fleet at Tritton to lower production costs; kicked off underground development work at Murrawombie; continued debottlenecking work at its processing plant; and reported a 32 per cent increase in contained copper at its Tritton ore reserve.

Six months into FY17, Aeris is continuing to push forward, with September quarter copper production levels of 6380t and a slightly lower forecast for December.

"We expect production from the Tritton operations to be down slightly for the December quarter compared to the previous period," Aeris Resources executive chairman Andre Labuschagne said.

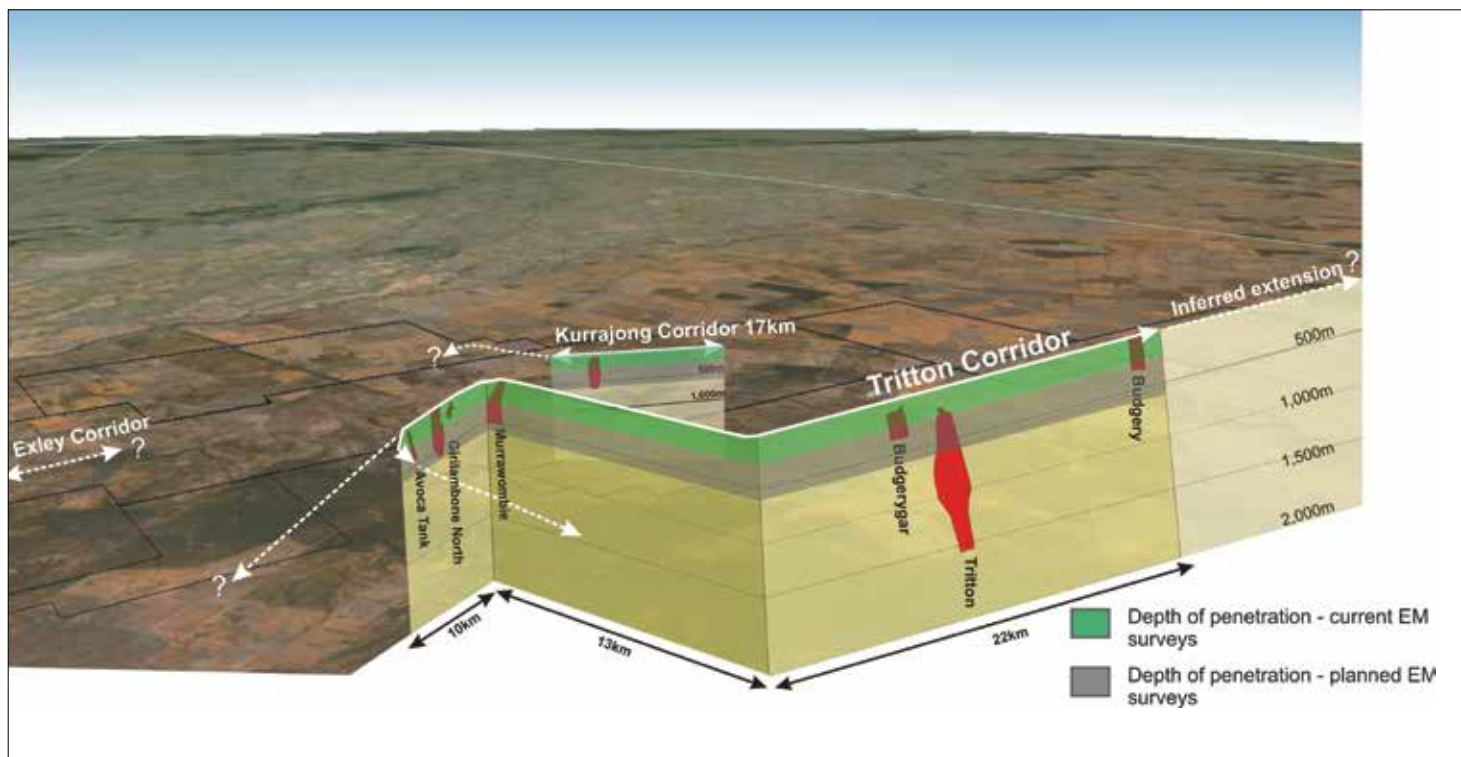
"However, we have continued to control costs well during the quarter and there have been beneficial gains in the copper price during the quarter.

"Production this quarter was impacted by several mining and processing factors, which have all been reviewed and are in the process of being resolved.

"Importantly, we are still confident in achieving our forecast production of 28,000 tonnes for FY17."

Mr Labuschagne said oversized rocks in Tritton stopes had ultimately hampered haulage and stope turnover while ground conditions in upper stopes of Murrawombie proved challenging.

"Our mine plan is now under review to improve production over the coming months to catch-up the shortfall," he said.



Aeris will use more powerful electromagnetic survey technology to further test its tenement package at depth.

"We have resolved the big rocks issue at Tritton, while Murrawombie will soon move to the next level of stopes where we expect ground conditions to improve as we go deeper."

"AS PART OF THIS RESTRUCTURING PROCESS, THE COMPANY REBRANDED AS AERIS RESOURCES TO SIGNAL IT HAD TURNED THE CORNER AFTER A CHALLENGING FEW YEARS."

Company restructure

Aeris' restructure was a turning point for the company, paving the way for future growth.

In December 2015 at an extraordinary general meeting, shareholders approved

the rebrand from Straits to Aeris to officiate the company's new direction.

"We completed a successful three-year restructuring process during FY16, resulting in a healthy net profit of \$22.26 million, compared to a loss of \$31.46 million in FY15," Mr Labuschagne said.

"As part of this restructuring process, the company rebranded as Aeris Resources to signal it had turned the corner after a challenging few years."

Post restructure, Aeris has achieved a 55 per cent reduction in its senior debt to \$US50 million, and the provision of a \$US25 million Revolving Priority Debt Facility.

"We plan to maintain the company's lean corporate structure, achieved through the restructure, while using our improved financial strength as a platform for growth," he said.

"Aeris is investing in its operational and exploration assets, while at the same time seeking appropriate opportunities for mergers and acquisitions to underpin the company's aim to become a mid-size, multi-operation company."

Tritton extension

First discovered in the mid 1990s, the large Tritton copper deposit is more than 20 million tonnes in size across multiple mines.

In 2004 mining began through the development of an access decline and the construction of a sulphide ore processing plant, while stope production began in 2005.

In 2015 the mine celebrated 10 years of production, with a large amount of resources still within its depths; a Proved and Probable Ore Reserve estimate of 6.4mt at 1.6 per cent copper for 100,000t of contained copper metal.

It was evident an extension of the Tritton operations was needed to extend mine life and unlock the remaining resources.

"In support of the current production volumes at the Tritton mine and the planned deeper mining operations, Aeris commenced the development of a new \$12 million ventilation shaft in FY16, which is expected to be operational in the second quarter of 2017," Mr Labuschagne said.

(continued on page 44)

Leading efficiency in raiseboring

RAISEBORE Australia (RBA) is a South Australian based company providing specialised raiseboring services to all States of Australia and internationally across six different countries.

The company was launched in March 1994 by its founder Rod Bertram, an innovator in the Australian raiseboring industry since 1992.

Today, RBA is the largest privately owned raiseboring company in Australia and a leader in cutting-edge technology and processes.

The company's growth is attributed to a highly skilled team of professionals as well as loyal clients, both in a buoyant and depressed market place, which has allowed RBA to provide capital investment that ensures it maintains its position as a leader in raiseboring technology.

RBA introduced 'Box-Holes' and 'Slot Holes' to the Australian market place in the 1990's and has the capacity to ream shafts from 660mm to 6.0m in diameter to a depth of 1000m.

Mr Bertram stated that there was no point in having equipment and personnel unless the projects were completed in a safe and timely manner.

"RBA's record speaks for itself and we will continue to offer unparalleled service to the mining industry both in metalliferous and coal, as well as civil construction," Mr Bertram said.

The company is proud of its commitment to safety where it has achieved a nine year period without a lost time injury (LTI), and was a finalist in the 2016 Australian Mining Prospector Awards for 'Excellence in Mine



Surface setup at the Tritton copper mine near Hermidale, NSW.

Safety – OH&S 'Blood Lead Level Exposure Programs'.

RBA has provided all raiseboring requirements to the Tritton mine since it was established in June 2005.

This has included both surface and underground ventilation shafts, up holes, down reaming and conventional slot holes as well as pilot holes for mine services including the installation of a paste fill system for the entire mine.

Similarly, RBA has constructed all of the raiseboring required at the Murrawombie mine which is part of Tritton's operations.

Currently, RBA is contracted by Aeris

Resources, the owner of Tritton, to excavate a major Return Air Raise (RAR) using raiseboring technology.

The RAR is designed to be 865m in depth and 5.0 metres in diameter and naturally vertical from the surface to the 4385 level.

RBA used an Atlas Copco Robbins 91RH raisebore machine for the project as construction of the shaft required the drilling of a 381mm (15") pilot hole utilising the Micon Rotary Vertical Drilling System (RVDS) and back reaming of the 381mm pilot hole to the required 5.0 metre diameter.

The pilot hole was completed on 30 October 2016 and drilled to an accuracy

of 0.08 per cent (700mm), an incredible achievement by all involved in the project.

Reaming has commenced and is progressing at the rate of 0.5 metres per hour with completion scheduled for early this year.

RBA is proud to be associated with Aeris Resources and enjoys the diversification of work at Tritton and Murrawombie mines as they are managed by a team of professional, highly skilled, and experienced managers who have the desire and ability to communicate well to contractors, even when arduous events occur, which always happens in major mining projects.

RAISEBORE AUSTRALIA THE RAISEBORING SPECIALIST

A privately owned company supplying raiseboring services to the mining and construction industries.

CONVENTIONAL DOWN REAMING UP-HOLE

We provide Directional Drilling of Pilot Holes for Raiseboring using

- Welnav Directionally Drilling Systems
- Micon RVDS Directionally Drilling Systems

Our services include:

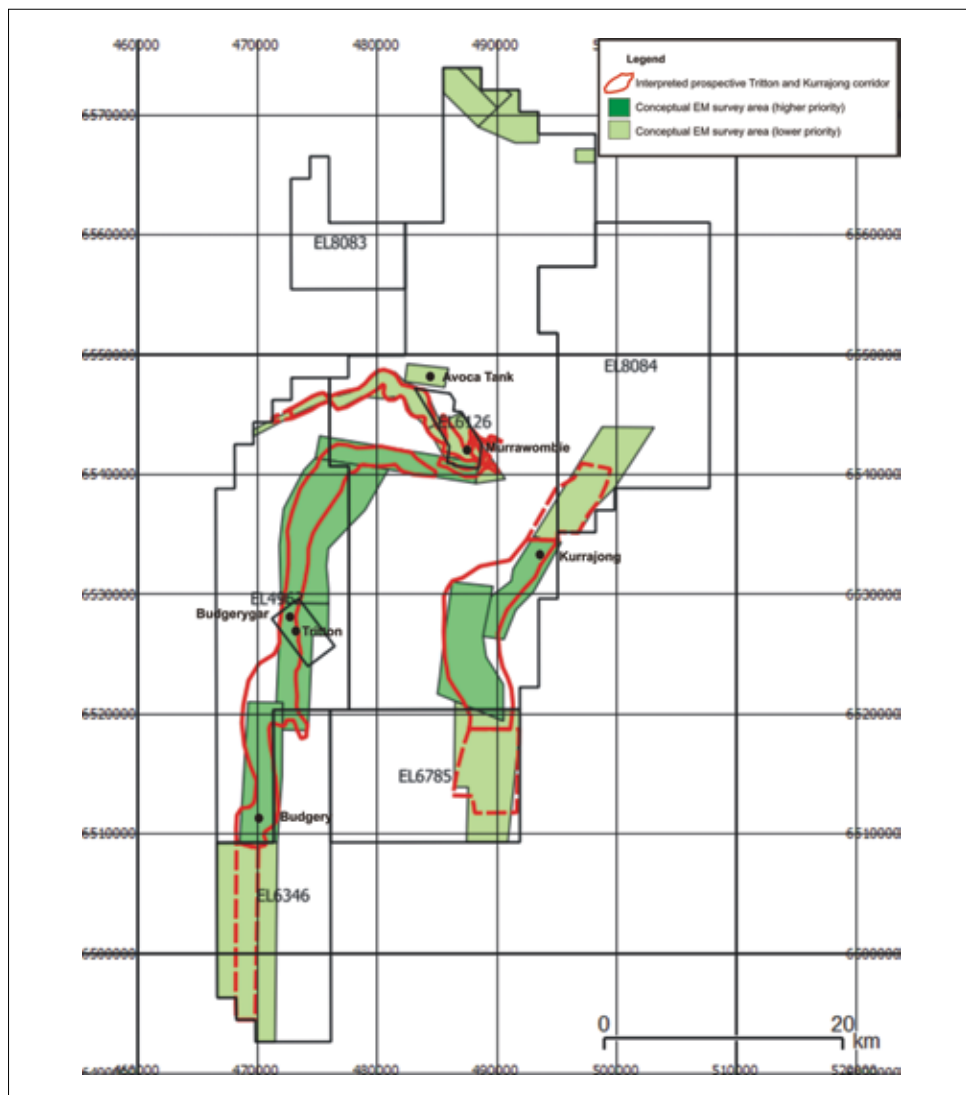
- A specialist raiseboring company with a core business in conventional, down reaming and up-hole raiseboring
- Our fleet features 13 machines (one of the largest in Australia) with the flexibility to ream raises as small as 0.66 metre diameter up to 6.0 metre diameter and 1,000 metres in depth
- RBA has raisebored 137,000 metres since inception

Raisebore
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Aeris Resources executive chairman Andre Labuschagne.



Map of Tritton tenement package showing planned electromagnetic survey coverage.

"This significant piece of capital expenditure involved the drilling of the 880 metre deep, five metre diameter ventilation shaft that when complete will extend from surface down to connect with the mine at the 1385 sublevel footwall development.

"The ventilation system supporting it will include twin centrifugal exhaust fans, each powered by a 1.3 megawatt motor, which together are capable of displacing 400m³ per second at surface."

During FY16, Aeris also continued to drill out the Tritton Deeps extension project, including an initial program of 17 holes for 6641 metres of drilling designed primarily to confirm mineralisation between 4200mRL to 4000mRL.

"A follow-up program drilled out the orebody to 40 metre by 40 metre spacing in the target zone ahead of the positive development decision in July," Mr Labuschagne said.

"Two deeper holes were also drilled and intersected copper mineralisation down to the 3,830mRL level, 1460 metres below surface, indicating the Tritton deposit remains open at depth.

"The development of Tritton Deeps, which has commenced, will extend mining activity in the Tritton underground mine to 155 metres below current stoping areas."

Tritton's current mine life spanned seven years out to 2023, with future expansions probable.

"We expect our near mine exploration and advanced project pipeline to deliver further Life of Mine extensions to the Tritton Operations," he said.

"Both Tritton and Murrawombie extend at depth, drilling in the future will define the resources."

Murrawombie underground

The Murrawombie deposit is in the southern area of the Girilambone Complex and is the largest concentration of copper metal outside the Tritton deposit.

As of June 2016, the deposit had an ore reserve of 3.3mt at 1.3 per cent copper.

In 1992, mining began at the open pit to unlock the oxide portion through heap leaching, but the sulphide resources were not mined due to their incompatibility with the heap leaching process.



Aeris has replaced the underground mine haulage truck fleet at the Tritton operations.

Plans to move underground first took place in 2007, when the company developed a portal and 600 metres of decline, but the project was shelved in 2008 as a result of the Global Financial Crisis.

Since this time, Aeris has completed a feasibility underground mining study to extract the deeper sulphide ore, and in 2016 gave the green light for construction to begin.

"The board approved development of Murrawombie in the March quarter of FY16 and we are on track for full production to be reached in the second half of FY17," Mr Labuschagne said.

"Murrawombie was the logical option for us to supplement the Tritton mine and has a plus five-year life at production rates up to 650,000 tonnes per annum.

"First ore from Murrawombie was delivered to the processing plant in the June quarter of FY16.

"The deposit remains open at depth, with historical drilling intersecting copper mineralisation 600m below surface (4600mRL)."

Once completed, ore would be extracted by sublevel open sloping and pillar recovery by caving methods, and would be transported to the Tritton plant for processing.

Exploration growth

In July 2016, Aeris announced it would spend \$7.5 million on greenfields exploration in the next two years in the hope of discovering the next Tritton-style deposit.

The company would conduct drilling across its 1800sqkm exploration tenement package spanning across the Tritton region.

"While there have been multiple discoveries of copper deposits (Tritton, Murrawombie, Avoca Tank) in the prolific Tritton Volcanic Massive Sulphide region, our tenement package is largely underexplored, particularly at depth," Mr Labuschagne said.

"With recent developments in electromagnetic technology it is now possible to see much deeper, potentially up to 500m, than was possible previously.

"We believe the company is in its strongest position in years to begin to realise the exploration upside potential of its landholding to unlock value for shareholders."

Tritton is a world-class Besshi (siliciclastic-mafic) VMS deposit, ranking in the 85th percentile by size and metal endowment when compared to similar deposits.

In the past, the company has successfully used electromagnetic exploration techniques but this was only able to identify anomalies up to 200 metres.

"The company will use new higher power electromagnetic technology to look deeper than the current survey data, validate and update identified geochemical anomalies and drill test coincident electromagnetic and geochemical anomalies," he said.

"We commenced the first phase of our significant regional electromagnetic geophysical survey over the Tritton and Kurrajong VMS corridors in November."

Outlook

Now the company's turnaround was complete and the Tritton operations had a clear path forward, Aeris' focus would shift to growth through near mine greenfields exploration and merger and acquisition opportunities, Mr Labuschagne said.

"The target in regard to merger and acquisitions is to acquire additional assets to transform Aeris into a mid-size, multi-operation resources company," he said.

"With this in mind, our focus is on base metals (copper and zinc) and gold projects, preferably within Australia, but we will consider offshore projects if the risk and return equation is right.

"We are actively evaluating a number of opportunities, which may lead to us acquiring a producing or ready to develop asset some time in FY17."

Aeris was also working towards meeting its FY17 guidance of 28,000t of copper at Tritton and would focus on safety initiatives across its operations.

"We continue to prioritise the safety of our people, which was reflected in the total recordable injury frequency rate at the Tritton Operations falling by more than 20 per cent during FY16," he said.

"I would like to thank our entire team for supporting Aeris on our transformational journey and continuing their tireless work in supporting our operational and corporate activities.

"The support of our shareholders and strategic partners over the last few years has also been a key factor in our success."



The Greenbushes Lithium operations will supply material to the new Kwinana Lithium plant.

All Images: Tianqi Lithium.

Lithium boost for WA

With construction of the newly approved Kwinana lithium processing plant off to a flying start, discussion surrounding a subsequent expansion at the nearby Greenbushes mine has the WA lithium industry bullish for the future.

ELIZABETH FABRI

THERE is no denying 2016 was a watershed year for lithium.

Improved investor sentiment coupled with a hike in prices has seen the commodity climb as interest in battery technology soared.

While many projects have sprung up across WA, government approval of Tianqi Lithium Australia's \$400 million Kwinana lithium plant in September was 'the icing on the cake', and was expected to generate up to 500 construction jobs and more than 115 full time production positions.

Once operational in 2018, the project would process spodumene concentrate from Talison Lithium's Greenbushes mine, and produce up to 24,000 tonnes per annum (tpa) of lithium hydroxide.

The product would be exported overseas for use in the manufacture of lithium ion batteries for electric cars and home storage systems; the two biggest growth areas in battery usage.

Tianqi Lithium Australia general manager Phil Thick said the plant was already set to become a significant contributor to the State economy.

"For decades WA has relied heavily on mining to drive the state economy," Mr Thick said.

"Nearly all mining activity has been primary mining with only minimal processing.



The site where the Kwinana lithium will be built.

"WA has a reputation for 'digging rocks out of the ground and sending them overseas for other countries to add value to'.

"Attempts to develop processing downstream of mining have been mostly unsuccessful, so this is a great opportunity to reverse that history.

"Importantly, the batteries ultimately produced are key components of the new energy world, which helps the environment

and our planet."

As a subsidiary of Tianqi Lithium Corporation, Tianqi Lithium Australia was backed by the world's largest lithium chemicals producer from spodumene minerals.

Its Kwinana project would add to the corporation's existing plants in China, as well as its 51 per cent interest in Talison's Greenbushes mine.

Construction begins

Tianqi chose to build the plant in WA for a number of reasons; chiefly to be in close proximity to its primary supplier, Greenbushes mine.

"There was certainly consideration a number of options, including building the plant in China, where Tianqi already has two major plants," Mr Thick said.

“Building the plant here in WA will create construction and production jobs; it adds value to the minerals before they are exported; it encourages innovation and the production process is safe and environmentally sound.

“There was also a desire to diversify supply options for our customers; Kwinana ticks all of the boxes in terms of availability of gas, electricity, water, reagents, etc and an experienced workforce close at hand.”

At the end of 2016 earthworks began on site after a five year development phase.

“It is very exciting to get the green light and commence construction of this most important project,” he said.

“Roads, fences, drainage, etc have all commenced and will be finished around February when the concrete works will commence.”

West Perth-based MSP Engineering was awarded head contractor for the project and would subcontract work to local businesses.

“There are a number of large pieces of major plant and equipment that we have ordered but take 12 months to manufacture and deliver,” he said.

“These are mostly coming from overseas as there are no Australian suppliers who can design and fabricate this proprietary equipment that is key to the plant processes.

“As a result of this, the major construction activity will commence in the second half of 2017 and carry through to late 2018.”

Greenbushes expansion

Located 250km south of Perth and about 90km south east of the Port of Bunbury, Talison’s Greenbushes mine produces more than 30 per cent of the world’s lithium.

The mine has produced lithium for more than 25 years and tantalum since the 1940s.

In this time the mine and its processing plants have been expanded on a number of occasions to further lithium concentrate production.

The most recent expansion was completed in mid 2012, and talks of a further expansion were now in the works to keep up with the demand for lithium once the Kwinana plant was online.

“Concurrent with the board approval for construction of the Kwinana lithium chemical plant, Tianqi Lithium in conjunction with its Talison joint venture partner is planning to expand its production further in Greenbushes to meet the growth plans of both partners,” the company stated in September.

Greenbushes currently produced 65,000

“ATTEMPTS TO DEVELOP PROCESSING DOWNSTREAM OF MINING HAVE BEEN MOSTLY UNSUCCESSFUL, SO THIS IS A GREAT OPPORTUNITY TO REVERSE THAT HISTORY.”



Talison Lithium and its predecessor companies have produced lithium from Greenbushes for more than 25 years.

tonnes of lithium carbonate equivalent a year, which was forecast to double under a new expansion.

Mr Thick confirmed the extension project was currently being considered but no decision had been made.

“Greenbushes has the capacity to continue to supply the current needs and future expanded needs of both Tianqi and the other owners, Albemarle,” he said.

Future plans

The Kwinana lithium plant could also undergo a potential expansion once operational, depending on market conditions.

“The land lease we have signed with LandCorp has adequate land for future expansion of the plant and there is further adjacent land available if needed,” Mr Thick said.

“The plant is designed to allow for future

expansion and this will be considered when the current project is running, depending on market conditions at the time.

“No decision has been made on any expansion at this time; we need to focus on building the plant first.”

Kwinana plant would also play host to industry research and development activities as Tianqi planned to further its Research and Development (R&D) activity both in China and WA through partnerships with WA universities.

Lithium outlook

The strong demand growth for lithium was being driven predominantly by the high performance rechargeable lithium battery market, but demand projections for lithium are mixed, Mr Thick said.

“Even on conservative estimates there will continue to be strong demand over coming years,” he said.

“There are many supply projects in the pipeline around the world but many of these are on a much longer timeline and still have significant risk.

“The development of our plant is in the perfect timing window and its proximity to such a large and high quality resource is a huge advantage.”

State development minister Bill Marmion was also of the view, claiming demand was increasing thanks to the growing use for renewable energy storage and electric batteries.

“While Western Australia has been mining and exporting lithium for more than 25 years, this project introduces value-adding secondary processing into the local supply chain,” Mr Marmion said.

“This is very positive news for growing the State’s economy as we seek to take a greater role in processing our raw materials to produce higher value products.”

5yr Greenbushes partnership delivers value

A long-standing partnership between drill and blast specialist Action Drill & Blast (ADB) and miner Talison Lithium Australia Pty Ltd at the Greenbushes lithium mine in WA’s southwest demonstrates the value of a close working relationship between miner and contractor.

ADB was awarded the contract for production blast hole drilling and LSI (load, stem, initiate) services at Greenbushes in 2011. Following a 12 month extension in 2013, the company was awarded another three year contract in 2014.

Talison leverages ADB’s integrated drill and blast capability, its focus on best-for-project solutions, and its industry-leading safety system to optimise the project’s blast design, commission customised drilling solutions, and ensure best practice safety standards.

Traditionally, drilling production techniques at the mine had used GD5000 top hole hammer drills to drill 115mm to 127mm blast holes on 5m to 10m benches.

However, Talison had a requirement for deeper and more accurate 30m pre-splits to provide a continuous split line between



Action Drill & Blast’s customised production technique has seen production targets consistently met, waste blasting costs reduced, and an exceptional safety record maintained.

each berm, which the GD5000s struggled to perform at the accuracy required.

The client also wanted larger hole sizes

in the bulk waste zones to reduce drill and blast costs, and was considering the use of reverse circulation (RC) drilling to

improve the site’s grade control process.

ADB developed and implemented a customised production technique to meet the client’s objectives by acquiring an Atlas Copco D65 drill; set up with RC but also capable of being easily changed over to drill conventional blast holes.

The drill comfortably drills up to 165mm diameter holes and its down hole hammer provides accurate pre-split holes to the required depth of 30m.

With the RC set up, the D65 is also able to fulfill the grade control requirements. The rig can perform all the functions required with no extra cost to the client for an additional machine.

ADB has also been initiating safety best practice at Greenbushes through the deployment of its industry-leading safety system ActionSAFE and implementing its OHSAS18001, ISO9001 and AS/NZS4801 certification.

The value of this professional, integrated drill and blast contract service has seen production targets consistently met, waste blasting costs reduced, and an exceptional safety record to date with no lost time to injury since ADB commenced on site.



All images: Aurelia.

Pursuing developments

Emerging exploration and minerals company Aurelia Metals has produced gold-lead-zinc-silver from its NSW-based Hera project since 2015. Newly appointed managing director and chief executive **Jim Simpson** chatted to *The Australian Mining Review* about Aurelia's flagship Hera mine, the 2016 leadership shakeup, and the company's exploration and development plans for 2017.

ELIZABETH FABRI

Q. At November's AGM Presentation you mentioned 2016 was a 'turnaround year' for the company. Why was it so significant?

There were a number of things that have improved at the [Hera] operation over the 2016 year.

Improved recoveries in the mill have moved from 78 per cent up to 87 per cent — so we're getting a lot more gold recovery — and the base metal recoveries are now over 90 per cent consistently.

Throughput in the last financial year was 310,000t and now we're exceeding 370,000t, and in that there's been a reduction in costs with the successful renegotiation and improvement in mine design. The mining costs have dropped from \$83 a tonne to \$64 a tonne, and through throughput and improved cost control the milling costs have dropped from \$83 a tonne to \$60 a tonne.

All of that equates to cash in the bank of about \$28 million as of the end of October, so we're on our way to putting money in the bank and continuing to improve the operation.

Q. December quarter results are not far off; can you provide some preliminary comment on what the company has been up to over the last three months and what was achieved?

What's lining up so far and what I did report in October was that our monthly throughput recoveries and grade have been good.

I expect this quarter to be quite positive and aligning with our previous quarters in March and June. We did have a quarter in September which was down due to some low grade ore which we didn't have much choice on, so we see this quarter bouncing back to where it has been in previous ones.



Aurelia Metals managing director and chief executive Jim Simpson.

Q. The high-grade Hera project was performing very strongly, delivering a gold grade 150 per cent above estimates in FY16. Can you provide an update on how the site is tracking?

With the improved understanding of the resources and the ore reserve upgrade in June, our geological models are now reconciling much better with the mill

output. We're seeing basically what I call an online or on par reconciliation of the block models with the mill outputs, and also what we'll see is base metal grades gradually increasing over the life of the mine.

Q. Aurelia mentioned in a recent report that there was still room for improvement at Hera. What do you hope to achieve?

Well, some of the objectives that we're looking at now is increased gold recovery from where it is at the moment, around 87-88 per cent, up to 94 per cent which is Definite Feasibility Study (DFS) levels.

We've still got some work to do to get to that because the small gains are often the hardest, but we're focused on getting to that point at the end of next year.

We're also focusing on increasing our throughput and making incremental improvements with very low capital expenditure, and we're also looking at our base metals expansion with the upgrade of the back end of the circuit to produce more metal as the grades improve. The other thing is that the cost reductions will primarily come from increased throughput and some refinements in the milling cost structure.

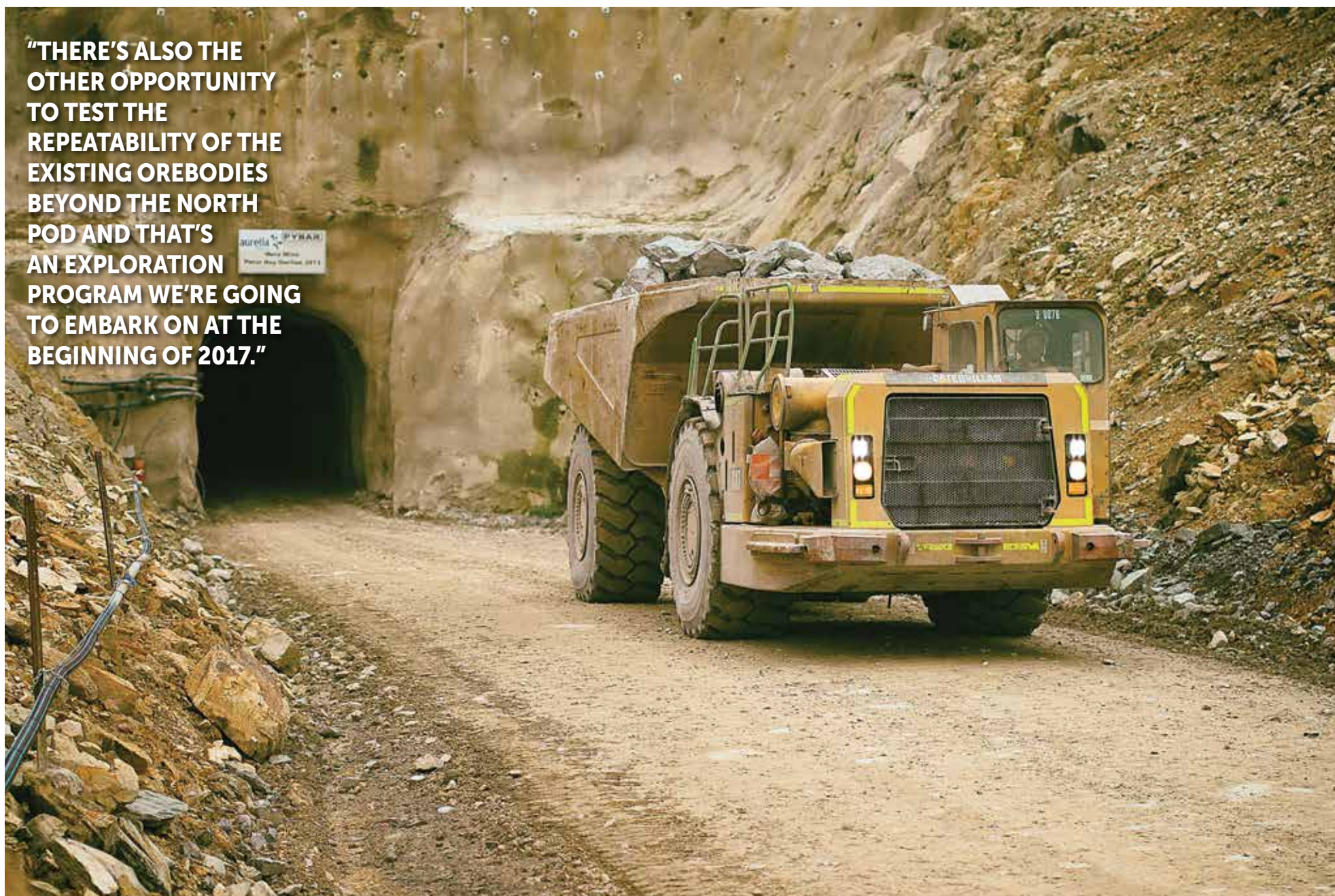
Q. This year you received approval for a modification to the Hera project, and more recently a Mining Lease Application to extend the Hera mining area to the north. What does this mean for the company moving forward?

This opens up an opportunity for the development and extraction of the North Pod and other potential resources.

The North Pod is the area that we're currently drilling which is an inferred resource at present so the North Pod is certainly one of our opportunities for development extraction. There's [also] other potential resources beyond North Pod we're keen to drill and eventually extract. The North Pod was originally scheduled at the back end of the mine, but now with its significance and its close proximity it will allow us to reschedule the life of the mine.

Q. How is the North Pod drilling program progressing, as well as Aurelia's other exploration projects?

"THERE'S ALSO THE OTHER OPPORTUNITY TO TEST THE REPEATABILITY OF THE EXISTING OREBODIES BEYOND THE NORTH POD AND THAT'S AN EXPLORATION PROGRAM WE'RE GOING TO EMBARK ON AT THE BEGINNING OF 2017."



The Hera project, 100km south-east of Cobar, NSW, produces gold-silver ore and bulk lead and zinc concentrate.

The North Pod drilling is confirming a significant resource which will enhance Aurelia's profitability in the future. There's also the other opportunity to test the repeatability of the existing orebodies beyond the North Pod and that's an exploration program we're going to embark on at the beginning of 2017.

Q. What progress has the company made at the Hera-Nymagee Project?

We're continuing to do a high level analysis on a possible high-grade option for the Nymagee mine and this will create the potential to increase the mine life at Hera by adding that orebody onto the back of what we're already mining at Hera.

Q. In June the company released an updated resources and reserves estimate. How has the updated estimate effected the company's operations and mine life? Were the results what you expected?

The results were probably better than expected in terms of grade. As discussed earlier, the undercore has now been built into the reserves so we saw an improvement in the reserve grades and this is being honoured again by what I said earlier with the mill output.

Also due to approximately 50 per cent of the resources being classified as inferred we've been very busy doing infill drilling of the inferred for close to 12 months and we're going to continue with this program throughout 2017, and this will have a positive extension for the ore reserves and life of mine going forward.

Q. Can you describe your gold hedging program and its benefits?



In FY 2016, Aurelia produced 46,882 oz of gold.

Our gold hedging is really based on an opportunistic approach (eg.) the hedges that we placed just recently evolved around spikes in gold price; one was around July when gold had a bit of a run and just recently the Trump event

when we placed some hedging.

At the moment we're just delivering into the hedge book in times like this when the gold price is softer and it helps us preserve our margin and honors our cut off values in our operation.

Q. The 2016 year has also seen some leadership changes with the retirement of chief executive Rimas Kairaitis in August, as well as chairman Tony Wehby in November. What impact has this had on the company?

Rimas and Tony did a great job as explorers and making the acquisition. That's been their forte and they also rescued the operation in its darkest hour, which was an incredible feat.

I respect them very much for where they've got the company today.

My forte is more running operations profitably and extracting their maximum potential; that's what I've been doing for the last 30 years and I have personally have a lot of experience in strategically developing operations and assessing other operations for potential acquisition.

The company has moved from a junior explorer to a junior producer so the management changes are appropriate for the evolution of Aurelia.

Q. What does the company hope to achieve in the 2017 year?

Our primary focus and strategy for 2017 is maximising cash generation and reducing our debt. There's nothing more important than reducing our net debt levels and reducing our gearing.

But we also have exploration programs and a large resource conversion program which will be the cornerstone in building our mine life; mine life is very critical for our operation. Lastly, my personal goal is to have the market truly reflect the value of Aurelia in the share price.

I think if we keep delivering on people's expectations that a lot of the market will have confidence in what we're doing, and hopefully reflect that in the share price. Aurelia is a great story, and one of the best mines and resources I've seen, and we certainly have a good foundation to build a company.

INDUSTRY PROFILES

COMPANIES GEARING UP

How to Manage Risk in a Changing Climate

Supplied by **David McEwen**

THE climate is changing. Whether or not that statement makes you think of the weather is beside the point. The implications for your business may be profound.

The Paris Climate Agreement came into force on 4 November having been ratified by sufficient countries including major greenhouse emitters the US, China, India and the Eurozone.

While the US election result has thrown a spanner in the works, momentum is building that will, in time, dent the appetite for traditional energy supplies.

The international aviation sector is set to get tighter emissions standards, land transport is moving rapidly towards automation and electrification, and there is increasing pressure to tackle the use of the highly polluting marine diesel oil in international shipping.

In the built sector, engineered forest products such as CLT (cross laminated timber) could take market share from concrete and steel as structural building products with impressive engineering properties and perceived environmental benefits.

Significant mid-rise commercial and residential projects have already been delivered globally including a 7,000sqm development in the Barangaroo precinct in Sydney. The timber high rise market could really accelerate if a proposed 80-story development in London goes ahead – aptly nicknamed “the toothpick”.

Lawmakers and portfolio analysts have begun to target organisations whose products or operations contribute most to greenhouse gas levels, with company



Adaptive Capability director David McEwen.

directors warned that business risks associated with climate change and responses to it will not be considered unforeseeable.

All this points to a crescendo of change for many firms in and supplying the mining sector. While fossil fuels will remain in the energy mix for the next few decades, transition away from them is underway in many countries and will accelerate despite increasing affluence, population size and technology dependence driving expanded energy demand in many developing countries.

In the last few years, renewable energy sources such as wind and solar have overtaken coal and gas in terms of new

electricity generation investment globally.

Combined with advances in battery storage, solar carries advantages for many developing communities, being quick, cheap, and easy to deploy at micro and precinct scale. Utility scale renewables are gaining ground and thermal solar – so-called “molten salts” technologies – offers the tantalising prospect of reliable base-load generation capability that can continue to produce power overnight and in overcast conditions.

As countries figure out how to meet their Paris obligations, firms whose operations, supply chains or end products embody or produce relatively higher levels of greenhouse emissions than

their competitors and substitutes will increasingly be sluggish with a rising carbon price, other government sanctions, or consumer boycotts led by green groups (including the controversial divestment movement, which urges banks and institutional investors to exit the fossil-fuel industry).

And like it or not, the physical climate is changing too, with 2014, 2015 and likely 2016 each breaking the hottest global average temperature record.

While there is still natural variability in the climate system, the long term warming trend is clear.

The direct effects are expected to include increasing droughts, heat waves, extreme weather and sea level rise. Climate sensitive businesses such as coral reef tourism, wine producers, alpine sports operators and those with coastal-exposed assets are already feeling these effects; many mining operations have potential exposure, either directly or via their downstream logistics providers.

Managing climate risks involves a structured identification, assessment and treatment process applied strategically across the organisation.

Treating sustainability as not much more than a marketing bolt-on is no longer going to cut it as the full implications of Paris and related disruptions begin to be felt over the next few years.

David McEwen is a Director at Adaptive Capability, providing strategic advice to help businesses create and preserve value in the face of climate change. He is also the author of the new book, Navigating the Adaptive Economy. Visit www.adaptiveeconomybook.com for more information.

Hitachi invests \$60m in WA market

AFTER five years of planning and a \$60 million investment, Hitachi Construction Machinery Australia (HCA) officially opened its new Perth facility to its WA and NT headquarters in the Forrestdale Business Park on 6 December, 2016.

Since its establishment in 1999, HCA has delivered more than 740 pieces of mining equipment, about 10,000 pieces of construction and forestry equipment, as well as providing service support throughout Australia via a national network of 25 branches to meet its customer's level of expectations.

In 2012, HCA opened its Brisbane facility, which is now a mining operation hub in Eastern Australia.

The new Perth facility is another developmental milestone to showcase the ongoing pledge that the organisation has to meeting customers' needs nationally and across the globe.

The evening launch was attended by Australian and Japanese executives, HCA employees and local customers.

Hitachi Construction Machinery Japan president Yuichi Tsujimoto highlighted the significance of the new facility; it was important not only to the business, but to the WA market.

“The land we stand on today spans approximately 104,000m² and by the time we complete all stages of this project our total investment will be approximately \$100 million,” Mr Tsujimoto said.



The new Forrestdale headquarters in Perth, WA.

The facility has also been awarded the Hitachi “Green 21 Award” for excellence in cutting edge eco-conscious design, utilising solar to generate electricity to lights and computers which are fitted in the roof.

The majority of all non-drinking water is

harvested from rainwater which is collected on site and the building is designed to make the best use of natural lighting, cooling and heating.

The official ribbon cutting took place inside the state-of-the-art building with

media officials and customers present to witness the next step in HCA's commitment to provide innovative solutions to exceed customer expectations.

More information about this service can be found at: www.hcma.com.au.

Award-winning training in the Hunter

HUNTER Plant Operator Training School's (HPOTS) new fleet of four-wheel drive vehicles is ready to deliver training – either at a client's site or HPOTS' own purpose-built four-by-four track.

Located on an 87 hectare property on the old Aberdare East Mine Colliery site – in the Cessnock area of the Hunter Valley – the diverse track is ideal for clients completing HPOTS' industry-leading courses.

The site is also available for heavy machinery expos, trade events, and all earthmoving machine training.

In September, HPOTS received the *Training Program of the Year* award at the Earthmover and Civil Contractor awards in recognition of its quality training and services.

The company's four-wheel drive program is as much an experience as it is training, with participants gaining practical experience in planning remote area trips, operation in difficult terrain, and recovery and advanced operation methods.

The company's nationally accredited two day program consists of all-terrain training in bush, mountains and Stockton beach. This program also includes lunch, cold drinks, and a barbeque on the first day.

The one day awareness course consists of basic recovery methods, best practice, emergency breaking techniques, general maintenance and any client-specific site requirements.

A theory and practical demonstration assessment is conducted in order to award the successful participant a National Statement of Attainment



A heavy machinery expo at the HPOTS site.

and a photo wallet card. The award is RIIV305E Operate and Maintain a Four Wheel Drive Vehicle.

Other services provided by the company include Earthmoving VOCs (all machines, makes and models), High

Risk Work Licenses, Certificate III qualifications in Civil Construction, Plant Operations, and Surface Extraction.





HPOTStraining
highrisk & plant operator training school
www.hpots.com.au

HPOTS Training has been operating and providing quality training services for over 34 years. We have a purpose designed four-wheel drive track on our premises and also deliver training on client sites. Our course covers the operation of a 4WD vehicle including recovery in both, bush and beach terrain. It includes:

- Plan and prepare for operation
- Pre-departure checks
- Use 4WD mode
- Recover a vehicle
- All terrains
- Maintenance of vehicle

This course is appropriate for those working in:

- Civil construction
- Mining
- National Parks
- RMS



Hunter Plant Operator Training School National unit of competency RIIV305E

McFarlane Street, Extended CESSNOCK NSW 2325 admin@hpots.com.au 1800 640 580

Asia Pacific's first grid scale Powerpack



(left to right) Vector chairman Michael Stiassny, NZ Minister of Energy and Resources Simon Bridges, and Vector chief executive Simon Mackenzie.

IN OCTOBER, leading New Zealand multi-network infrastructure company Vector officially opened its renovated Glen Innes substation in Auckland, now home to the Asia Pacific's first grid scale Tesla Powerpack battery storage system.

With a storage capacity of 1MW/2.3MWh – the equivalent to powering 450 average homes for 2.3 hours – the Powerpack will support the current conventional substation during peaks for a reliable supply.

Vector chief executive Simon Mackenzie said the Tesla Powerpack battery storage system represented a radical transformation in how Vector managed its electricity network.

“By gauging trends such as household energy consumption, the effect of infill housing and the uptake of new energy systems, we can target growth areas and make sure they have a reliable energy flow with this backup to the conventional substation.

“And when connection or consumption growth requires a conventional network upgrade, we can mobilise the batteries to other parts of the network where power demand is rising.

“This is transforming the way the energy sector is managed and will have a powerful influence on consumer behaviour.”

\$NZ2 billion is needed to be invested in Auckland's networks across the next decade. Mr Mackenzie said new technologies such as Tesla Powerpack allowed Vector to better manage the rising demand while looking into more innovative and future-proof infrastructure options.

Tesla was also working with Vector to integrate Powerpack solutions for customers across Australia, New Zealand and the Pacific Islands, and was looking to support future developments across these key markets with battery storage.



The grid scale Tesla Powerpack battery storage system.

Vector hosted a series of roadshow events throughout November and early December in Sydney, Cairns, Melbourne, Adelaide and Perth to showcase developments in emerging energy storage technology.

The first roadshow in Sydney was launched by NSW minister for Industry, Resources and Energy Anthony Roberts.

“Partnerships such as Vector Energy and Tesla Powerpack which is showcased

today, are unlocking new opportunities for innovation and investment, and promising to deliver immense economic and environmental benefits to consumers and businesses,” Mr Roberts said.

Proudly supporting Australian mining

SEALYS continued leadership in both commercial and domestic bedding categories is a great driver for quality and technological innovation.

Sealy of Australia is Australia's leading manufacturer of premium bedding, and its flagship brand, Sealy Posturepedic, consistently enjoys the highest consumer awareness and preference in the category.

The company's reputation is founded upon combining leading edge sleep technology with stringent standards of product quality and performance.

Proudly supporting the Australian mining industry with durable, quality bedding, Sealy is at the forefront of product development; continuously improving and enhancing products to ensure better performance.

The company also demonstrates a firm commitment to Australian manufacturing, and is a proud supporter of the 'Australian Made' campaign.

All Sealy bedding is manufactured in five plants around Australia and the vast majority of components are also sourced locally or manufactured in-house.

An expanding workforce is testament to Sealy's commitment to Australian-based manufacturing.

Sealy's R&D facility at its Brisbane headquarters is the only bedding testing facility in Australia that is NATA accredited.

It continues to monitor all aspects of product and components performance.

With an environmental policy in place, and through environmentally friendly measures such as waste and water management, Sealy is taking initiatives now that are designed to lead to long term



Sealy of Australia employ the highest skilled bedding craftspeople, many who have worked in the industry for over 20 years.

environmental sustainability.

Sealy has a long standing commitment to manufacturing locally.

At a time when many sectors seek lower costs by sending manufacture or service divisions offshore, Sealy has continued to invest in equipment and skilling people for long-term local production.

In addition, Sealy Australia has implemented a continuous improvement program, comprising facets such as 6S, a health and safety audit program, product audits, and waste management initiatives (among others).

The outcomes of this program are improved products and more efficient

manufacturing practices, which produce increased flexibility to allow greater responsiveness to customer demands.

Sealy's commercial specialists can be contacted on (07) 3331 5200 and commercial@sealy.com.au; more information can also be found on the company website, www.sealy.com.au

Expert sleep solutions



Slumber Corp is fully owned and operated in WA.

SLEEP studies reveal insufficient sleep impairs various cognitive functions and behaviour including memory, attention and decision making.

"But we don't need sleep studies to tell us how important sleep is to our everyday capacity to function effectively," Slumber Corp sales manager Steve Caban said.

"Essentially, the better we rest and sleep the more revived we feel and

the better we are able to make critical decisions over the course of a day's activity.

"The two critical elements to providing a restful night's sleep are support and comfort, and at Slumber Corp we deliver."

Manufacturing sleep solutions for everyday, Slumber Corp's expert team is dedicated to servicing a wide range of industries, including mining.



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Heavy Machinery Training and Assessment



Rideout Mining® Down Under incorporating CES Mining and Employment® is owned and operated by Peter Rideout and specialises in offering heavy machinery training courses.

WHAT WE DO?

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- Coal Board Medicals (Section 4)
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RIDEOUT MINING®
DOWN UNDER

Mine Specific Training Courses

Rideout for a career in mining

RIDEOUT Mining Down Under owner-operator Peter Rideout has been working in the mining industry for more than 38 years.

With a wealth of knowledge and first-hand experience working in Australian mines, Peter's dump truck driver training courses have become a thriving success.

Peter has extensive experience working in open-cut and underground coal, iron ore, and gold mines and is an accredited TAE40110A trainer and assessor.

His extensive mine experience allows him to offer courses in heavy machinery, including haul and dump truck training with a particular emphasis on the requirements that would be expected in the mining industry.

Personnel that complete Rideout Mining's heavy equipment driver training courses come out qualified to operate haul trucks, loaders, water carts, graders, bulldozers, bobcats and excavators within the mining and civil industries.

Participants who demonstrate competency in both the theory and practical assessments, also receive a Statement of Completion from Rideout Mining plus the RII Mine Site Criteria Competency certificate.

The company also offers mine-specific courses dealing with mine management, supervisor courses, mine rescue, BMA core inductions and a range of associated medical courses.

Rideout Mining also provides on-site workplace training anywhere in Australia, using client equipment and machinery for bookings of 10 or more.

Further information on Rideout Mining training courses and course dates can be found by visiting: www.rideoutmining.com.au.



Rideout Mining provides people with the necessary skills for safe, reliable work in the mining industry.

Performance testing at its best

MATERIALS testing laboratory Allunga specialises in evaluating the durability and performance of materials.

Australia's harsh environmental conditions, such as high UV levels, high temperatures, and strongly corrosive coastal environments, are tough on materials of all types.

Changes assessed by Allunga include the performance and colourfastness of coating systems, changes in strength flexibility and dimensional stability of many materials, and changes in performance such as insulation capabilities, mould resistance, corrosion resistance, and anti-fouling properties.

Accelerated testing plays an important role in Allunga's assessment processes, as clients often can't wait 10 years to see if the materials and equipment they use will fail or corrode.

Allunga often uses accelerated testing on products such as wheelie bins, PVC, shade cloths, dam liners, retroreflective materials, insulation, rubbers, geofabrics, construction materials, handrails and paint systems.

Allunga has 45 years of experience in the industry and has NATA accreditation, to help design and conduct testing programs to meet these needs.

Recently Allunga evaluated the performance and durability of PV panels and inverters. It refined the dual axis solar tracking systems for accelerated ASTM



Exposure racks used in corrosion control.

G90 compliant 'Altrac' exposure testing.

A suite of corrosion testing services including a salt-spray chamber, humidity cabinet and digital oven allows it to provide a wide range of corrosion tests and cycles. Allunga also operates a dedicated marine

littoral exposure site focused on longer-term corrosion studies.

The company's anti fouling capabilities are currently being upgraded and it has the use of the electron microscope facilities at JCU to provide images and analysis of

changes.

While Allunga is based in Townsville and operates three special purpose exposure sites across northern Australia, testing can be, and is, conducted at remote locations as required.



Allunga
EXPOSURE LABORATORY

WHEN YOU NEED TO TEST DURABILITY

Corrosion Testing at Allunga:

- A wide range on test cycles are available using salt-spray chamber, a controlled humidity cabinet, and a digital laboratory oven.
- Allunga also operates a dedicated marine/littoral class 5 exposure site primarily for corrosion testing.

Allunga is fully equipped for natural weathering tests of all types, and also offers:

- Accelerated exposure tests (Altrac ASTM G90, Tracrac, AS 2433)
- Anti-fouling tests
- Dedicated arid and mould-resistance exposure sites



Concrete corrosion protection extending asset life



More information can be found at www.duoguard.com.au.

CORROSION control specialist Duoguard Australia is the sole Australian, New Zealand and South Pacific distributor of the Duoguard Hybrid Anode system, which arrests the corrosion of reinforcing steel in concrete.

The cost-effective, innovative and rapidly installed Duoguard cathodic protection system provides a two-stage treatment.

Corrosion is stopped during an impressed current phase, then controlled through a long-life, no-maintenance galvanic anode control system.

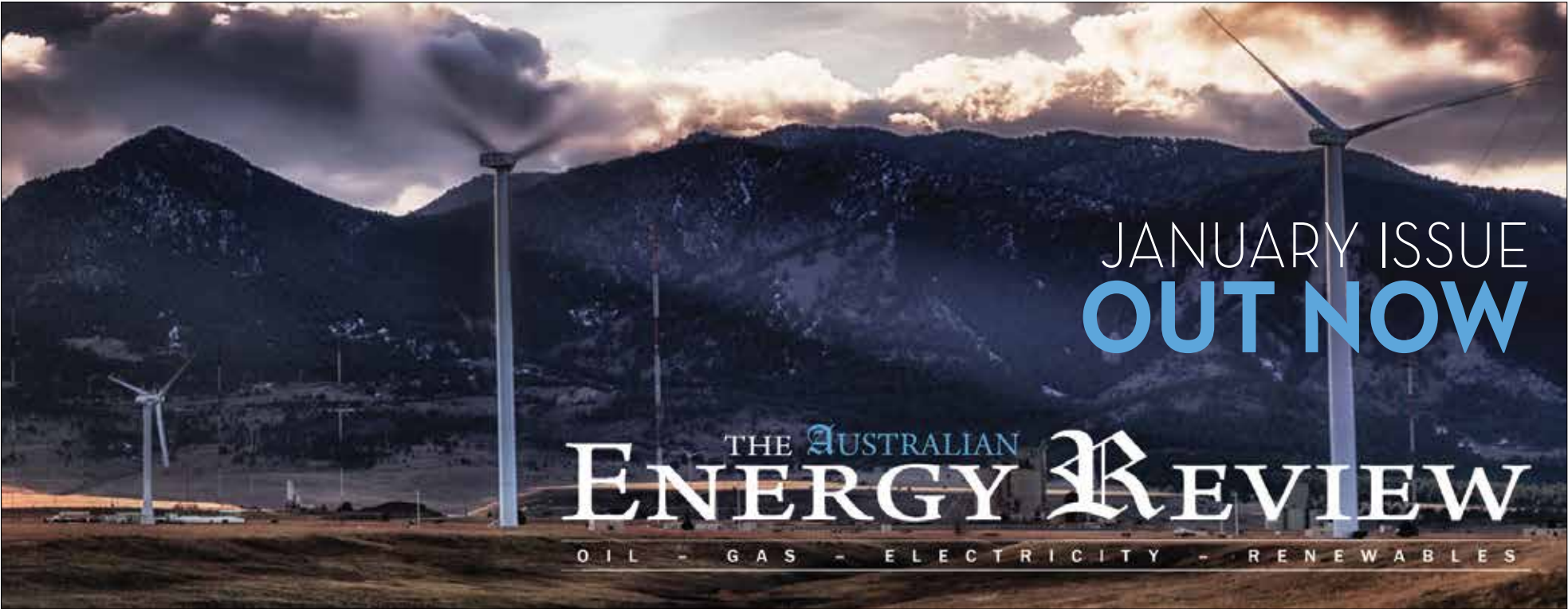
The system extends the life of all types of steel reinforced concrete structures, including mining structures, thickening tanks, tunnels, marine structures, bridge decks, industrial structures and high rise buildings.

Duoguard Australia provides site support through experienced engineering contractors, including training and onsite installation backup from staff with extensive experience in corrosion control and concrete remediation.

Duoguard Australia, through a wide variety of engineering contractors, offers a wealth of experience in the treatment of reinforced steel corrosion, with exposure

to galvanic and impressed current cathodic protection, chloride extraction, realkalisation as well as traditional concrete corrosion repair.

Duoguard Australias warehouse — based in Melbourne — has the capacity to provide quality and reliable logistical support to all Australian states and territories, New Zealand, the South Pacific and further afield.



JANUARY ISSUE
OUT NOW

THE AUSTRALIAN
ENERGY REVIEW
OIL - GAS - ELECTRICITY - RENEWABLES

Sudden impact to tyre efficiency

WHILE high-tech driverless haul trucks have increased efficiencies for large mining operations, a simple and reliable approach using the Broons' Square Impact Roller has always been highly effective at improving haul road strength and reducing costly tyre wear.

Loose sharp rocks wedge between lugs resulting in damage which leads to expensive failures; and at over \$50,000 a tyre, it can cost around \$300,000 to fit up an entire haul truck.

For just a fraction of the tyre replacement cost, the Broons Square Impact Roller rubbilises loose rock on tip heads and waste dumps, stabilising haul roads by increasing insitu density and creating a solid pit floor for working vehicles; factors that all lead to improved tyre life and performance.

The unique, University proven "square" compactor module imparts deep compaction down more than a metre to improve ground stability; a performance characteristic unmatched by traditional vibrating rollers.

Working at speeds of between 10 and 12 kilometres per hour, the Broons Impact Roller is far more efficient over large areas, including waste dumps.

As a consequence, graders can be deployed to more important jobs instead of being allocated to general tasks such as around-the-clock road cleaning.

Routine daily maintenance is reduced to a handful of grease points on the machine, as the roller includes a module that allows hydraulic raising from the cabin of the tow tractor for quick mobilisation between sites.



The Broons Square Impact Roller.

"The reputation of our Impact Roller has been built on the back of extensive use on mines around Australia and overseas for many decades," Broons Hire director Stuart Bowes said.

After close to 45 years of experience in the mining and construction industry worldwide, Broons' innovative compaction roller maintains its performance excellence.

Broons can arrange a trial anywhere

in Australia with hire or purchase options and can be contacted on (08) 8268 1988 or info@broons.com to discuss mine site compaction, with brochure details at: www.broons.com/impact.

Mining's green shoots are emerging

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Value = \$120
- 12 month **subscription** to Business Development Data
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- 12 month **electronic subscription** to The Australian Mining Review **Free**
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For the one amazing low price of **\$925 + GST**

(this includes all setup costs and artwork)

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Vikie Taylor

p: (08) 6314 0340 e: vikie@miningoilgas.com.au



Specialised data solutions for mining



CSA Global is very active within the mining sector, working closely with various mine sites.

FOUNDED in Dublin in 1984, CSA Global is a privately owned consulting company specialising in the provision of mining, geological and technological services across the mining, infrastructure and financial industries.

CSA Global has more than 30 years international experience in most mineral commodities, forging itself as one of the key leaders in the mining and geology consulting space.

Recently, the existing data management team opened its doors to a team of IT specialists to impart a more robust service offering that allowed them to leverage knowledge of IT management, storage and data security.

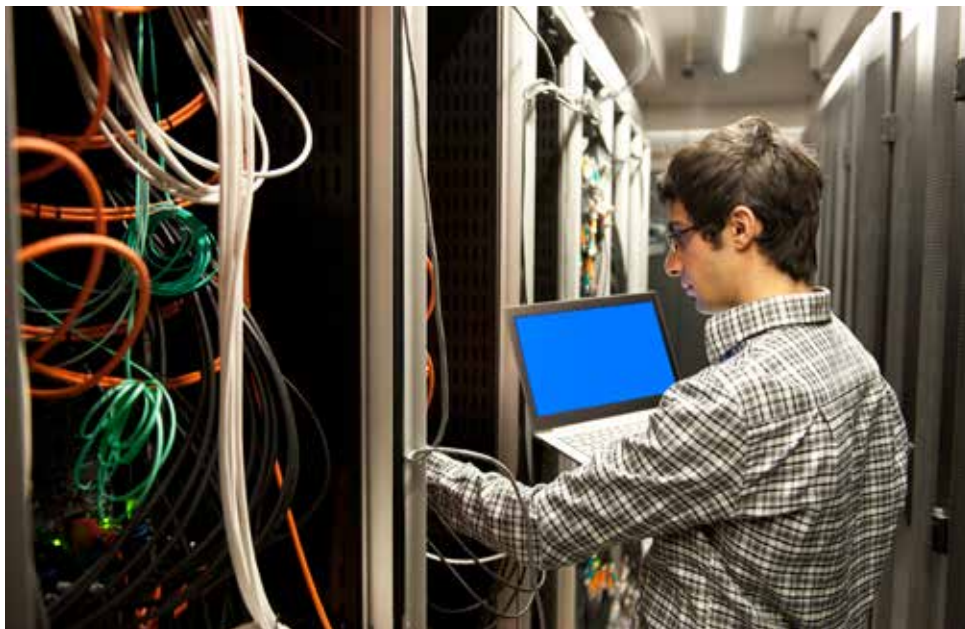
The collaborative efforts of CSA Global's technology service offering are delivering value to a range of clients from all parts of the exploration and mining cycle across the globe; including exploration companies in Australia, Asia, and Americas, as well as companies developing new mines in Latin America and West Africa.

The team is currently delivering operational support roles to mining companies in China, Africa and Europe and has been providing expert advice on system selection, implementation and support in the areas of production reporting, grade control, exploration databases, corporate data rooms, as well as managed IT services.

The team offers a highly skilled and dedicated workforce to deliver cost-effective data management and IT solutions to its clients, based on its experience and expertise in a range of commodities.

CSA Global defines data as one of the most valuable assets in a company's possession, and understanding how to manage, manipulate and extract key data insights are crucial to the successful development of a viable mine site.

From the inputting of data on a tablet to presenting a mineral resource or a mine



CSA Global offers highly skilled and cost effective data management solutions.

design at an investor meeting; CSA Global has the capacity and capability to manage this process end-to-end.

"We ensure database management and data extraction are based on a thorough understanding of our client's needs," CSA Global data manager Dale Harris said.

"This knowledge enables CSA Global to provide the very best data management solution, tools and workflows for each client, for all stages of the project; from conception through exploration and then through to production."

CSA Global has five key service offerings which are fully integrated and provide expert advice and solutions across all stages of the mining cycle; from project generation to exploration, evaluation, development, operations, technology and corporate services.

The diversity of its services provides

successful solutions for clients' needs and ensures an innovative approach to all project deliverables.

The technology team comprises a team of experts providing unbiased advice, data management, GIS services and the provision of a fully managed IT service that takes a hands-on approach to assessing clients' needs.

"Data is the lifeblood of an organisation, and increasingly, decisions are being based purely on data and the management, reliability and resilience of that data become critical to the success of the company," Mr Harris said.

The data management team recognises some pain points, including poor domain knowledge, limited data organisation, minimal data redundancy and the unreliability of data as critical issues in the

mining industry.

The technology team helps its clients establish a 'single point of truth' and attributes its success to being software agnostic; and provides recommendations on the best data management solutions.

Over time, the team has demonstrated its experience across the use of all major GIS, mining and exploration software such as Datamine, Micromine, Whittle, Surpac, MineSched, ArcGIS and Datashed; just to name a few.

"How you capture your data through to how you sell your data is how we provide guidance," Mr Harris said.

The technology team leverages some of the industry's most reputable vendors, including Microsoft, Fortigate, Webroot and Software One to ensure data is kept safe through its managed technology service.

CSA Global IT manager Chris Morrissey said that by hosting client data or supporting infrastructure, the pressure is taken off a company so it can concentrate on what it does best.

"Our technology team is made up of experts in both data and IT management; we work with your service providers to deliver solutions, giving you a single point of contact," Mr Morrissey said.

The CSA Global Technology team is highly skilled in the provision of infrastructure, IT management, big data, cloud and software capabilities.

With its head office in Perth, Western Australia, as well as an office in Brisbane supporting the east coast, CSA is further supported around the world with offices in Darwin, Jakarta, Singapore, Johannesburg, Horsham (UK), Moscow, Dubai, and Vancouver; with recently acquired consulting firm, ACA Howe International in Toronto.

More information on CSA Global can be found at www.csaglobal.com.

Quality pontoon pump solutions



Tru-Flo's diesel and electric pumps have high durability for mining specific tasks.

SINCE the early 2000's, Tru-Flo Pumping Systems (Tru-Flo) has built quality electric and diesel driven pontoon pump units recognised in the mining industry for their high performance and reliability in harsh conditions.

Headquartered in Bathurst, NSW, Tru-Flo has branches operating near key mining hubs in QLD, WA and Indonesia.

From these bases, Tru-Flo can service clients throughout Australia and abroad; even in remote international mining locations such as Papua New Guinea and the Pacific Islands.

When building a pontoon pump, Tru-Flo's skilled in-house engineering team considers each location's particular specifications during the planning and design process, resulting in the delivery of a tailored pump that precisely meets client specifications.

Tru-Flo pontoons can be configured to suit a range of applications, including

tailings return, dewatering, leachate and CHPP supply water pumps; as well as to underground or fire water supply and water evaporation projects.

The range is capable of pumping against high head situations, large quantities of solids, and slurries; often encountered in mine dewatering.

During Tru-Flo's manufacturing process, safety and quality assurance are always top of mind.

Tru-Flo diesel pontoons are manufactured to withstand harsh Australian and international open cut mining environments.

The diesel range can be fully customised to suit individual mine applications, with engineering approvals available for compliance, displacements and weight carrying capacities; and are custom designed for safety, quality and ease-of-use.

Each Tru-Flo diesel pontoon pump is manufactured in three module sections,

enabling easy transport in condensed shipping and sea freight containers.

All Tru-Flo diesel pumps are quality assured and pressure tested prior to painting, as pumps are primed and painted with high build, two pack epoxy paint in accordance with Tru-Flo's 'mine spec' coating and bake procedure to protect against abrasive mine water.

Each pump is also fitted with hand, knee and kick rails to meet Australian standards, and come with two supplied onboard life rings, nylon ropes and keeper hooks.

Tru-Flo diesel pontoons can be dragged and skidded across tough mining terrain, as they have a rugged design fitted with super heavy duty push bars enabling them to be towed or pushed by earthmoving equipment.

For added convenience, replaceable wear strips, under skid runners and Bisaloy wear plates can be re-ordered upon request.

Tru-Flo also provides electric pontoons

that are used extensively by mining companies throughout the diverse range of applications that mining demands.

From acidic leachate ponds to dredge pontoons, the Tru-Flo range of electric pontoons come varied and adaptable to suit a range of mining requirements.

Steel constructed or Roto mould high-density polyethylene cells are available, with the option of foam filling for indestructible buoyancy.

Access to the pontoon is available through various systems including floating and spanning walk ways.

As with all of Tru-Flo's pump range, electric pumps are fully customisable and built to the highest quality and performance standards.

Tru-Flo manufactures its pontoons to be site specific, providing a purpose-built solution that will suit a clients' application precisely.



Backed by experience



Pioneer Pump provides better flow, higher head, greater efficiency, and unparalleled service designed to meet unique challenges.

FOUNDED in 1998 by four dedicated pumping professionals, Pioneer Pump designs and manufactures reliable and efficient pumps for multiple industries.

While its origins lie in the US, Pioneer Pump's Australian arm is the central hub for supply into the Southeast Asia and Pacific region.

Based in Victoria, the company's 2000sqm factory and warehouse contains a

large inventory of pumps and spare parts, and close to the full product range.

This is complimented by a team of lively and innovative individuals with strong expertise and dedication to fulfilling the company vision.

The representative sales team for Pioneer Pump is led by Australian founder Steve Bosnar, and has the communication skills and product knowledge to answer all

questions and queries.

"With more than 140 years of experience in our selected fields there is no room for error or mistakes when it comes to serving our customers," Mr Bosnar said.

"Our Australian site is home to engineers that have been expertly trained to meet deadlines [and adapt to] restrictions and changes due to individual customer needs throughout the assembly line to ensure the

product is quintessential and delivered on time.

"Over the last 18 years, we have built up a portfolio of world class pumps that tend to various industries across the globe and [have become] a global company that exceeds all expectations."

More information can be found at www.pioneerpump.com.au or by calling (03) 9988 1650.



PIONEER HEAVY DUTY CENTRIFUGAL PUMPS

Available in End Suction and Fully Automatic Vacuum Assist Self Priming versions. Sized from 2 1/2" (65mm) to 30" (760mm) Port diameters. Bare Shaft and SAE Mount for direct mounting to diesel engines. Highest efficiency impeller and volute designs. High Head dirty water and 3" plus solids handling impeller designs. Run Dry Mechanical Seals are standard through out the ranges.

Materials of Construction

Standard Ductile Iron/ CA6NM SS/ 17-4 SS, also available in 316SS, CD4MCU DUPLEX SS, and 27% CHROME IRON for some of the range.

Max Flows up to 2600 LPS
Max Head up to 260M



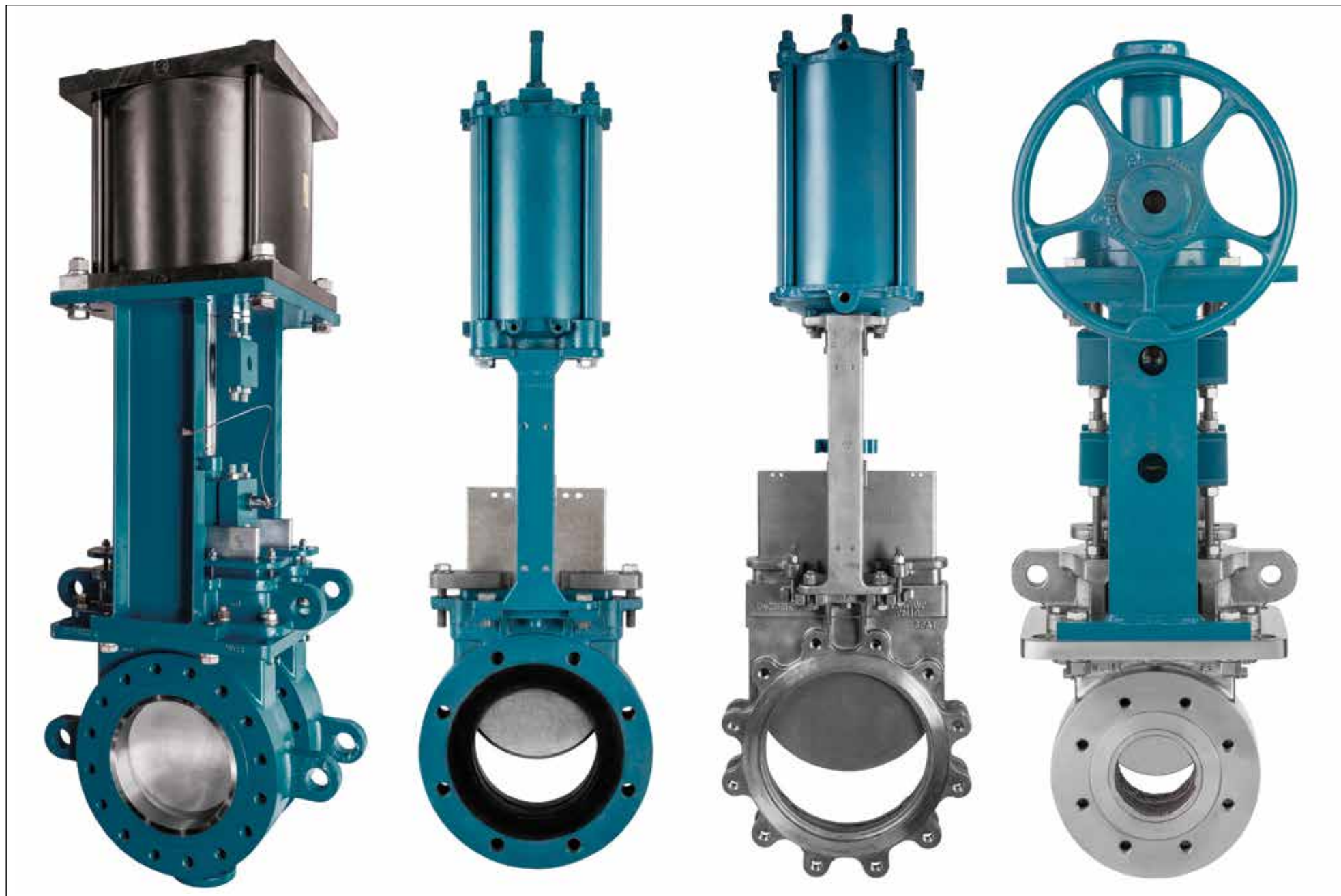
Diesel Mine Spec
Skid Packages

Skid Mount &
Trailer Mount
Diesel Silent
Packages

Electric Drive
Packages

Diesel Mine Spec
& Road Spec
Trailer Packages

The DeZURIK difference



DeZURIK's valve range with SIL certification.

A HISTORY in innovation, decades of mining experience, and a customer-centric culture are hallmarks of industry-leading valve manufacturer DeZURIK.

Boasting four of the valve industry's most trusted brands – DeZURIK, APCO, HILTON and Willamette – the company is recognised globally for its design innovation, quality and service.

Since its founding in 1928, DeZURIK's story is one marked by innovation.

That year, facing a problem with pine pitch build-up in valves at a paper mill, employee Matt DeZURIK designed a first-of-its-kind eccentric plug valve – a revolutionary development at the time.

Customers quickly recognised the advantages of this new valve.

A wave of orders followed, and a company was born.

The same spirit of innovation that founded the company lives on as DeZURIK continues to collaborate with customers to create solutions for the some of the world's most demanding applications.

Today, DeZURIK engineers use the latest advancements in technology such as solid modelling, finite element analysis and 3D rapid prototyping, and computational fluid dynamics.

These technology tools allow the company to create valves that offer outstanding installed performance.

DeZURIK serves thousands of customers in virtually every country in the world.

Chief among these is the mining industry, where DeZURIK continually delivers innovations in gate, plug, butterfly, check, air, and rotary control valves for mining applications.

DeZURIK's state-of-the-art machining centres allow the company to produce more than 100,000 valves annually in sizes ranging from between 15mm and 3700mm.

Among the many valve designs for superior performance are features such as 100 per cent port areas for high-flow capacity, premium packing systems with metallic scraper rings for long service life, and full-force lockouts for safety.

In addition, the team's expertise in materials engineering allows them to

assist in selecting the correct metals, elastomers, and hardened trim materials for longest service life and maximum value.

Its wide variety of valve styles can handle everything from abrasive tailings and scaling lime slurries to corrosive and caustic acids.

The company enjoys a rich history with Australia's mining industry, having supplied high-quality valves to leading mining companies for more than 50 years.

DeZURIK - Australia offers applications expertise, on-site inventory, valve automation, and repair and preventative maintenance services.

More information can be found at www.dezurik.com.au.

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REACHING OUT | Lighting Towers

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Metro-MH

Metro-POD

Metro-LED

The bright new idea in lighting. JLG's Metro Series Lighting Towers offer a host of benefits to make light work of night projects. The Metro Series has reduced noise levels thanks to the new hood design coupled with better engine and exhaust system technologies. Customers can expect a brighter output of 3 x 610 W LED lights on the Metro-Pod and 340 W LED lights on the Metro-LED; while the Metro-MH boasts 1000 W Metal Halide light heads. Auto start/stop controllers and fuel efficient engines mean fuel consumption is greatly reduced and the units run longer between refuelling. Designed for side-by-side loading on trucks, transport is made easy and once onsite they are easily positioned and setup by one person, making for further savings in time and labour. And best of all, the Metro Series is designed and built in Australia with ISO9001 certification and is backed by JLG's industry-leading Ground Support network.



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JLG
reachingout™

JLG secures ISO 9001 certification

JLG'S recently-launched Metro-POD Lighting Tower – the newest addition to the company's popular 'Metro Series' – not only provides users with the latest in light tower technology, but the added peace of mind of knowing the model has been purpose-built in accordance with ISO 9001 standards.

ISO 9001 is the standard which specifies the requirements for a Quality Management System (QMS), which is designed to help companies ensure that they meet the needs of customers and stakeholders while adhering to statutory and regulatory requirements.

Regulating the standard is the International Organisation for Standardisation (ISO), an independent, non-governmental group with a membership of 163 national standard bodies.

JLG Industries Australia and New Zealand general manager Bob Mules said the latest certification demonstrated the robust management and quality systems at JLG, and the company's desire to remain at the forefront of this industry sector.

"An ISO 9001 certification is evidence of our commitment to quality and provides our customers with evidence of our internal discipline to achieve this quality," Mr Mules said.

"It also assists in building a culture

of continuous improvement where customers can count on consistent, repeatable, high quality products.

"Beyond JLG's own internal processes, the certification also affects supplied components, guaranteeing a high standard to the overall product."

In meeting certification for its Metro-POD Lighting Towers and other lighting tower products, JLG's facility in Port Macquarie, NSW, where the towers are designed and manufactured, use an extensive QMS that is annually audited both internally and externally by an independent third-party auditor.

The facility uses an array of cutting-edge, lean and six sigma tools to produce the products, with the goal of delighting customers with their superior performance.

As an additional measure to ensure JLG lighting towers meet the company's stringent internal and ISO 9001 requirements, five quality inspection points occur through the course of manufacturing before the product is shipped to customers.

These are: a fabrication final inspection, paint final inspection, final assembly final inspection, run-up inspection and a final pass quality audit.

More information can be found at www.jlg.com.au.



JLG recently received ISO9001 certification for its Metro-Pod Lighting Tower.

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THE AUSTRALIAN
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FLOW PROMOTION LINERS

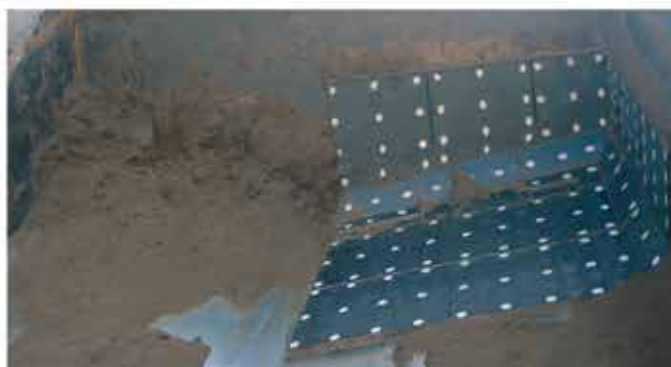


MATROX Flow Promotion Liners assist to reduce typical flow problems of bulk solids in bins, hoppers, chutes, truck beds and other applications.

Compared to steel when lining an existing bin with MATROX, the cost is only about one third and lower in weight. MATROX Sheet reduces the load on the overall structure!



- Excellent resistance to abrasion
- Very high surface hardness
- Good sliding characteristics
- High impact strength
- Very good resistance to chemicals
- On-site installation / project management



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Best suited for harsh environments

THE new formulation of Matrox (a high performance polymer lining) was specifically developed to reduce typical flow problems of bulk solids in bins, hoppers, chutes, truck beds and other applications in the bulk material handling and mining industries.

However, every application makes its own special demands on the lining material.

The Matrox range combines the best surface friction qualities with abrasion resistance; not only to promote bulk material flow, but also to withstand the abrasion of flowing bulk materials in rugged applications under different environmental conditions.

The Matrox grades are based on a specific formulation of ultra-high molecular weight polyethylene that has been specially developed for use as a lining-material, either in new construction or as a retrofit.

Dotmar has a team of experienced and highly qualified installers that can either line applications at one of its nationwide branches or work on site with all the appropriate tickets and inductions.

Dotmar has extensive experience with project management to provide end-to-end lining solutions that cater to mining.

Further information on Dotmar's Matrox can be found by calling 1800 170 001 or via: www.dotmar.com.au.



Dotmar's Matrox lining is made tough for applications in the resources sector.

Premium plastics for mining

AN Australian industry leader since 1981, E-Plas specialises in premium industrial and engineering plastics, combining invaluable years of expertise and experience with youthful enthusiasm.

From state-of-the-art hopper and chute linings, including the top performing Tivar UHMW-PE product range and QuickSilver Truck Lining Systems, E-Plas' products are perfectly suited to the rigours and demands of mining and other bulk handling environments.

"Our diverse product range has got it covered," E-Plas director Lisa Marshall said.

"We aim for the best product at the best price, from our tried and true work horses like HDPE, acetal (POM), nylon, PEEK, polypropylene, to polycarbonate and acrylic."

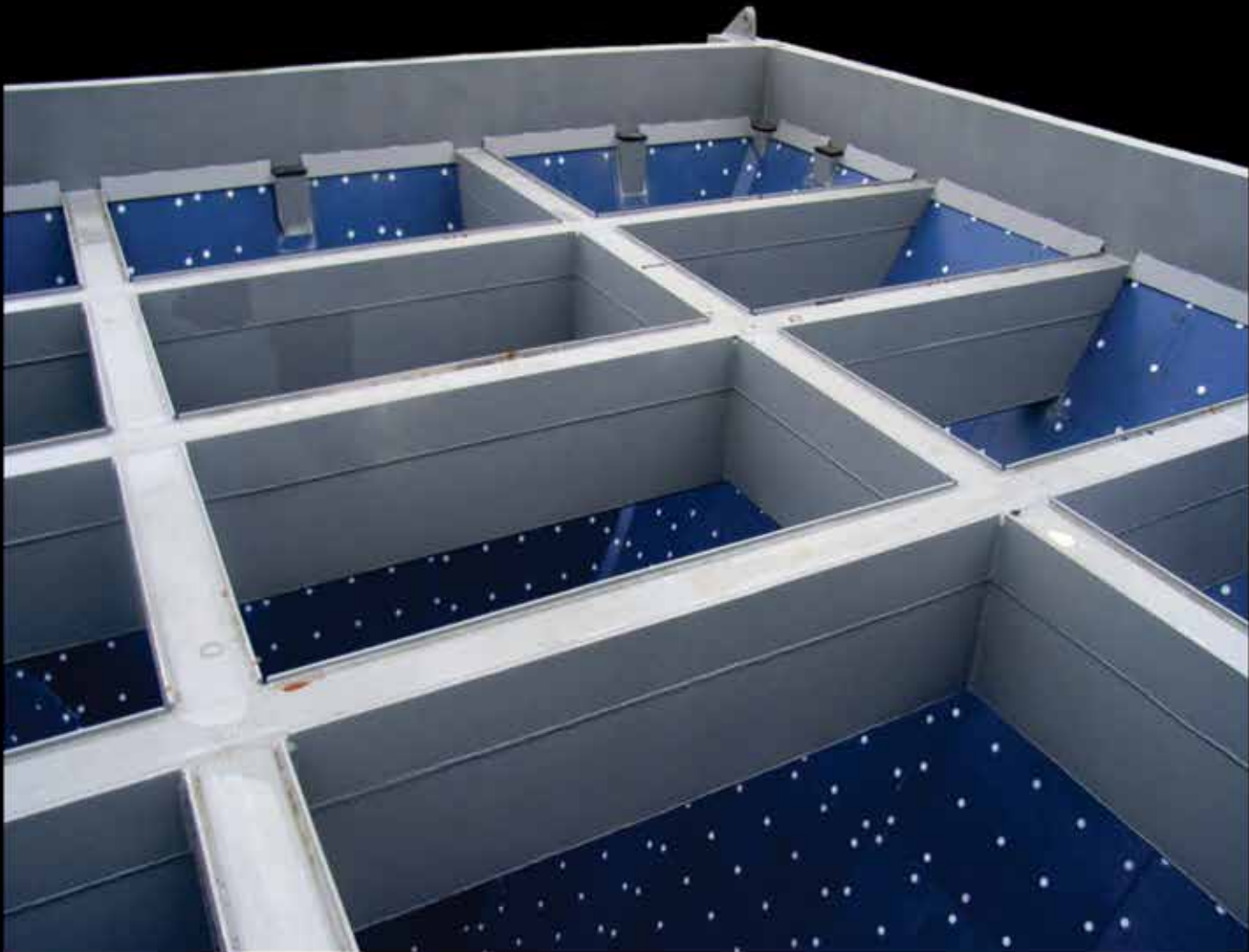
The company is backed by some of the world's leading manufacturers, which enables it access to excellent product supply, knowledge and support.

In addition, the E-Plas team are happy to investigate specialty materials and arrange special orders on request, and can also provide fabrication services such as CNC, standard machining, and cut to size.

"With many years of experience in the plastics and engineering field, our able and dedicated staff members are qualified to solve your plastics problems, answer your questions and satisfy your plastics needs," Ms Marshall said.



E-Plas is a leading national supplier of engineering plastics.



- Tivar®**
Premium Linings
- Tivar 88®**
World Renowned
Bulk Handling Material
- Tivar Ceram P®**
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High Abrasion Applications
- Tivar DrySlide®**
Modified Material with Optimum
Sliding Friction Properties
- QuickSilver®**
Premium Lining For Truck Body
Continuous Lining Applications

Optimised Performance, Bulk Handling Specialised UHMW-PE

Quality management at Industrial Plastics



Sodium hydroxide and ammonia tanks manufactured to ISO9001 standards for Leighton Contractors.

PLASTICS are a cost-effective material that can be used extensively in the mining industry and its supporting sectors.

Custom fabricated products including tanks, liners, chutes, downcomers, launders and piping systems, would all be subject to the benefits of plastic — from reduced maintenance, corrosion free properties, high chemical, wear resistance and durability (impact resistance).

With 45 years' experience in the plastic fabrication market, Industrial Plastics has a glowing reputation forged through its capability to deliver high-quality products and exceptional service.

The company believes its ISO9001 Quality Management System, which has driven the business every day since 2008, is the secret to its competitiveness in the market.

"At the front end, our customers see a fantastic and often unique product supported by critical data, including manufacturing data records (MDR's), inspection and test plans (ITP's), as-built drawings, and installation and maintenance instructions," Industrial Plastics director Scott Miller said.

"But our Quality Management System is so much more than this.

Among other things, it drives staff development, occupational health and safety, customer satisfaction and continuous improvement throughout our business streams."

The Quality Management System had also been a critical ingredient in supporting the company's current national expansion.

"Opening new branches and being able to engage our new employees via our Quality Management Handbook is invaluable; we love it," Mr Miller said.

Industrial Plastics is also proud of its many successful projects in the mining industry, including launders for Xstrata Copper and Xstrata Zinc, large storage tanks for Rio Tinto, a variety of components for Glencore mines, and slurry tanks for Jellinbah Resources.

"Our business benefits from the important role it plays in supporting the ongoing maintenance and preservation of mining assets in addition to capital expenditure projects," senior sales engineer Kevin Smerdon said.

"We are always keen to assist in the design phase and provide new options and ideas for mine engineers who have a budget."



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Flight Extruded Plastics state-of-the-art facility is based in South Australia.

FLIGHT Extruded Plastics has been supplying sheet and rollstock into the Australasian market for more than 35 years, and has recently expanded its capabilities to extrude HDPE and polypropylene from its South Australian facility.

Through an ongoing investment in extrusion equipment, the company has the largest and most diverse capability in Australia, and is in a unique position to offer custom sheet to the mining and

fabrication market.

"FEP offers patterned, coloured, coextruded sheet options and can also supply sheet with additives including UV stabilizers and flame retardants," sales manager Andrew FitzGerald said.

"As a local manufacturer, we take pride in supplying quality materials run to specified requirements and within short lead times."

Further information can be found at www.flightplastics.com.au.

Proven tank cleaning technology

WHEN it comes to underground chemical storage, today's formulations present many challenges.

Whether it's for fuel, water, waste or oil – any contents are prone to contamination, and tank owners are looking for answers.

Often the solution requires completely cleaning the tank, a task made difficult by limited or refined space entry options into storage tanks.

Gamajet, a world leader within the key technology areas of heat transfer, separation and fluid handling, has created multiple products that clean any size fluid tank, quickly, thoroughly, and without cutting and entry.

This efficient cleaning method utilises the latest tank cleaning technology, because regardless of use, stored content, sitting in AST, UST or other portable storage, must perform as expected.

Gamajet devices by Spray Nozzle Engineering can also be used to polish the fuel.

In many cases, the fuel is used as a cleaning agent, powering the fluid-driven cleaning device in its 360 degree pattern, scouring the tank clean.

Tank owners and contractors are now turning to Gamajet from Spray Nozzle Engineering to solve their storage tank cleaning challenges.

Gamajet from Spray Nozzle Engineering offers specialised jet cleaning product and engineering solutions, based on its key technologies of heat transfer, separation and fluid handling.

Every device is custom selected for optimal cleaning and provides a solution



Spray Nozzle Engineering can eliminate confined space entry on tank cleaning applications.

for every tank, tote and vessel, regardless of shape, size or internal obstructions.

Its products use patented technology to save companies billions of gallons of

water and chemicals, millions of hours, and facilitate massive increases in plant productivity and worker safety, all over the world.

Spray Nozzle Engineering can also tailor custom hose reel packages to raise and lower tank cleaning nozzles automatically thus eliminating confined space entry issues.

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THE AUSTRALIAN
MINING REVIEW

Networks for harsh environments

NLT has supplied Wi-Fi and data systems for more than a decade, and was the first in the world to deploy intrinsically safe Wi-Fi solutions to an Australian coal mine.

The company's N-Connex isn't just another typical Wi-Fi network. It's a modular, IP67-rated system that can easily be modified and expanded to suit the changing needs of a mine, and specifically designed to simplify the installation and maintenance of a network.

Wi-Fi and the vast array of applications and solutions that utilise the technology have come a long way over recent years.

Originally interested in procuring and installing a Leaky Feeder system for its expanding mine, the De Bacis silver mining project in Mexico quickly changed its mind after being introduced to the N-Connex.

NLT's solution met all of De Bacis' current needs, while guaranteeing the mine would be future-proofed. This new, innovative solution finally provides underground hard rock mines with a reliable and powerful alternative to the incumbent Leaky Feeder radio system.

Leaky Feeder historically had an advantage over modern, IP-based solutions as a cost effective, mine-wide voice communication system; however, is no longer the case.

Partnering with Icom, NLT now offers a handheld and vehicle-mounted IP radio that looks and functions similarly to traditional two-way radios.

Additionally, performance of the IP radio terminals is superior to its two-way counterparts, finally making the critical component of voice communication over IP networks (VoIP) a reality.

The N-Connex also overcomes Leaky Feeder's bandwidth limitations for data applications. With a one-gigabit backbone



The N-Connex Wi-Fi network system.

capability, N-Connex can support the high-data demands of today's modern mine, while providing essential needs like voice communications.

With voice communications, data, and Wi-Fi networking all supported by a single system, N-Connex eliminates the need to install both a fibre system and a Leaky Feeder system in tandem.

N-Connex's Wi-Fi network enables two-way voice communications, video monitoring, and a platform for tracking personnel, vehicles, and assets; plus full high-speed connectivity for Wi-Fi enabled devices.

N-Connex takes the complexity out of networking, enabling a mine to expand at its own pace through the addition of true plug-and-play modules.

The integration of all of these requirements into one, simple, modular system that achieves the same level of coverage (with a low-cost premium) as a Leaky Feeder system was the catalyst for NLT's design of N-Connex.

NLT's N-Connex is evidence that future-proofing a mine's technology and data requirements can be affordable and achievable, making reliance on outdated legacy technology a thing of the past.



Transition to a more connected mine

Discover the N-Connex Digital Network

Relying on incumbent and outdated solutions such as Leaky Feeder and single purpose networks will restrict your mine's performance.

Voice communications, data networking, monitoring and control systems, video, personnel and vehicle tracking and all of today's modern applications demand an advanced and connected mine. Take the smarter, integrated approach to your mine's connectivity.

- Plug n' play, high speed modular network
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- No installation specialists required
- A true, turnkey data and communications solution
- Install the modules you need as required
- **Connect and future proof your mine with NLT N-Connex**



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Northern Light Technologies

Rebecca Knol

SACOME chief executive

After taking a five year break from the resources sector to run her own learning and development business, Rebecca Knol has dived back into mining via her recent appointment as South Australian Chamber of Mines and Energy (SACOME) chief executive. **Elizabeth Fabri** spoke to the seasoned professional about her experience as a woman in mining, and what she hopes to achieve in her new position.

Q. Describe your education and professional background.

I have worked in the mining, oil and gas sectors nationally and internationally and have significant on site and consultant experience in community relations, environment and health and safety.

In 1998 I was a recipient of a Winston Churchill Fellowship, researching international trends and practices that led to the development of State and National Guidelines for mine closure planning in Australia.

In Adelaide, I was the National Manager for Major Projects with Origin Energy and in this position was responsible for the regulatory approvals of renewables and gas projects in Australia and New Zealand.

I hold a Bachelor of Landscape Architecture, a Graduate Diploma in Environmental Studies, a Masters in Science and a Masters in Business.

Q. How does it feel to have returned to the mining sector after running your company KidsNetwork for the last five years?

It is invigorating to be back in the resources sector and amongst the complexities and challenges that it offers.

While there are encouraging signs that the sector is emerging from a very flat period, the sector is grappling with volatile commodity prices, the need for growth and de-carbonisation, and the imperative of change in a digital world.

On the upside, change and adaptability are underpinned by innovation and imagination, and there is no shortage of either of those in the resources sector. It is exciting to be part of this complex and challenging debate.

My experience in the education sector, which is also challenged by a post industrial paradigm, and the experience of running my own business have provided a platform of experience that allows me to view the resources sector with fresh eyes.

Q. What do you look forward to achieving at SACOME?

The South Australian Chamber of Mines and Energy's core role has not changed. We are here to influence policy, to enhance resources projects and attract investment, to advocate on behalf of our members, and to help connect service providers with procurement opportunities, while broadening the



understanding of our sector among the wider community.

I am looking forward to strengthening our strategic frameworks, and the South Australian State election in early 2018 will provide a challenge in this area.

I believe SACOME's work should be judged, at least in part, by the overall perception of our industry. I am looking forward to developing effective strategies in partnership with our stakeholders to clearly frame, develop and articulate our policy positions and to ensure they are consistently sought and considered.

Q. The resources industry is still very much male-driven. How has your experience been as a woman? Do you hope more women consider a job in mining?

Diversity in any sector is desirable. There are many resources companies who lead the way in attracting and retaining women – it simply makes good business sense to do so.

Working in Africa during the construction of a mining operation I was one of a handful of women (three!) in a workforce of over 300 – I experienced

support, respect and mateship from the men I worked with in this challenging environment.

This culture extended into the operational phase of the mine when employment swelled to 1600 but the numbers of women were still low. It was not uncommon to sit yarning about families and friends we missed many miles away.

The industry is full of husbands and dads, wives, mums and partners, and the digital world has made a significant difference to remote employees being able to maintain friendships and relationships across continents and time zones.

My wish is always that women are recognized for their competencies not their gender. It is a fabulous sector with unlimited opportunities for men and women and as my appointment to this position demonstrates, an industry that values diverse experiences and is respectful of women.

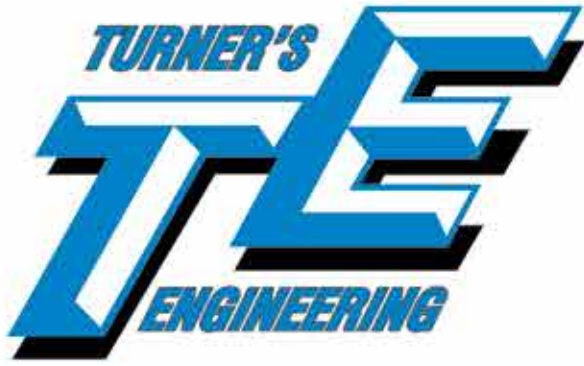
Q. What is the best piece of advice someone has given you in your career?

I was fortunate early in my career to be asked the question "what is your purpose"? It was a really tough question to answer and took me some time to nut out but once I did, every personal and professional decision has been easy to make. This advice helped me to look out the front window and be purposeful about my journey, and I am very grateful to Graeme Guinness for asking it.

Q. In your opinion what are the biggest issues facing the mining industry currently, and how can the industry tackle these?

Like all sectors, but more than many, we have to address the way we do things, because the world now does things very differently. The two biggest challenges for the sector remain unchanged – community engagement and access to land. We are no longer in an era of unabated land access, limited environmental concerns, and limited community interest in projects. Communities are galvanised globally and leverage off social media to spread their message.

Communication is crucial in these areas; communication with each other, with government, with local communities, and with the public, which both benefits from and judges what we do. Our industry has evolved out of the industrial age, and the transition to a low carbon, advanced technology era is both a challenge and opportunity.



Our Motto is "Quality through Innovation"

Turner's Engineering QLD offers a diverse range of products and services, providing solutions for a broad range of needs in the construction, mining & transport industries.

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- Manufacturing, Conversion and refurbishment of Fuel, Service and Water Trucks
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- Roadworthy inspection, Compliance & Modification plates, Registration & CTP Insurance for everything from Motorbikes through to Heavy Vehicles
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Our Mission at Turners's Engineering is to provide our clientele with the highest value, the most reliable services and superior quality products, surpassing their expectations.

We strive for operational excellence, apply industry leading technologies and shape the industry with regards to OH&S, Environmental Management and ethical business practices to achieve better customer satisfaction and strong financial performance.



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